

MORESBY HEIGHTS

LOCAL STRUCTURE PLAN



FEBRUARY 2015

ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Greater Geraldton Local Planning Scheme No.1

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

7 November 2014

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Date of Expiry:

19 October 2035

EXECUTIVE SUMMARY

Location of the Structure Plan Area

The structure plan area is located approximately 10km north east of the Geraldton CBD, 4km from the coast, at the foot of the Moresby Range.

Land uses proposed by the Structure Plan

The structure plan proposes development of the site for predominantly residential purposes, supported by a neighbourhood centre, primary school and public open space. It also proposes areas of regional and district open space, in support of the City of Greater Geraldton's planning strategies and requirements, and a tourism node at the top of the Moresby Range scarp.

Relationship to the Local Planning Scheme

The structure plan has been prepared under Clause 5.17 of the City of Greater Geraldton's Local Planning Scheme No. 5.

Item	
Total area covered by the structure plan	395.1ha
Area of specific land uses	
Residential	187.7
Commercial (Neighbourhood Centre)	3.5
Primary School	4.0
Rural Residential	68.5
Public Open Space	130.5
Estimated lot yield	1,500 – 2,000
Estimated number of dwellings	1,500 - 2,000
Estimated population (du x 2.6)	3,900 – 5,200
Number of high schools	-
Number of primary schools	1
Estimated retail floor space	4,500-6,000m ²
Estimated employment provided	150-200 ¹
Number and area of public open space	
'Regional' Open Space	79.0
District Open Space	33.7
Local Open Space	19.3

NOTES: 1 - Based on assumption of 3.3 employees per 100m² retail floorspace.

PART 1 – STATUTORY SECTION

TABLE OF CONTENTS

ENDORSEMENT PAGE

TABLE OF MODIFICATIONS

- 1.0 STRUCTURE PLAN AREA**
- 2.0 STRUCTURE PLAN CONTENT**
- 3.0 INTERPRETATION AND SCHEME RELATIONSHIP**
- 4.0 OPERATION**
- 5.0 LAND USE AND SUBDIVISION REQUIREMENTS**
 - 5.1 Commercial Zone**
 - 5.2 Tourist Zone**
 - 5.3 Rural Residential Zone**
 - 5.4 Residential Zone**
 - 5.5 Public Open Space**
 - 5.6 Reports/Strategies Required Prior to Subdivision**
 - 5.7 Conditions of Subdivision Approval**
- 6.0 DEVELOPMENT REQUIREMENTS**
 - 6.1 Design Guidelines**
 - 6.2 Detailed Area Plans (DAPs)**
- 7.0 OTHER REQUIREMENTS**

MAP 1 – Local Structure Plan

TABLE OF MODIFICATIONS

Modification No.	Description of Modification	Date Endorsed by Council	Date Endorsed by WAPC

PART 1 - STATUTORY SECTION

1.0 STRUCTURE PLAN AREA

This Structure Plan shall apply to lots 80 and 81 Hackett Road, and Lot 55 Cooper Street, Waggrakine being the land contained within the inner edge of the broken black line shown on the Structure Plan Map (Map 1).

2.0 STRUCTURE PLAN CONTENT

This Structure Plan comprises the:

- a) Statutory section (Part 1);
- b) Explanatory section (Part 2); and
- c) Appendices to Part 2 – Technical reports.

Part 1 includes the Structure Plan Map and provisions.

Part 2 (and its appendices) justifies and explains the provisions contained in Part 1, and should be used as a reference guide to interpret and implement Part 1.

3.0 INTERPRETATION AND SCHEME RELATIONSHIP

Unless otherwise specified in this part, the words and expressions used in this Structure Plan shall have the respective meanings given to them in the City of Greater Geraldton Local Planning Scheme No. 5 (Greenough) (the 'Scheme').

The Structure Plan Map outlines land uses, zones and reserves applicable within the Structure Plan area. The zones and reserves designated under this Structure Plan apply to land within it as if the zones and reserves were incorporated into the Scheme.

Pursuant to clause 5.17.12.2 of the Scheme, if a provision of this Structure Plan is inconsistent with a provision of the Scheme, then the provision of the Scheme prevails to the extent of the inconsistency.

Pursuant to clause 5.17.12.3 of the Scheme, the provisions this Structure Plan apply to the land as if its provisions were incorporated into the Scheme and it is binding and enforceable in the same way as corresponding provisions incorporated into the Scheme.

Part 2 of this Structure Plan and the Technical Appendices are to be used as a reference only to clarify and guide interpretation and implementation of Part 1.

4.0 OPERATION

In accordance with the sub-clause 5.17.12.1 of the Scheme, this Structure Plan shall come into operation when it is certified by the WAPC pursuant to clause 5.17.10.2 of the Scheme.

5.0 LAND USE AND SUBDIVISION REQUIREMENTS

The Structure Plan Map outlines land uses, zones and reserves applicable within the Structure Plan area. The zones and reserves designated under this Structure Plan apply to the land within it as if the zones and reserves were incorporated into the Scheme.

5.1 Commercial Zone

Land use permissibility shall be in accordance with the “Commercial” zone in the Scheme with the exception of the following variations:

<u>LAND USE</u>	<u>PERMISSIBILITY</u>
Aged and Dependent Persons Accommodation	D
Ancillary Accommodation	D
Bed and Breakfast	D
Home Business	D
Home Occupation	D
Home Office	P
Grouped Dwellings	D
Multiple Dwellings	D
Single House	D

‘P’ and ‘D’ shall have the same meaning as within the Scheme.

The ‘Commercial’ site may include retail floorspace up to 6,000m².

5.2 Tourist Zone

Land use permissibility shall be in accordance with the “Tourist” zone in the Scheme with the exception of the following restricted uses which are NOT PERMITTED:

- Aged and Dependand Persons Dwellings
- Fast Food Outlet
- Holiday Home
- Lunch Bar
- Residential Building
- Service Station.

A ‘Shop’ use may be permitted provided it is considered by the local government to be incidental to the predominant use.

Further subdivision of Tourist sites is not permitted except where:

- It has been fully developed, or an approved development plan has been prepared for the whole site, and provision has been made for the coordinated development of the site in accordance with the plan, to the satisfaction of Council; and
- An approved, enduring and enforceable management plan has been prepared to ensure the coordinated management, operation and maintenance of the site as a single tourism entity, to the satisfaction of Council.

5.3 Rural Residential Zone

Subdivision shall generally be in accordance with the Structure Plan Map with a minimum lot size of 1 hectare.

Stocking rates shall not exceed Agriculture Western Australia's standards and no stock is permitted on 'Conservation Lots'.

At the time of subdivision a Local Development Plan shall be prepared for each lot and shall address the following:

- Identification of building envelopes and/or building exclusion areas;
- Siting, materials and finishes for development; and
- Re-vegetation requirements.

For lots other than 'Conservation Lots' a minimum of 3% of the lot shall be re-vegetated, and thereafter maintained to the satisfaction of the local government, with a combination of trees, shrubs and ground covers consistent with the indigenous plant communities identified in the Geraldton Regional Flora and Vegetation Survey. The local government may accept a cash contribution in-lieu of revegetation.

No development or land use shall impede in any way the natural water flow along any creek line or water/drainage course.

'Conservation Lots' nominated on the Structure Plan Map shall also be subject to a restrictive covenant. The restrictive covenant will protect and preserve remnant or regenerated vegetation in perpetuity and should include among other things, provisions for:

- Prohibit further clearing;
- Clearly delineate a building envelope and/or building exclusion area;
- On-going weed management;
- Prohibit stocking; and
- Rehabilitate unstable/degraded areas with local provenance seedlings.

5.4 Residential Zone

Between 1000 and 2000 dwellings are anticipated within the Structure Plan area.

The Structure Plan Map defines the residential density ranges that apply to specific areas within the Structure Plan area.

5.5 Public Open Space

Public open space shall be provided generally in accordance with the Structure Plan Map and Table 1, with an updated public open space schedule to be provided at the time of subdivision for determination by the WAPC, upon the advice of the City of Greater Geraldton.

Table 1: Public Open Space Schedule

Regional Open Space	79.05 ha
District Open Space	21.16 ha
Neighbourhood Open Space	3.09 ha
Local Open Space	13.87 ha
Conservation	14.85 ha

Public open space management plans required as conditions of subdivision approval (refer 5.7 below) should address:

- Minimisation of clearing and vegetation disturbance during construction;
- Access control (during construction and post-construction);
- Revegetation species (incorporating native plant species with local provenance) and establishment;
- Invasive species control (weeds and pests);
- Stormwater management (including erosion control);
- Ongoing maintenance and management of the vegetated areas;
- Protection and improvement in the environmental condition of waterways and wetlands;
- Bushfire management;
- Interface management; and
- Public education.

5.6 Reports/Strategies Required Prior to Subdivision

Any subdivision or development proposal to progress the establishment of the eastern most Tourist site shall include information that demonstrates suitable access arrangements. Any such proposal will also be accompanied by a Visual Landscape Assessment and Management Plan, demonstrating to the satisfaction of the relevant authority, visual integration and appropriate siting of all aspects of the subdivision and / or development.

Prior to any subdivision, an updated Traffic Report shall be prepared which addresses the following:

- Through traffic counts on Tramway, Hall, David, Sutcliffe, Hackett and Chapman Valley Roads;
- Turning movement counts on the following intersections: North West Coastal Highway – Tramway Road, Sutcliffe Road – Chapman Valley Road and Hackett Road – Chapman Valley Road;
- Intersection assessment and recommendations for the following intersections: Tramway Road – Hall Road, Tramway Road – David Road and Arnold Road – Sutcliffe Road;
- Sidra analysis (or similar) and recommendations for the following intersections: North West Coastal Highway – Tramway Road, Sutcliffe Road - Chapman Valley Road, Hackett Road – Chapman Valley Road;
- Local area traffic management device proposals to address long straight road alignments and four-way intersections within the development area.

Prior to any subdivision application being lodged in excess of 4 years from the operation date of the structure plan (as defined in section 4.0), an updated Traffic Report shall be prepared. Thereafter, any further subdivision application shall be accompanied by a Traffic Report not greater than 4 years old.

5.7 Conditions of Subdivision Approval

At the time of subdivision conditions may be recommended, as applicable, requiring the preparation and/or implementation of the following:

- a) Vegetation Management Plan identifying what areas of remnant vegetation are to be retained (the City of Greater Geraldton / Department of Parks and Wildlife);
- b) Bushfire Management Plan in general accordance with relevant State Planning Policy and associated Guidelines (City of Greater Geraldton / Department of Fire and Emergency Services);
- c) Public Open Space Landscape and Management Plan (City of Greater Geraldton);
- d) Urban Water Management Plan (including more detailed geotechnical assessment demonstrating soil permeability(City of Greater Geraldton); and
- e) Waste Water Treatment Plan (in the event that on-site waste water treatment is approved) detailing the location of processing facilities either within or abutting POS (City of Greater Geraldton).

6.0 DEVELOPMENT REQUIREMENTS

6.1 Design Guidelines

Design Guidelines may be recommended to be prepared as a condition of subdivision, to address the proposed Development Response detailed in section 7.2.1.2 of the Moresby Heights Visual and Landscape Assessment appended to Part 2 of the Structure Plan relating to building placement, design, materials and colours. These may be adopted and implemented as a Town Planning Scheme Policy under Clause 2.2 of the Scheme.

6.2 Local Development Plans (LDPs)

Local Development Plans shall be prepared and approved in accordance with Clause 5.17.15 of the Scheme for the following sites:

- Commercial site;
- Tourist sites;
- Rural Residential sites; and
- Lots with direct frontage to Public Open Space.

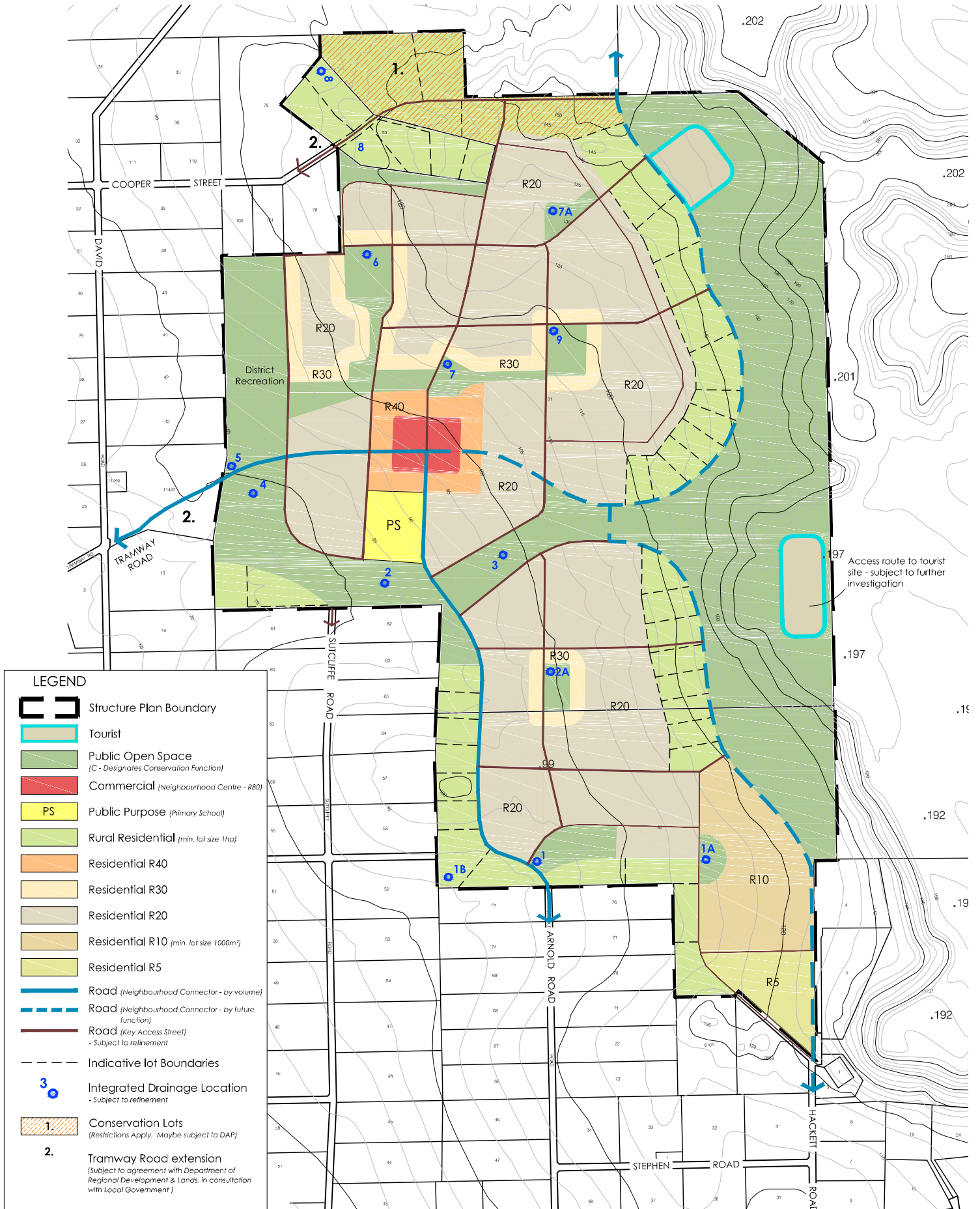
In addition, as a prerequisite to development, the 'Tourist' sites shall be required to prepare fire management plans which incorporate the aspects of bushfire protection, bushfire attack levels on buildings, access and egress to and from the sites in the event of bushfire, managing bushfire fuels adjacent to the sites and, for the site on the top of the Moresby Range, the potential for a shelter in place scenario.

7.0 OTHER REQUIREMENTS

Transfer of the District Open Space area to the City of Greater Geraldton shall occur at or before release of the 200th lot.

At least two permanent roads providing access to the southern portion of the development shall be provided at or before release of the 300th lot.

The construction of the Tramway Road extension to the development shall occur at or before release of the 300th lot. Deferral of the extension requirement up to a maximum of the 600th lot may occur with the approval of the City of Greater Geraldton, should the operation of Chapman Valley Road at the time be at a level acceptable to the City of Greater Geraldton.



MAP 1 - LOCAL STRUCTURE PLAN



PART 2 – EXPLANATORY REPORT

TABLE OF CONTENTS

- 1.0 INTRODUCTION AND PURPOSE**
- 2.0 LAND DESCRIPTION**
 - 2.1 Location**
 - 2.2 Area and Land Use**
 - 2.3 Legal Description and Ownership**
- 3.0 PLANNING FRAMEWORK**
 - 3.1 Zoning and Reservations**
 - 3.2 Regional and Sub-Regional Plans**
 - 3.2.1 Greater Geraldton Region Plan Update 2010 (WAPC)
 - 3.3 Policies**
 - 3.3.1 Moresby Range Management Strategy 2009 (WAPC)
 - 3.3.2 Moresby Range Management Plan 2010 (City of Geraldton Greenough & Shire of Chapman Valley)
 - 3.3.2.1 *Visual Impact Assessment*
 - 3.3.3 General WAPC Policies
 - 3.4 Other Approvals and Decisions**
- 4.0 SITE ANALYSIS**
 - 4.1 Landform, Topography and Soils**
 - 4.2 Conservation and Environmental Values**
 - 4.3 Bushfire Hazard**
 - 4.4 Heritage**
- 5.0 CONTEXT AND CONSTRAINTS ANALYSIS (REFER FIGURE 10)**
 - 5.1 Transport and access**
 - 5.2 Services and Infrastructure**
 - 5.3 Centres and Employment**
 - 5.4 Regional and District Open Space and Community Infrastructure**
 - 5.5 Land Use Context**
 - 5.6 Unexploded Ordinance**

6.0 STRUCTURE PLAN DESCRIPTION

6.1 Overview and Neighbourhood Structure

6.2 Commercial centres

6.3 Natural features

6.4 Street block layout

6.5 Movement network

6.6 Land use (including density and population estimates)

6.7 Schools and Community Facilities

6.8 Public Parklands (Refer Figure 16)

6.9 Urban Water Management

6.10 Infrastructure Coordination, Servicing and Staging

6.11 Visual Integration

7.0 BUSHFIRE MANAGEMENT

8.0 IMPLEMENTATION

FIGURES

Figure 1 - Structure Plan Area

Figure 2 - Location Plan

Figure 3 - Current Zoning (City of Greater Geraldton TPS 5)

Figure 4 - Greater Geraldton Region Plan Update 2010 (WAPC)

Figure 5 - Moresby Range Management Strategy 2010 – Map 8 (WAPC)

Figure 6 - Moresby Range Management Plan 2011 – Plan 3.1 (Shire of Chapman Valley – City of Greater Geraldton)

Figure 7 - Acid Sulphate Soil Overlay

Figure 8 - Vegetation Condition and Location of Priority Flora (Coterra)

Figure 9 - Wetland Locations (Coterra)

Figure 10 - Context and Constraints

Figure 11 - Development Concept

Figure 12 - Road Hierarchy (Jonathan Riley Traffic Consultant)

Figure 13 - Roads for Future Bus Service (Jonathan Riley Traffic Consultant)

Figure 14 - Footpaths and Cycle Paths (Jonathan Riley Traffic Consultant)

Figure 15 - Public Open Space Plan

Figure 16 - Landscape Hierarchy (EPCAD)

Figure 17 - Illustrative Landscape Plan (EPCAD)

Figure 18 - Landscape Concepts (EPCAD)

Figure 19 - Stormwater Catchment Plan (Aecom)

APPENDICES

Appendix 1 - Certificates of Title

Appendix 2 - Moresby Range Design Response (Ferart Design for Shire of Chapman Valley & City of Greater Geraldton, 2010)

Appendix 3 - Visual Impact Assessment Report (EPCAD, August 2013)

Appendix 4 - EPA Comments on Amendment 5 to Local Planning Scheme No. 5 (Oct 2011)

Appendix 5 - Environmental Assessment Report (Coterra, Jan 2013)

Appendix 6 - Traffic Report (Riley Consulting, Dec 2013)

Appendix 7 - Local Water Management Strategy (Aurecon, 27 Jan 2015)

Appendix 8 - UXO Clearance (Sept 2006)

1.0 INTRODUCTION AND PURPOSE

This structure plan seeks to provide a comprehensive planning framework to coordinate the subdivision and development of the Moresby Heights estate area (occasionally referred to as the Wavecrest Estate) as a new residential neighbourhood. It is prepared under section 5.17 of the City of Geraldton Greenough's Local Planning Scheme No. 5 and applies to 395ha north-east of Geraldton CBD (refer Figure 1 – Structure Plan Area).

2.0 LAND DESCRIPTION

2.1 Location

The structure plan area is located approximately 10km north-east of Geraldton CBD, on the foot and side slopes up to the Moresby Range, 4km from the coast (refer Figure 2 – Location Plan). It is located within the City of Geraldton Greenough and abuts the Shire of Chapman Valley boundary to the north and east.

2.2 Area and Land Use

The structure plan area totals 395.15ha. The majority is currently used for rural purposes, principally for pasture.

2.3 Legal Description and Ownership

The structure plan area comprises:

Lot No.	Certificate of Title (Appendix 1)	Area	Ownership
Lot 55	CT 136/190A	9.75ha	P J Dossetter & V L Neil
Lot 80	CT 2669/491 and 492	80.69ha	Caversham Property P/L Portstyle Nominees P/L
Lot 81	CT 2670/71, 72 and 73	304.67ha	VJ & JM Newman Seatone Nominees P/L Caversham Property P/L

3.0 PLANNING FRAMEWORK

Key planning instruments applicable to the site are summarised as follows:

3.1 Zoning and Reservations

The site is currently zoned 'Development' under the City of Geraldton-Greenough's Local Planning Scheme No. 5 (Greenough) (refer Figure 3 – Current Zoning). This zoning was put in place to facilitate its development by Amendment 5 to the Scheme, gazetted on 10 August 2012.

A portion of the site is subject to the Moresby Range Special Control Area provisions of Part 6 of the Scheme. This seeks to conserve the landscape values of the Range. Clause 6.3.4 (a) states that the Council may consider supporting development within the area which is responsive to the objective of the SCA, having regard to:

- The siting of the proposed development;
- The design and layout of the proposed development;
- The materials and finishes to be used in the proposed development;
- The protection of remnant native vegetation or revegetation located on the site; and
- The installation and maintenance of vegetation, retaining walls or other works to prevent erosion.

These issues are addressed by the Structure Plan, which is supported by a detailed Visual and Landscape Assessment, and are discussed further below.

3.2 Regional and Sub-Regional Plans

3.2.1 Greater Geraldton Region Plan Update 2010 (WAPC)

The Geraldton Region Plan (incorporating the Greater Geraldton Structure Plan) was adopted by the Western Australian Planning Commission in June 1999 to provide a regional framework to guide strategic planning and development decisions within the area. The Plan recognises that the greater Geraldton area is the focus of commercial and administrative activity for the Mid-West Region and, as such, aims to provide a framework for coordinating development and managing growth of the regional centre.

The Plan was subject to a review and update in 2010 which resulted in the subject site being identified as a Development Investigation Area (refer Figure 4). The text in relation to this Area states that:

- The site's location and proximity to Central Geraldton and the northern coastal corridor will be significant considerations in determining the most appropriate level of intensification;
- Whilst the site is largely cleared, some pockets of remnant vegetation remain;
- The surrounding area is of visual landscape value and any development will need to consider this context and its interface; and
- Any amendment will need to be supported by appropriate environmental studies and address the Geraldton Regional Flora and Vegetation Survey and the Moresby Range Management Strategy.

Development is therefore anticipated, subject to adequate response to key issues, most notably environmental and visual impact. These issues are addressed by the Structure Plan and are discussed further below.

3.3 Policies

3.3.1 Moresby Range Management Strategy 2009 (WAPC)

The Moresby Range Management Strategy was prepared by the Western Australian Planning Commission and adopted in 2009. It recognises the high landscape significance of the Range, and seeks to:

- Protect, conserve and enhance its natural values;
- Protect the indigenous and non-indigenous cultural values;
- Improve public access and recreation opportunities;
- Manage the risk of erosion and bushfire; and
- Ensure a consistent and coordinated policy approach to the areas planning.

It makes a number of recommendations, some general and some specific in nature. Of particular relevance to this proposal are recommendations 11-17:

- *Ensure land use and development proposals maintain, and, where possible, enhance conservation values associated with the land... Consideration should be given to the potential to create conservation lots.* The recommendation has been complied with through the conservation of the Range face and tops within a reserve, the retention of vegetated areas and key linkages through the site in Public Open Space, and the application of graduating lot sizes and layout in a form responsive to the site's contours and attributes. Revegetation requirements on larger lots and remediation of local open spaces contributed to improved environmental outcomes. Creation of conservation lots is also proposed in the north of the site to allow retention of remnant vegetation on private land;
- Development management measures for land use or development proposals within or adjacent to nature reserves to protect and, where possible, enhance the conservation values of the nature reserve...: This recommendation has been complied with through the requirements for retention of vegetation on key sites, revegetation requirements for larger sites, retention of priority vegetation within local open space, and the requirement for all Public Open Space to be subject to an approved management strategy addressing a range of issues including conservation significance;
- *Promote revegetation of ... corridors identified in map 5...*: No vegetation corridors are identified on the site in map 5 of the Strategy, however an additional corridor or linkage is proposed through the site as part of the LSP to provide both a recreational and environmental link across the site to the Range tops;
- *Ensure that land use or development proposals over land containing or adjacent to an existing or potential vegetation corridor reasonably contribute to the provision and / or enhancement of the vegetation corridor:* as stated above, the site has not been identified as requiring a vegetation corridor however one has been provided as part of the overall open space strategy in part in response to the objectives of the Range Management Strategy. A road is proposed along this as stipulated as the preferred interface in most circumstances by WAPC policy, and revegetation and enhancement of the corridor will be achieved through the development and implementation of a POS management strategy required as a component of subdivision. This City's role in

- developing and approving all POS management strategies should ensure that its objectives, including those of the Range Management Strategy, are met;
- *Working with land owners, target and prioritise areas for revegetation...:* The landowner has, in this instance, approached and worked with the City to identify and prioritise areas for revegetation, consistent with the intent of this recommendation;
 - *Seek expert advice from the DEC, DAFWA and NACC regarding revegetation...:* Expert environmental scientists Coterra Environments undertook analysis of the site, and sought the input of both the (then) DEC and City in their investigations, the recommendations of which have been incorporated into this proposal. Development of detailed plans for local open space will be undertaken at subdivision in accordance with WAPC processes and the requirements of the Structure Plan. At that time, further input from expert groups as to the detail of works required and species to be used can be undertaken;
 - *Implement the recommendation of the Chapman River Foreshore Assessment Report...:* Application of integrated local water management principles should ensure that the development does not adversely affect, and indeed can improve the quality and maintain the quantity of its input into the catchment within which it is situated.

The Strategy Plan for Detailed Investigation (Map 8 reproduced in Figure 5) also indicates that the sideslopes on the subject site should be revegetated, with which recommendation the proposal accommodates. The Plan also indicates an area of 'Priority for Public Recreation' immediately south-east of the site, which outcome the proposal can also contribute to by providing complementary spaces and activities.

3.3.2 Moresby Range Management Plan 2010 (City of Geraldton Greenough & Shire of Chapman Valley)

The Moresby Range Management Plan was prepared for the Shire of Chapman Valley, City of Geraldton-Greenough and the Department of Planning to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range (closest to Geraldton). It has been endorsed by both local governments, but not by the WAPC. Of particular relevance to the site, it defines the boundary of a proposed Regional Reserve incorporating the eastern portion of the site, within and to which rehabilitation and public access are promoted. The document states that current land owners are to receive a fair and reasonable exchange for their land through purchase, land swaps, and development opportunities.

The document also makes recommendations regarding appropriate forms of development to limit visual impact and promote an appropriate interface within the study area, suggesting that:

- the eastern portion of the site forms part of the '*broad landscape features that should be preserved and enhanced*';
- The northern portion of the lot is defined as a '*high visibility area, larger lots typically 2-4ha*';
- The south-western pocket forms a '*lower visibility area, lots typically larger than 1ha*'.

The Plan anticipated development in the area and, as such, this proposal is not at odds with it, albeit contemplating development at a higher density than is notionally indicated in the Plan. This should, however, be acceptable, subject to satisfactory demonstration that this will not undermine the associated objectives of managing the visual impact of new development.

The development proposal assists in achieving a number of other Management Plan objectives including:

- establishment of the Range Reserve, through provision of around 80ha of regional open space in the Range, in addition to local open space within the development;
- provision of public access to the scarp, with establishment of a strong green spine or link through the subdivision to the 'top', providing for integrated pedestrian and cycle access through a landscaped setting. Vehicular access would also be required to provide access to the tourism site, and would be subject to detailed location and site planning;
- creation of recreational opportunities associated with the Range, including walk and cycle trails and potentially other activities associated with the tourism site;
- preservation and enhancement of remnant vegetation within local open space and within the range parkland;
- retention and remediation of drainage lines within green open space links;
- revegetation of open space areas and through provision of landscaping along road reserves and within private land; and
- limitation of visual impact through careful development siting and design, and application of design controls on colours, materials and building location.

3.3.2.1 Visual Impact Assessment

Due to the sensitivity of the site and its relationship to the Range highlighted in the Management Plan, a detailed assessment was undertaken to more comprehensively assess its role in the landscape and the potential visual impact of development (Appendix 3). This was undertaken by EPCAD Landscape Architects and Environmental Planners and concludes that development can occur without detriment to the broader and contextual landscape, subject to application of a number of visual management measures detailed in section 7.2.1 of the report. These have been incorporated in the statutory component of the structure plan and include:

- Siting of higher density areas in areas of least visual exposure, and areas lower density in higher parts of the site;
- Preservation of the Range face;
- Retention of remnant vegetation where possible;
- Revegetation of public open space areas and the planting of street trees;
- Promotion of native plant species in both public and private areas of the site;
- Application of design guidelines to control the use of materials and colours in new buildings to ensure these complement the landscape and are non-intrusive; and
- Separate, detailed assessment of any development proposed on top of the escarpment, and the construction of a road up to it.

3.3.3 General WAPC Policies

A number of more general planning policies and guidelines apply to the zoning, development and subdivision of the land including:

- State Planning Policy 3 – Urban Growth & Settlement (WAPC);
- State Planning Policy No. 3.4 Natural Hazards and Disasters (WAPC);
- Liveable Neighbourhoods (WAPC);
- Planning for Bush Fire Protection Guidelines (Edition 2); and
- Better Urban Water Management Guidelines.

The Geraldton Regional Flora Survey 2010 and draft Biodiversity Strategy also provides useful background information and guidance.

The structure plan and its supporting documents respond to and generally accords with these.

3.4 Other Approvals and Decisions

Advice provided by the EPA in relation to rezoning the land to 'Development' (provided in Appendix 4) indicated that:

- The environmental report submitted with the scheme amendment adequately documents environmental factors;
- The amendment report and supporting documentation demonstrate consideration of significant values in the area, and advance adequate management to preserve the majority of these values;
- The delineation of Public Open Space should occur, and provision for preparation of a Public Open Space Management Plan/s should be made as part of the site Structure Plan to formalise public open space provision and management measures.

This advice has been addressed in the Structure Plan through the formalisation of open space locations to coincide with areas of environmental value, and through inclusion of a requirement for preparation of management plans for all public open space, with consultation with the Department of Environment and Conservation to occur for those incorporating an environmental function (refer Clauses 6 and 8 of Part 1).

4.0 SITE ANALYSIS

4.1 Landform, Topography and Soils

The site's topography transitions from the flat coastal plain west of the site, through the foot and side slopes to the Moresby Range 'tops' on the very east of the site. Its elevation consequently rises from approximately 75m AHD up to 210m AHD at the highest point of the ranges on the eastern boundary (refer Figure 1). The contours show quite a steep rise in elevation however when viewed from the ground, the slope appears quite gradual, with the exception of the dramatic rise along the eastern edge of the site to the range 'tops' which appear almost cliff-like. The steepest portion of the site is generally not proposed to be developed, with the slope in the development area not posing any significant challenge to development.

Details of soil types are documented in the appended Environmental Assessment report (Appendix 5). It notes that the majority of the site contains primarily colluvial foot slopes, with silty sand over mottled sandy clay soils (WA Geological Survey, 2001, quoted in Coterra, 2010). The escarpment is composed of colluvial formed talus slope consisting of weathered rock, debris and gravel, shale, siltstone and sandstone with shelly sandy limestone (Coterra, 2010). These soil types are generally suitable for development and on-site effluent disposal, though with some management potentially required for erosion, particularly for the steeper sloped eastern area.

Geotechnical investigations will provide further detail and will inform the development of specific treatments and management strategies to support subdivision.

The site is generally identified as being at low risk of acid sulphate soils, though a small area around the dampland in the south and abutting the wetland in the west of the site poses some risk (refer Figure 7). For the most part, these areas are not proposed to be disturbed, however an Acid Sulphate Soils Investigation is being undertaken to further ascertain the risk, and to determine whether a Management Plan will be required in accordance with the requirements of the Department of Environment and Conservation (DEC) at subdivision stage.

4.2 Conservation and Environmental Values

The Environmental Assessment Report prepared for the site (Appendix 5) found that:

- The site consists of largely degraded agricultural grazing land;
- There is some remnant native vegetation of mixed Thicket of Acacia and Banksia shrub. Much of this has been impacted by historic grazing practices and for the most part, the vegetation exists as overstorey;
- One Priority 1 Flora species (*Melaleuca huttensis*) and one Priority 3 Flora species (*Grevillea triloba*) were located on the site (refer Figure 8);
- One individual *M. Huttensis* was recorded within the northwest corner of the site;
- *G triloba* was recorded in three areas in the northern and northwest corners, in the areas classified as being in 'Good' to 'Excellent' condition, at densities of 20%, 5% and patches of 20% respectively;

- There are no recorded Environmentally Sensitive Areas (ESA's) within or near to the site. In addition, no known occurrences of Threatened Ecological Communities are known to exist within the site based on the surveyed vegetation associations;
- The proposed development is expected to have a limited impact on remnant vegetation. Over-storey vegetation will be mostly located within Public Open Space or retained in large covenanted lots, and individual and small clusters of trees will be retained where feasible. All areas with Priority Flora located in them will be retained in Open Space or within the large lots on the north in which vegetation located outside specified building envelopes will be required to be retained (subject to bushfire management requirements);
- Development of the site presents an opportunity to facilitate revegetation through site, open space and streetscape landscaping, with the use of native species promoted. Approximately 30% of the site is proposed for open space under the current Development Concept (discussed below), well above the 10% normally required of residential development, and far in excess of the 0% which could be achieved through maintenance of existing rural use, or even Rural Residential redevelopment. Further detail on precise areas, design, species to be used and management of open space proposed will be developed and submitted to approval agencies as part of the subdivision process;
- There are two seasonal wetlands on the site, located in the south-west and near the western edge of the site (refer Figure 9). The vegetation condition of both was assessed to be between 'Good to Degraded' to 'Degraded' (refer Figure 8). Neither are mapped as wetland areas by the DEC or EPA, and are not identified as having any conservation significance. Nevertheless they are proposed to be retained within open space given they represent natural drainage features and retain some vegetation, albeit degraded, thus retaining some environmental value;
- Three natural drainage lines are present through the site, which have been highly modified due to clearing. The Local Water Management Strategy prepared for the site incorporates these within multiple use open space corridors;
- Fauna habitat is limited across the bulk of the site due to the cleared nature of the site. Habitat for some species would be available in remnant vegetation, particularly in north west corner, however as these are generally degraded with limited understorey, they are of limited value. The vegetation within the very north west corner of the site will be retained outside of designated building envelopes and will not compromise habitat viability;
- Potential foraging habitat for Carnaby's and Baudin Cockatoo is present in some areas of existing vegetation (Coterra, 2011). Retention of these areas is proposed in the Development Concept prepared for the site, limiting potential impact on these species. Regeneration of existing vegetated areas and the provision of additional areas of open space, as well as plantings in road reserves and on private properties present opportunities to improve the environment for these and other native species.

4.3 Bushfire Hazard

A strategic analysis of the site and development proposal has been undertaken by ICS Group, the key findings and recommendations of which are summarised as follows:

- The site is largely cleared but some pockets of remnant vegetation remain;
- Adjoining properties have a mix of native vegetation and cleared land;
- The site has not been declared a Bushfire prone area. Nevertheless, fire does present a risk requiring consideration and response in the detailed planning of the site. Measures might include:
 - Maintenance of a minimum of two access points to development areas;
 - Provision of fire hydrants at appropriate intervals along roads adjacent to development areas;
 - Provision of roads or strategic firebreaks in appropriate locations;
 - Provision of appropriate hazard separation (setbacks) to reduce Bushfire Attack Levels on houses to BAL-29 or less;
 - If required, specific assessment of bushfire protection for on-site waste water treatment infrastructure;
 - Specific assessment of and planning for the proposed tourism facilities;
 - Where appropriate, provision of fire services access to and through open space areas in landscape planning;
 - Development of a bushfire protection plan for the Moresby Range reserve;
 - Consultation with the local government and / or DFES (as the case may be) with regards to the possibility of their wanting to locate a fire station within the development.

These recommendations have been incorporated into the Local Structure Plan where applicable. Further implementation will occur through the subdivision process (at which time more detailed site planning, hydrant placement planning etc will occur).

4.4 Heritage

A search conducted through the Department of Indigenous Affairs Register of Aboriginal Heritage Sites found that there are no sites of Aboriginal significance which have been recorded on the site (Coterra, 2011). The closest registered site is located approximately 3km north-west of the northern edge of the site. It is recognised that the Moresby Range is likely to have significance to the indigenous as well as the non-indigenous community, as is noted in the Moresby Range Management Plan: There is potential for development of the site to incorporate recognition of its cultural significance. This issue can be further considered and addressed in detailed site planning of the proposed tourism site on top of the Range.

The State Heritage Office has indicated that P12059 – Geraldton-Northampton Railway Precinct is on the Heritage Council's Assessment Program and adjoins the Plan area on its western boundary. As a direct consequence of this Assessment Program P12059 may, at a future date, become a State Registered Place.

5.0 CONTEXT AND CONSTRAINTS ANALYSIS (REFER FIGURE 10)

5.1 Transport and Access

Private vehicular access represents the most prevalent form of transport within Geraldton and will likely serve as the primary travel mode to and from the site. The landholding has very good access to the existing road network, being just north of Chapman Valley Road with existing access connections to Sutcliffe Road, Arnold Road, Hackett Road and Cooper Street. A further link is proposed through extension of Tramway Road, subject to the agreement of Council. Consideration will need to be given to any impacts the extension of Tramway Road may have on the heritage significance of the Geraldton – Northampton Railway Precinct adjoining the Structure Plan area on its western boundary. Some upgrading of local roads and intersections is likely to be required to support the development, as detailed in the Traffic Report prepared by Riley Consulting (Appendix 6), and contributions towards regional upgrades of Chapman Valley Road and the North West Coastal Highway may also be required.

Only limited public transport is currently available within Geraldton, and none to the subject site however this development will provide a strong catchment for the extension of services if and when the network is reviewed.

The new Oakajee infrastructure corridor is proposed to run around the back of the Moresby Range, with this site having good access to the port from both it and the Highway.

5.2 Services and Infrastructure

Preliminary investigation of service availability has indicated that all basic utilities should be available to service the site, subject to the usual upgrade requirements (refer Appendix 7). Extension of power, water and telecommunications will be required as conditions of subdivision and will occur as a matter of course. Sufficient water pressure may necessitate the provision of some pressure boosting: this will be confirmed following detailed design, in consultation with Council and Water Corp.

As an alternative to extension of sewer to the site, new sustainable water treatment technology is proposed to deal with waste water. This will see it pumped to one or two local treatment facilities (housed in buildings the size of a residential house – refer below examples) where it will be processed and grey water produced to provide reticulation to public open space. The establishment of this process and licensing of the facilities is subject to strict requirements and guidelines to ensure no risk to public health or amenity, and on-going responsible management of the system. This technology is currently being applied throughout the United States of America with a similar local example approved at Point Grey in Mandurah and at Lancelin. In the current context of water shortages and stretched services, this technology appears likely to become increasingly common, and represents an example of sustainable innovation.



Plates 1 & 2: Example Aqueonics WWT facilities, West Chester PA, & Truckee, CA

Extension of conventional deep sewerage to the site represents an alternative waste water treatment option, though would be likely to come at a high capital cost.

Preliminary geotechnical information suggests that Rural Residential lots will be capable of accommodating septic systems, with detailed investigations currently being undertaken to confirm this.

5.3 Centres and Employment

Geraldton is well provided for regional shopping, services and employments, with residents of the proposed development able to access these. In addition to the Geraldton CBD centre, a district activity centre is proposed at Glenfield Beach, with local facilities at Drummond Cove, Waggrakine, Glenfield and Strathbalyn. A neighbourhood centre is also proposed as part of the structure plan to provide local goods and services on-site. This can provide for a range of local services, such as a small supermarket or local store, GP, hairdressing etc. This will provide for excellent accessibility to convenience goods, reduce travel distances required, and will provide a focal point for the development and locally based social engagement.

The site's proximity to Oakajee is likely to make it attractive to employees at the port, and to mining and other enterprises north and east of Geraldton.

5.4 Regional and District Open Space and Community Infrastructure

Liveable Neighbourhoods states that an average of one primary school is required for 1500 residential lots, and one secondary school per 6500-7000 lots. A primary school is proposed to be provided in a central and accessible location abutting the neighbourhood centre. Consultation with the Department of Education has indicated the proposed plan is acceptable to them.

The City of Greater Geraldton has identified a need for additional district recreation facilities to serve this area. 14ha of open space is consequently proposed along the southern boundary of the site, in close proximity to the proposed primary school and local centre.

No other community facilities have been identified as necessary to support the proposal, though there is potential for a community building to be located within the local centre, if necessary. Less formal but equally important community meeting spaces will be available within open spaces, a possible town square and within quality streetscapes.

5.5 Land Use Context

The site is surrounded by Rural Residential developments to the south and west, which are subject to the Waggrakine Rural Residential Structure Plan. Land to the north and east is zoned Rural and is subject to low intensity agricultural use.

The development of the site for urban purposes will require treatment of these areas to provide a transition in intensity of development. This has been addressed through the provision of rural residential and 'special residential' lots and / or open space around the periphery of the development. Increased traffic on local roads providing access to the site is likely to be of concern to some abutting residents however it will remain within the limits of their current designated function.

The development will essentially represent an expansion of Geraldton city. Its separation from existing urban areas by the Waggrakine Rural Residential area will give it something of a 'village' character, however its proximity to Geraldton means that it will effectively form a suburb of the city.

5.6 Unexploded Ordinance

The site has been identified as having potential unexploded ordinance, because the face of the Moresby Range could possibly have been used for target practice during training in the past. UXO investigations conducted in 2006 by FESA concluded that the site poses minimal risk, and consequently application of a standard advice note on subdivided titles is the only recommendation made (refer Appendix 8).

6.0 STRUCTURE PLAN DESCRIPTION

6.1 Overview and Neighbourhood Structure

The proposed Structure Plan and the Development Concept from which it has evolved (refer Figure 11) provide for development of the site to accommodate:

- 79 ha of 'regional' open space, protecting the Moresby Range tops;
- A neighbourhood centre and abutting Primary School, roughly in the centre of the site;
- Urban residential neighbourhoods both north and south of the neighbourhood centre, with potential for higher density in close proximity to the centre;
- Low density and Rural Residential around the periphery of the residential neighbourhoods, providing for a diversity of lot types and a graduation in density from adjoining rural residential and rural areas;
- An integrated network of parkland throughout the development, protecting areas of environmental significance, providing for integrated urban water management, and providing for local recreation and amenity to service the subdivision;
- 33ha of District Open Space, provided in a linear spine through the development to link to the Moresby Range, and in a consolidated 14ha block in the south of the site, to provide for District Recreation (as requested by the City);
- Two potential tourism facilities, including one on the Range Tops, where a low profile development could be designed to nestle in behind the Range 'edge' where it would be visually unobtrusive, but could benefit from the magnificent ocean views this location affords. In addition to accommodation, the site might also accommodate a cafe or restaurant, or possibly even a small tavern similar to the Mundaring Hotel, which would provide an attraction to the local Geraldton community as well as more distant visitors. The second, lower site appears more suited to eco-chalets or similar self-contained, low intensity accommodation.

The design is based on a 'modified grid' layout, providing an interconnected, legible and walkable area. The centre and school are provided at a key intersection within the subdivision, maximising accessibility and reinforcing their role as a physical as well as psychological centrepiece. Linear open space abutting the centre has been incorporated to protect areas of environmental significance, provide for integration of natural drainage function, create a local community parkland, and to provide a strong open space link or spine running through the site and connecting up with the Moresby Range open space in the east. It will accommodate areas for both passive and active recreation, cycle and walk paths and provide a strong link to through the estate to the Range.

6.2 Commercial Centres

The neighbourhood centre proposed is expected to be of a neighbourhood centre scale (up to 6,000m² of retail, subject to economic viability). It is intended to provide for convenience goods and services such as a small supermarket, hairdresser and the like, as well as providing a community focal point for the estate. It will not compete with the commercial primacy of Geraldton CBD which, 10km from the site, will continue to provide the primary destination for many commercial activities, but it can supplement it, providing local access to daily needs and increasing the self-sufficiency of the estate. It accords with

the direction of SPP 4.2 which stipulates that Neighbourhood Centres can service catchments of between 2,000 and 15,000 people, within a radius of approximately 1km.

The centre has been co-located with the estate primary school, district open space and linear park to reinforce its role as an activity centre, in accordance with Liveable Neighbourhoods design requirements. It has also been located at a central cross roads to maximise its accessibility to the neighbourhoods it services.

Its design will be subject to a specific Local Development Plan as a condition of subdivision approval.

6.3 Natural Features

The design is highly responsive to natural features, facilitating the creation of a 'sense of place' within the community. The Plan:

- Provides for the protection of the Moresby Range face and tops, and provides for public access to these;
- Integrates natural drainage lines into an open space network, allowing for best practice stormwater management;
- Retains and enhances the local damp lands / wetlands in the southern portion of the site;
- Locates the majority of remnant vegetation within open space or, in the case of vegetation in the very north of the site, on large lots with restricting clearing; and
- Responds to the contours of the land, both with regards to road layout and in the concentration of residential densities in low lying areas and, placement of larger lots in higher areas where they may be more visible.

Earthworks required to implement the plan will be limited, ensuring that the natural topography is respected.

6.4 Street Block Layout

The street network is highly interconnected, building off the existing local network and extending routes in a modified grid through the subdivision. It provides a legible layout with good connectivity for local vehicles, pedestrians and cyclists, whilst avoiding long straight, unbroken routes which encourage high speeds.

The network promotes perimeter block development, creating conventional, safe and attractive streetscapes with good passive surveillance. Cul de sac have been minimised.

6.5 Movement Network

A traffic analysis of the proposal has been undertaken by Riley Consulting (refer Appendix 6).

This has found that:

- The site when fully developed can be expended to generate 16,200 vehicle movements per day, of which about 11,300 can be expected to access the external network;
- Projected traffic increases to the external network indicate that the North West Coastal Highway south of Chapman Valley road will require duplication;
- The intersection of North West Coastal Highway / Cooper Street is probably sufficient in its current layout but is recommended to be modified to include full standard left and right turn lanes;
- The intersection of North West Coastal Highway / Tramway Road will require a full standard right turn lane;
- The creation of four-way intersections on Tramway Road may require provision of small roundabouts or other forms of traffic management;
- Local roads providing access through to Chapman Valley Road can accommodate forecast volumes but may require some upgrading such as provision of kerbs and wider carriageways.

The details and timing of improvements is proposed to be further assessed and determined at subdivision.

The internal road network incorporates two Neighbourhood Connector roads extending from Tramway Road and Arnold Road, through to the town centre. The remainder of the network comprises Access and Higher Order Access Streets (refer Figure 12), though the Hackett Road connection may ultimately develop into a Neighbourhood Connector, should further links providing a continuous route along the foothills of the Moresby Range be developed as is recommended by the Moresby Range Management Plan. The majority of roads are expected to carry less than 1000 vehicles per day, with all but one (the Tramway Road extension) expected to carry less than 3000vpd. Indicative minimum cross sections for predominant street types are provided in Figure 12 – 17 of the traffic report, though will be subject to further development at subdivision.

The road network is in the form of a modified grid which provides for excellent levels of accessibility and permeability.

Traffic signals are not anticipated as necessary within the development however priority controls will be necessary in some locations. The details of treatment will be determined in consultation with the City as part of the subdivision planning process.

Provision for possible future bus services to the site is proposed through the provision of a wider (7.2m carriageway) route through the subdivision (refer Figure 13) however there is currently no timeframe for or commitment to the provision of such a service by PTA.

Provision for pedestrians and cyclists is proposed through:

- Recommended placement of footpaths on both sides of the road where traffic volumes are anticipated to exceed 1000 vehicles per day (refer Figure 14);
- Provision of shared paths as an alternative to on-street cycling on Neighbourhood Connectors.

Additional recreational walking and cycling routes are proposed through open space as part of the landscape planning process. Provision of some public parking to service the key terminus to this network (most likely abutting the village centre) may be appropriate.

6.6 Land Use (including density and population estimates)

The land use breakdown provided for by the structure plan is as follows:

TABLE 1: Land Use Schedule – Moresby Heights Local Structure Plan, January 2013 (2118-100E-01)

	Lot 55 (ha)	%	Lots 80 & 81 (ha)	%	Sub-Total (ha)	%	Total (ha)
GROSS AREA (GA)	9.75		385.40		395.15		395.15
Non Residential Land Uses (NRLU)							
Wetlands	0.00		1.51		1.51		
High School	0.00		0.00		0.00		
Primary School	0.00		4.00		4.00		
Village Centre	0.00		3.50		3.50		
Tourist	0.00		8.30		8.30		
Rural Residential	2.86		65.64		68.50		
Total NRLU	2.86		82.95		85.81		85.81
GROSS RESIDENTIAL AREA (GRA) [GA less NRLU]	6.89		302.45		309.34		309.34
Public Open Space							
Required @ 10%	0.69		30.25		30.93		30.93
Gross Open Space Proposed	0.00	0.00	130.52	43.16	130.52	42.19	130.52
Credit Open Space Proposed (refer POS Schedule)	0.00	0.00	124.40	41.13	124.40	40.22	
POS Surplus to 10%	-0.69		94.16		93.47		94.16
NET RESIDENTIAL AREA (NRA) [GRA less POS]	6.89		171.93		178.81		178.81

The Plan provides for approximately 2000 dwellings, at the following densities:

	Lot 55 (ha)	Lots 80 & 81 (ha)	Total Zoned Area (ha)	Assumed Yield / Ha ¹	Estimated Yield
Rural Residential	8.77	65.64	68.50	As per LSP	45.00
Residential R5	0.00	5.99	11.90	3.00	35.71
Residential R10	0.00	15.40	15.40	5.00	77.00
Residential R20	0.00	129.60	129.60	10.38	1345.25
Residential R30	0.00	14.70	14.70	17.33	254.75
Residential R40	0.00	7.00	7.00	21.67	151.69
Total	8.77	238.33	247.10		1909.40
Notes:					
1. Assumes 20%, 25%, 25%, 32.5%, 35% & 35% respectively for roads etc, and av lot areas of 1ha, 2500m ² , 1,500m ² , 650m ² , 375m ² and 300m ² respectively.					

This yield estimate equates to a density yield of around 5 dwellings per gross hectare or 11 per net residential hectare. The yield per gross hectare is relatively low because of the high proportion of open space incorporated.

Actual yields are likely to vary this estimate, particularly if the market dictates larger lot sizes (as current indications suggest is probable), however it provides a reasonable indication of what could occur.

This could cater for up to 4,963 people assuming an average of 2.6 persons per household (as per 2011 national average).

Areas of higher residential density have been concentrated around the Neighbourhood Centre, maximising accessibility to local amenities as well as limiting visual impact (this area being identified as least visually intrusive). The lowest density areas have been located around the periphery of each neighbourhood, where they:

- Contribute to lot and lifestyle diversity;
- Provide for reduced visual impact;
- Allow for increased tree cover;
- Provide a transition to abutting rural and rural residential sites, reducing land use impact; and
- Allow for retention of vegetation, particularly on the lots in the very north of the site, where vegetation is to be retained through covenant.

6.7 Schools and Community Facilities

Based on the estimated lot yield, one primary school has been provided abutting the centre, in the middle of the development. This should service the entire subdivision.

Geraldton Senior College and John Willcock College will service secondary education demand, supplemented by private facilities.

The Department of Education and Training has indicated support for this proposal.

The nominated school site is 4ha in area, is surrounded by streets on three sides and abuts the linear open space spine on the fourth (east) side. The site is flat, highly accessible and meets the requirements of Liveable Neighbourhoods.

6.8 Public Parklands (Refer Figure 15)

A total of 130ha of public open space (POS) is shown in the Structure Plan. This substantially exceeds the 31ha required under WAPC Policy, but allows for:

- Retention of the Moresby Range side slopes and tops within a 'regional' park (approx. 79ha);
- Incorporation of a linear POS spine running through the estate from Tramway Road to the Range (approx. 15.5ha);
- Provision of 14ha of District Recreation, as requested by the City; and
- A network of local open space, providing for good access to parkland for all residents, and retention of remnant vegetation and environmental features in several locations (approx. 22ha).

Open space provision is illustrated in Figure 15 and is calculated against Liveable Neighbourhoods requirements in the Table 3, overleaf, which demonstrates provision well in excess of the minimum requirement, even if full credit is not extended to drainage areas outside the 1:1 year event swale area.

Precise areas and locations of POS may be refined at subdivision.

Sites with a 'conservation' function nominated provide for retention of some remnant vegetation and, within POS P3 and P11, the retention and enhancement of wetlands as part of integrated drainage areas. Those where the conservation function is more significant are designated as 'Conservation' in the LSP.

Development of the linear parkland and local open spaces (totalling around 37ha) would be required as a condition of subdivision under WAPC Policy, with the details of landscape treatment to be determined as part of POS Management Strategies required prior to development. It is, however, intended that open space:

- Retain remnant vegetation where feasible;
- Incorporate integrated drainage lines and swales;
- Provide for grassed areas, natural areas, recreational use and play equipment;
- Address state and local government requirements in regards to maintenance, and local government and / or DFES (as the case may be) requirements in relation to bushfire management.

TABLE 3: Public Open Space Schedule – Moresby Heights Local Structure Plan, January 2013
 2118-105-01 (based on Plan 2118-121-01 & Aecom LWMS Rev.C)

	Lot 55	Lots 80 & 81	Total LSP Area (lots 55, 80 & 81)	TOTALS
	(ha)	(ha)	(ha)	(ha)
Site Area (SA)	9.75	385.40	395.15	395.15
Less:				
Environmental Exclusions (EE)				
Wetlands ¹	0.00	1.51	1.51	
Total Environmental Exclusions	0.00	1.51	1.51	
Net Site Area (NSA = SA - EE)	9.75	383.89	393.64	
Less:				
Deductions (ha)				
High School	0.00	0.00		
Primary School	0.00	4.00	4.00	
Village Centre	0.00	3.50	3.50	
Tourist	0.00	8.30	8.30	
Rural Residential	2.86	65.64	68.50	
Deductions Subtotal	2.86	81.44	84.30	
Gross Subdivisible Area (GSA = NSA - Deductions)	6.89	302.45	309.34	309.34
Public Open Space Required @ 10% GSA	0.69	30.25	30.93	30.93
Public Open Space contribution (ha)				
May comprise:				
Minimum 80% unrestricted Public Open Space	0.55	24.20	24.75	
Maximum 20% restricted use Public Open Space	0.14	6.05	6.19	
Unrestricted Public Open Space sites (ha)				
P1 - Moresby Regional Parkland	0.00	79.05		
P2 - Linear Open Space (incorporating conservation function, excluding drainage area) ³	0.00	5.05		
P3 - Linear Open Space 2 (incorporating conservation function, excluding drainage area & wetland)	0.00	8.16		
P4 - District Recreation (excluding drainage area)	0.00	13.66		
P5 - Local Park (excluding drainage area)	0.00	4.63		
P6 - Local Park (excluding drainage area)	0.00	2.36		
P7 - Neighbourhood Park (excluding drainage area)	0.00	0.38		
P8 - Neighbourhood Park (excluding drainage area)	0.00	0.81		
P9 - Local Open Space (incorporating conservation function) ³	0.00	2.50		
P10 - Neighbourhood Park	0.00	0.38		
P11 - Local Park (incorporating conservation function, excluding drainage area & wetland)	0.00	1.23		
P12 - Neighbourhood Park	0.00	0.15		
Total Unrestricted Public Open Space sites	0.00	118.36	118.36	

Restricted Public Open Space sites ²				
P2 drainage area (catchment 3)	0.00	2.19		
P3 drainage area (catchment 2 & 4)	0.00	3.39		
P4 drainage area (catchment 5)	0.00	0.50		
P5 drainage area (catchment 6)	0.00	1.05		
P6 drainage area (catchment 7)	0.00	0.67		
P7 drainage area (catchment 9)	0.00	1.54		
P8 drainage area (catchment 7A)	0.00	0.38		
P10 -drainage area (catchment 2A)	0.00	0.80		
P11 drainage area (catchment 1)	0.00	0.75		
P12 drainage area (catchment 1A)	0.00	0.90		
Total Restricted Public Open Space sites	0.00	12.17	12.17	
Gross Public Open Space Provision	0.00	130.52	130.52	
Credited Public Open Space Provision (= Restricted Open Space plus up to 20% Unrestricted Open Space)	0.00	124.40	124.54	124.54
Surplus Open Space Provision	-0.69	94.16	93.61	

Notes:

- 1: Wetland areas as mapped in Landgate
- 2: Areas subject to inundation in 20% AEP Storm Events (1:5year events). Credit actually available to 1:1 year event, but calculation not yet available. To be detailed at subdivision.
- 3: Conservation Open Space: credit given to be determined at subdivision in consultation with Local Authority.

A landscape hierarchy and some indicative illustrations are provided in Figures 16-18.

The central linear open space is particularly significant for the development, providing for both a physical and psychological link to the Range, and encouraging better access to it, as so strongly promoted in the Moresby Range Management Strategy.

The City will be responsible for the development of the playing fields and any associated infrastructure, given that this facility services a much wider area than the development alone, and that the 14ha area is being given up above and beyond the requirements of WAPC POS requirements. Similarly, revegetation of the Range Reserve is proposed to be allocated to the Council and DEC, or the Range Management Authority proposed under the Moresby Range Management Plan. Again, this is because this regional open space provides a regional rather than local amenity, with its provision free of cost more than meeting the proponents’ responsibilities. All other POS areas are expected to attract the standard requirement for development in accordance with an approved management strategy, as per WAPC policy.

6.9 Urban Water Management

A Local Water Management Strategy (LWMS) has been prepared by AECOM to support the Structure Plan (Appendix D to the Preliminary Engineering Services Report – Appendix 7). The LWMS:

- Responds to the Better Urban Water Management Guidelines (DoW 2008b) as well as Council requirements and WAPC policies;

- Applies Integrated Water Cycle Management principles, including holistic consideration of all water resources in planning, sustainable and equitable use of water sources and whole of catchment integration of natural resource use and management;
- Proposes nine catchments (and 4 additional sub-catchments) and provides preliminary calculations for the storage requirements of each (to be incorporated into public open space) – refer Figure 19; and
- Confirms that development and implementation of the Strategy recommendations will occur through more detailed Urban Water Management Plans which will be prepared to support subdivision.

The Strategy generally reflects City of Greater Geraldton guidelines in relation to basin sizing however it should be noted that these conservatively assume that the ability of lots to dispose of stormwater on-site will be limited. As such, they incorporate a high assumption for lot and POS drainage, in addition to the usual road drainage. Preliminary information suggests that on-site permeability and water table levels will not inhibit the ability of lots to dispose of stormwater on site, and lot sizes are not so small as to restrict this either. It is therefore likely that basin sizes and infrastructure will be reduced to substantially reduce the private lot and POS component in the development of Urban Water Management Plans at subdivision, when detailed geotechnical (including deeper test pits) and lot size information will be available to confirm the appropriateness of this.

6.10 Infrastructure Coordination, Servicing and Staging

Preliminary investigation of servicing opportunities and constraints has been undertaken, as documented in Appendix 7. This confirms that upgrades to existing infrastructure will be necessary to service the development. Service agencies have indicated that upon approval of the site's rezoning or, in some cases, the structure plan, they will undertake the necessary planning to determine the details of service provision, and upgrades required. These may include a requirement to boost water pressure through installation of new or upgrade of the existing water tank on Hackett Road, to be determined in consultation with Council and Water Corp. The responsibilities and procedures for service provision are well established through the respective agencies.

Application of new waste water treatment technology, if this is pursued in lieu of conventional deep sewer, will require that all necessary approvals are in place (namely approval from the Economic Regulation Authority and Council approval for the development) prior to development. Additionally establishment of a binding and on-going operating agreement will be necessary. In principle agreement on this has already been reached with the City. Finalisation of the agreement should be a condition of subdivision. Location of the water treatment plant/s is proposed to be within open space, most probably in the west, at the bottom of the catchment, and will be subject to development approval. Because of the small size and self contained nature of these facilities, and the absence of odour issues generated by them, their location and development should not have any impact on surrounding areas.

The landscaping of local open space areas will be the responsibility of the developer as per Liveable Neighbourhoods requirements. The landscaping of POS areas will be undertaken in accordance with plans approved by the City, following consultation with the DEC, as documented in Part 1.

A preliminary indication of anticipated staging for early releases is detailed in Appendix C to Appendix 7, which will see development of Low Density / Special Residential areas in the south of the estate occur first, supplemented by a proposed Stage 2 just west of the Neighbourhood Centre. Further stages are planned to the north of this, abutting the District Recreation, providing for a range of residential lots types. Development of the Centre is planned as early as commercially feasible.

Provision of district recreation areas and Moresby Range Reserve are planned to occur prior to or upon completion of Stage 1, with Part 1 specifying that it is to occur prior to or upon creation of the first 200th lot, or as otherwise agreed between the City and the landowner.

To ensure adequate access and appropriate traffic management:

- Secondary access (additional to Hackett Road) is required at or before release of 300 lots;
- Extension of Tramway Road will be required at or before release of 600 lots.

6.11 Visual Integration

Visual impact measures have been incorporated into the structure plan in two ways:

- Firstly the design and layout limits impact by:
 - Retaining most of the Range side slopes and the tops in their natural form;
 - Locating more dense development within the lower, least visible portion of the site;
 - Locating larger lots are on the higher, more visible portions of the site; and
 - Making provision to retain much of the remnant vegetation.
- Secondly, statutory provision has been made in the LSP text to require:
 - Development and application of guidelines governing colours and finishes;
 - Landscaping and streetscaping with appropriate plant species to soften the impact of development; and
 - Detailed design assessment of those elements with greatest potential for visual intrusion, namely the tourism sites, and the access road to the eastern of these.

The plan was prepared with reference to the detailed Visual Impact Assessment conducted of it as part of the early planning process for the site, and has been subsequently reviewed by Epcad to ensure compliance.

7.0 BUSHFIRE MANAGEMENT

Fire management measures have been incorporated in the Structure Plan through:

- Provision of multiple access points to and through the development;
- Location of road interface abutting open space; and
- Incorporation of requirements in the Part 1 statutory provisions or as part of routine conditions of subdivision approval requiring:
 - Provision of detailed Fire Management Plans at subdivision;
 - Provision of fire hydrants at appropriate intervals along road;
 - Incorporation of fire access and planning within open space design and management; and
 - Application of AS3959 design requirements on buildings within bushfire prone areas.

8.0 IMPLEMENTATION

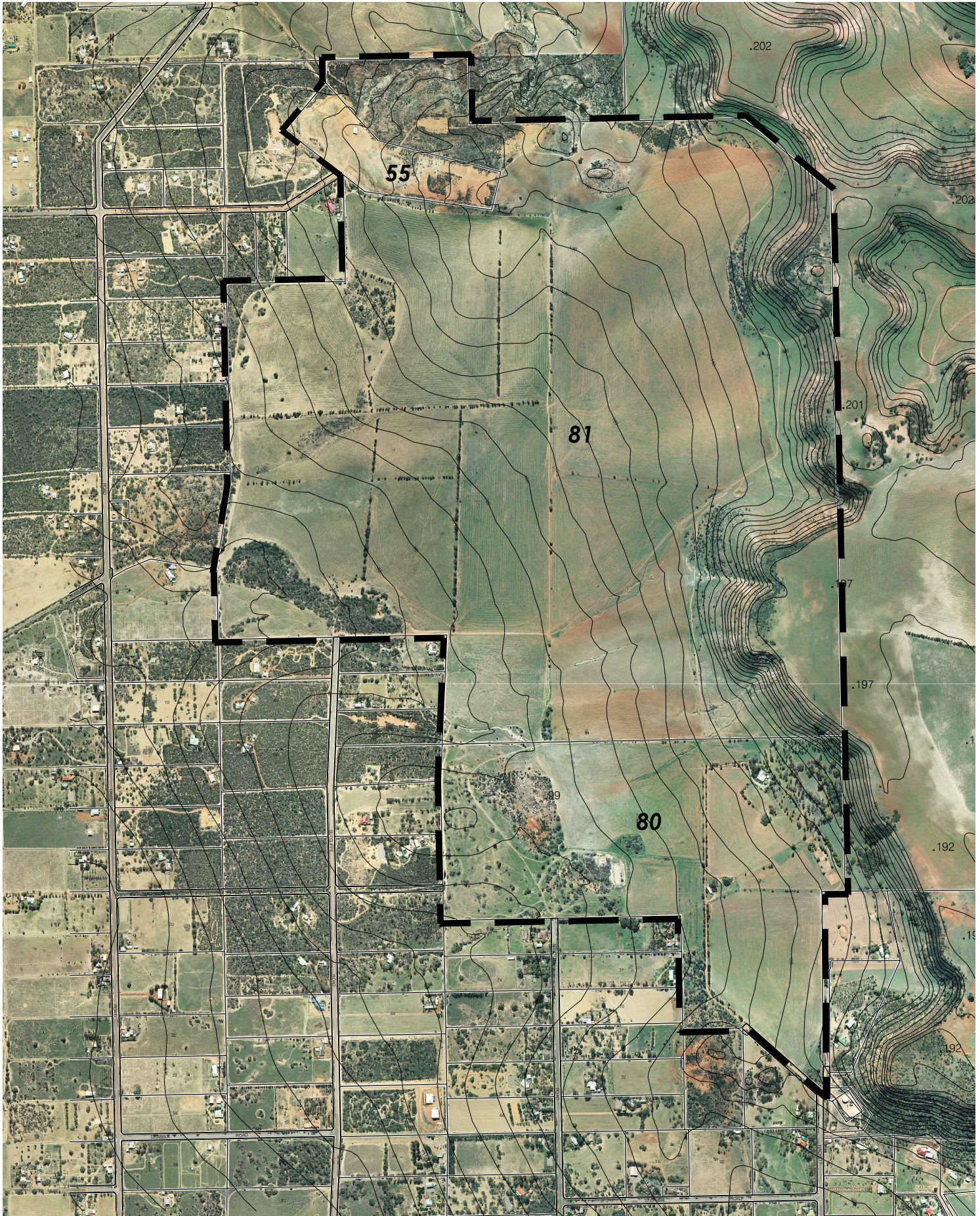
Implementation will be staged over a number of years (estimate 10-20). Construction is proposed to commence in the south of the site, taking access from Hackett Road. Provision has been made in the structure plan to ensure adequate provision of access to the development as it expands, as per the Traffic Report.

Provision of more detailed information in relation to service provision and design, and open space will occur as a matter of course, as part of the subdivision process, and will be enforced through standard subdivision conditions.

Schedule 1: Summary of Consultation

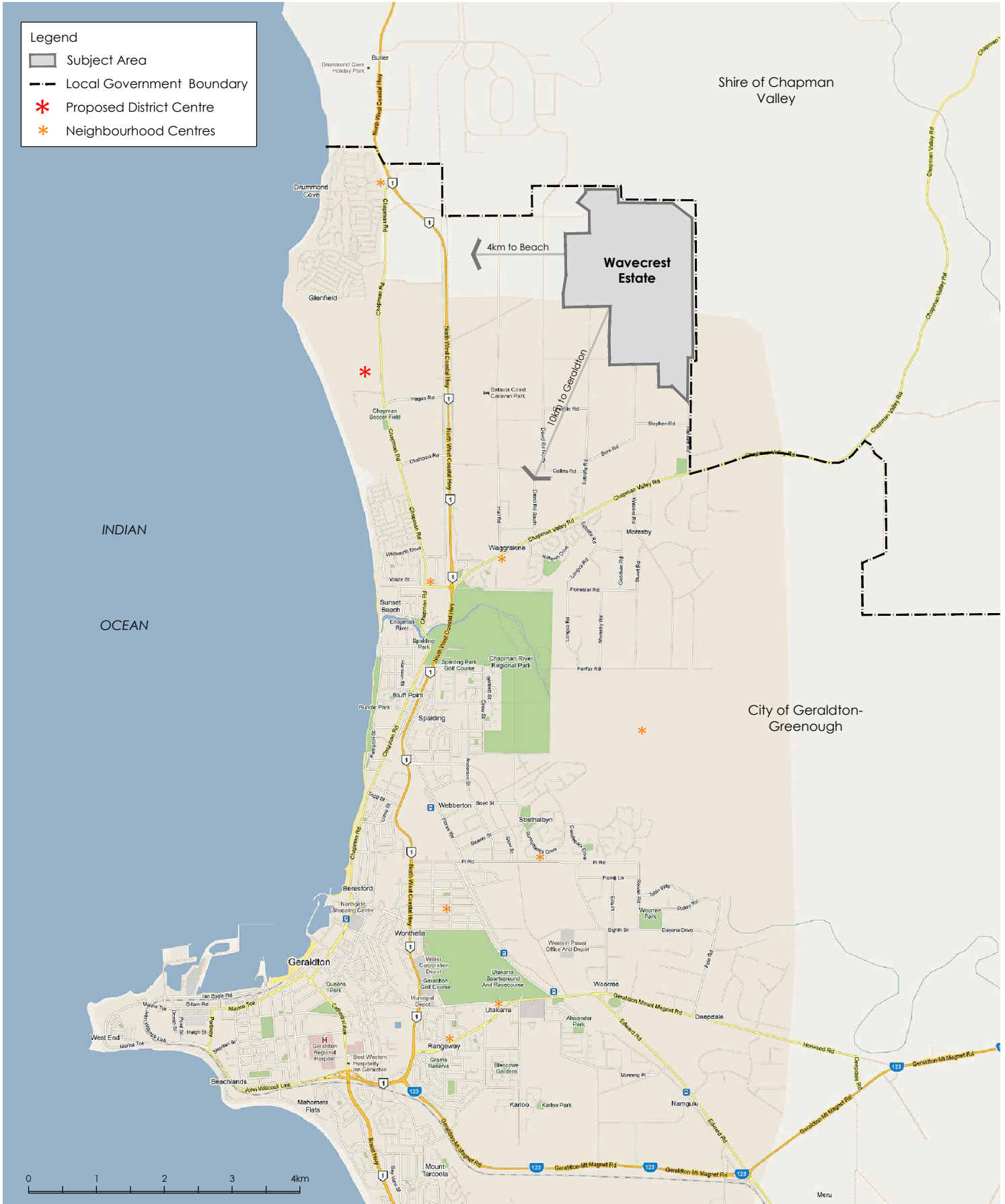
Agency	Date/s	Summary of Outcomes
Local Government	Various inc 22 Nov 2011, 10 May 2012, LSP consultation meeting 10 th May 2012, LSP update meeting 14 August 2012, March-Dec 2013	Incorporation of Lot 55 into plan, modification to residential densities, reconfiguration access to Rural Residential lots south of POS 3, conduct of preliminary geotech to confirm soil permeability. Earlier input into Development Concept, prior to rezoning. Input into draft LSP including requirement for additional assessment of visual impact, modifications to text, designation of Conservation areas and review of traffic estimates.
Dept of Planning	Various inc. 1 May 2012	Provision for the requirement of detailed POS Schedules as a component of subdivision to be included in LSP.
Dept of Water	January & February 2012	Kerry Wray, Simon Rodgers: LWMS to be submitted
Dept of Environment & Conservation	May 2011 - Amdt	Desire to retain majority remnant vegetation, particularly priority species, possible Carnaby habitat, retention & rehabilitation of Range desirable, POS management important.
Dept of Education	17 Nov 2011	1 Primary School on site acceptable. Size appears acceptable, though subject to confirmation of lot yield. Location & layout appear acceptable, subject to confirmation of grades (flat site required) and ability to extend roads around all four sides if required. Further comment to be provided following more detailed review of plan.
Western Power	Nov - Dec 2011	Feasibility Study supplied as documented in Engineering Services Rpt
Alinta Gas		Atco gas consulted August 2011 (response February 2012). WA Gas Network & Origin Energy consulted late 2011 as potential alternative suppliers.
Water Corporation	Nov 2011	As documented in Preliminary Engineering Services Rpt – Waste Water Planning yet to be undertaken for the precinct. Process for alternative service provider documented.
Telstra	Early 2012	N/A – Subject to NBN Co. – consulted early 2012
FESA (now DFES)	19 & 20 Oct 2011	Identification of key risks and strategies inc minimum setback distances for houses, density & building control, access & vegetation management
Adjoining landowners	Nov / Dec 2011 June 2012	Consultation as part of rezoning process. Provision of alternative development options and discussion with HLD occurred June 2012. Owners provided preferred concept through the City (March 13) which has been incorporated in LSP.

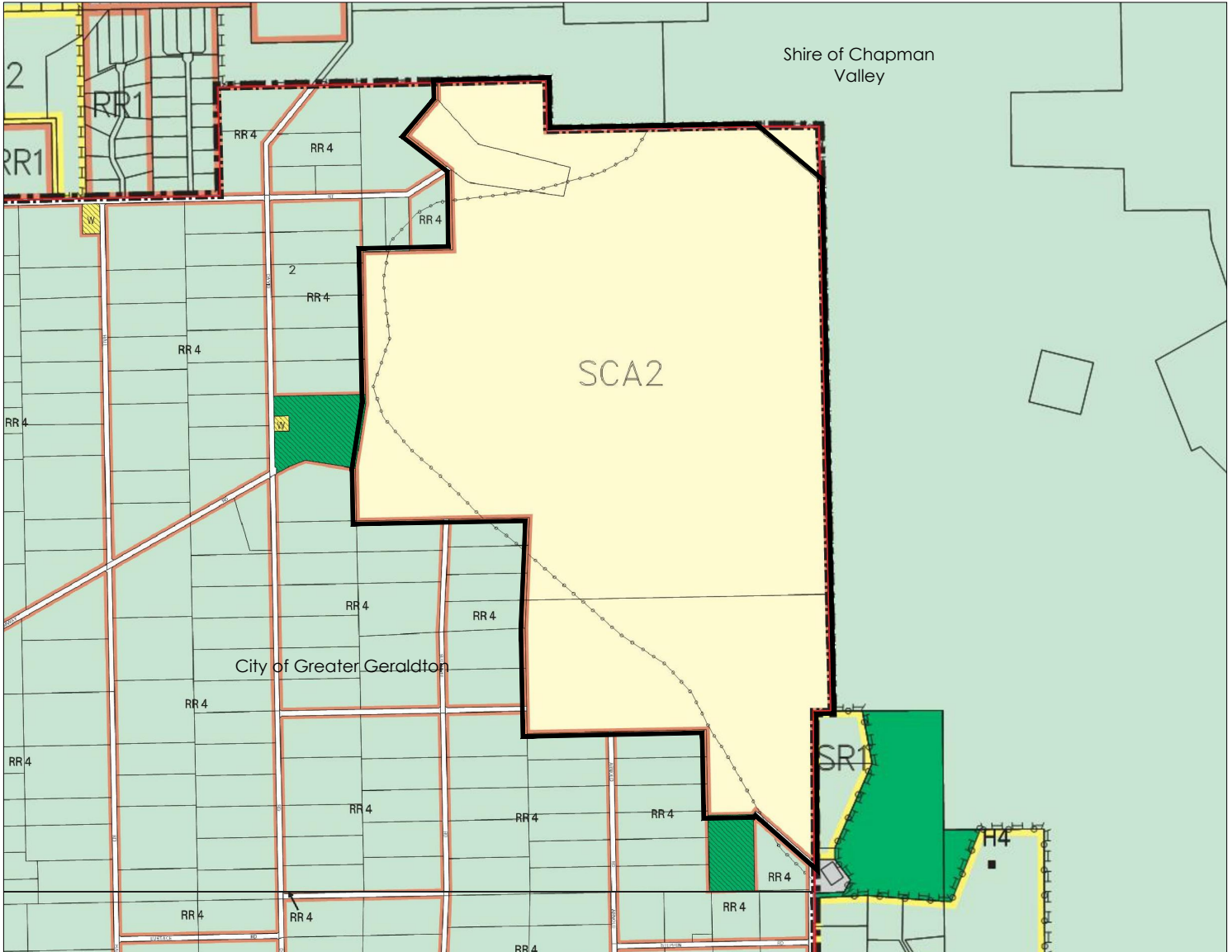
FIGURES



STRUCTURE PLAN AREA (AERIAL IMAGERY)







LEGEND

LOCAL SCHEME RESERVES

MAJOR ROAD	ROAD
NATURE RESERVES	WATERWAY
PARKS AND RECREATION	SUBJECT SITE
PUBLIC PURPOSES	
PUBLIC PURPOSES DENOTED AS FOLLOWS:	
A AIRPORT	
C CIVIC	
CE CEMETERY	
CF&F CONSERVATION OF FLORA & FAUNA	
CP CAR PARK	
D DRAINAGE	
FF FIRE FIGHTING	
G GRAVEL	
H HALL	
HS HIGH SCHOOL	
M MUSEUM	
P PRISON	
PS PRIMARY SCHOOL	
PS/HIS PRIMARY & HIGH SCHOOL	
RD RUBBISH DISPOSAL	
TS TRIG STATION	
W WATER	
W/P WESTERN POWER	
RAILWAY	

ZONES

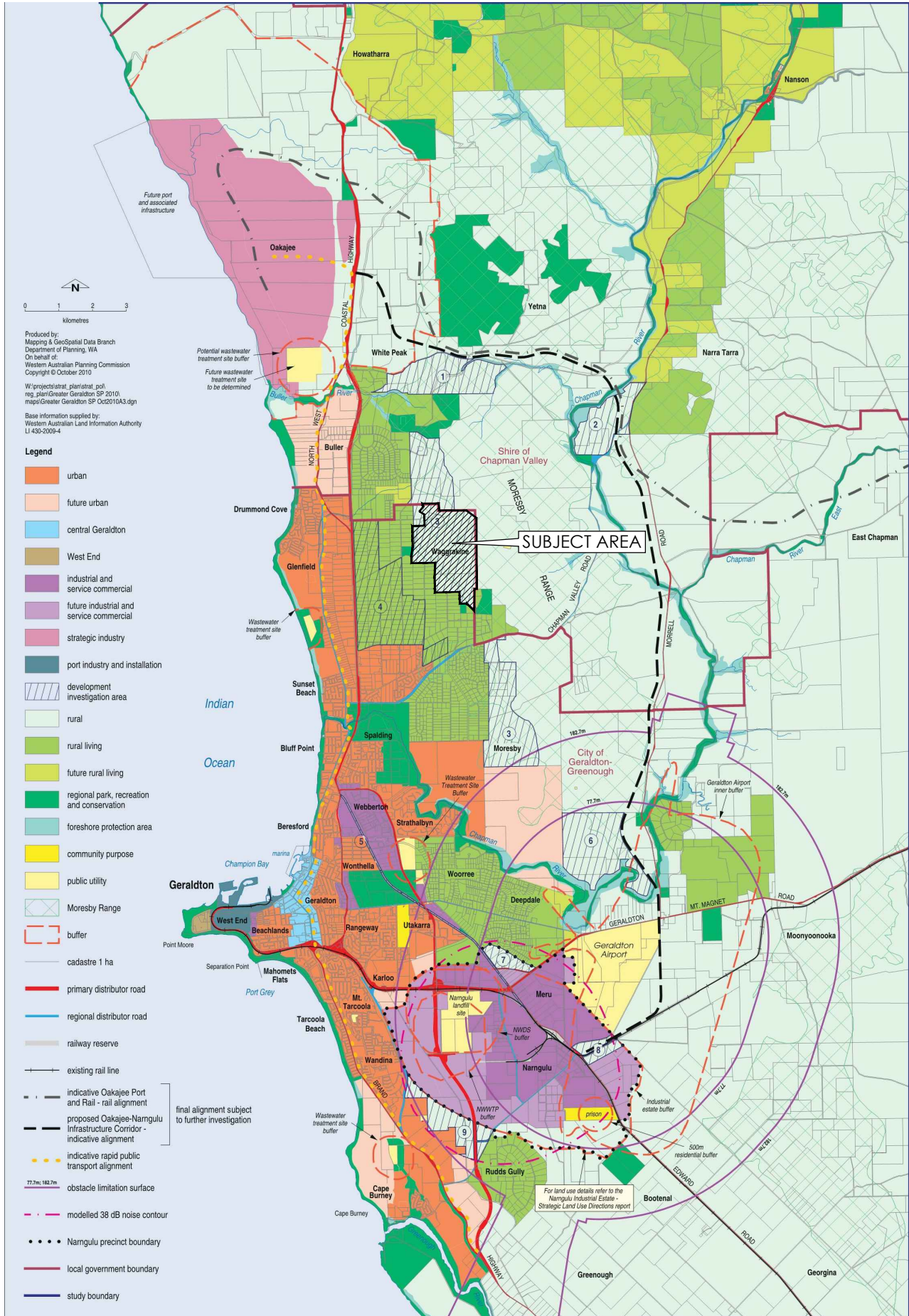
DEVELOPMENT	LIGHT INDUSTRY
RESIDENTIAL	DUNE PRESERVATION
TOURIST	RURAL
COMMERCIAL	RURAL RESIDENTIAL
HIGHWAY COMMERCIAL	RURAL SMALLHOLDING
SPECIAL USE	
CIVIC AND CULTURAL	
GENERAL INDUSTRY	

OTHER

R CODES	SCA-NARNGULU WASTEWATER TREATMENT PLANT
RESTRICTED USES	SCA-NARNGULU WASTE DISPOSAL FACILITY
SCHEME BOUNDARY	SPECIAL USE AREA (SEE SCHEME TEXT)
LOCAL GOVERNMENT BOUNDARY	RURAL RESIDENTIAL AREA (SEE SCHEME TEXT)
TOWNSITE -- LAND ACT	RURAL SMALLHOLDING AREA (SEE SCHEME TEXT)
SPECIAL CONTROL AREA -MORSEBY RANGE LANDSCAPE	
SPECIAL CONTROL AREA -GREENOUGH HERITAGE	

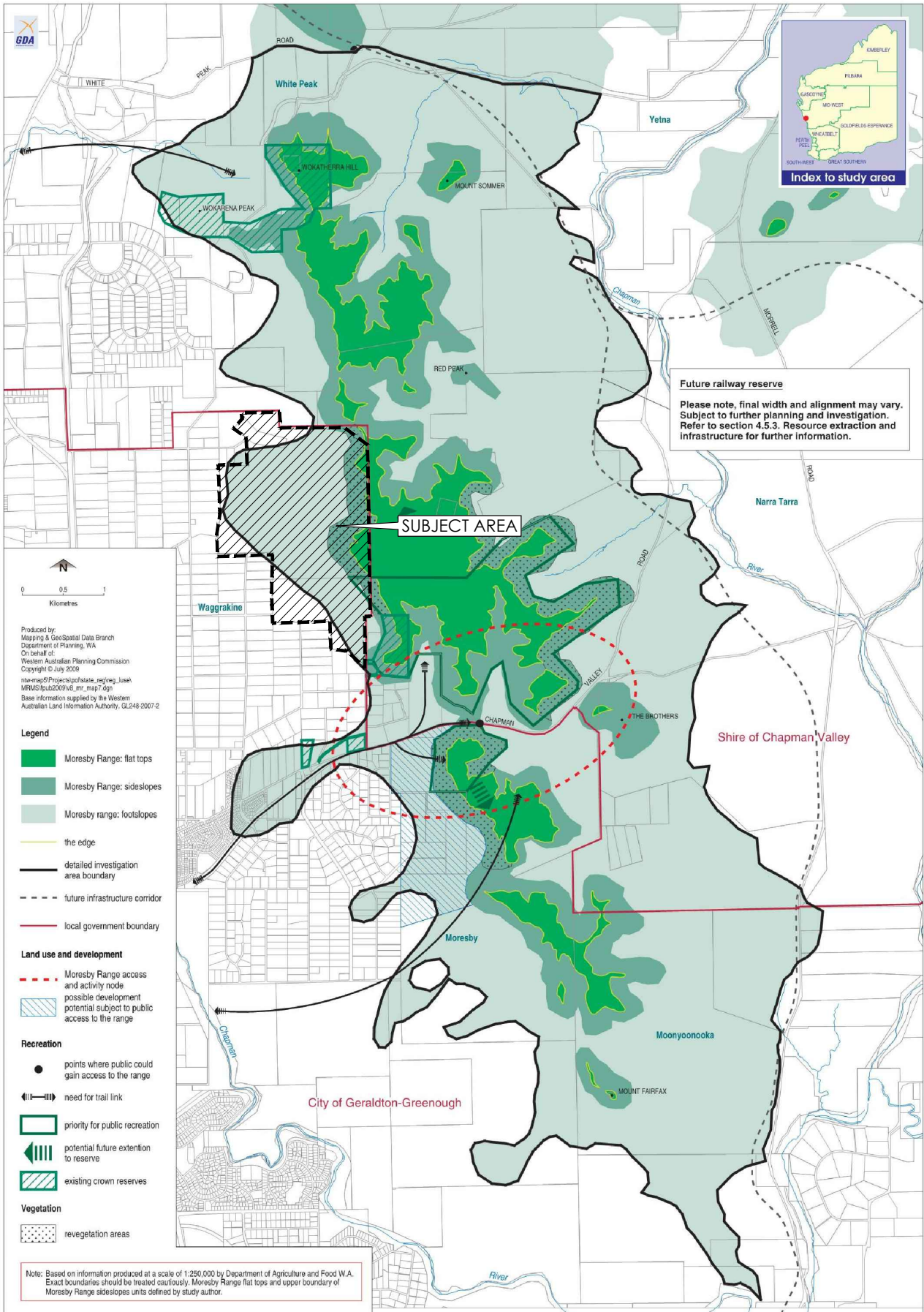
CURRENT ZONING - CITY OF GREATER GERALDTON TPS No.5





GREATER Geraldton STRUCTURE PLAN UPDATE 2010





MORESBY RANGE MANAGEMENT STRATEGY 2010
-STRATEGY PLAN FOR DETAILED INVESTIGATION AREA



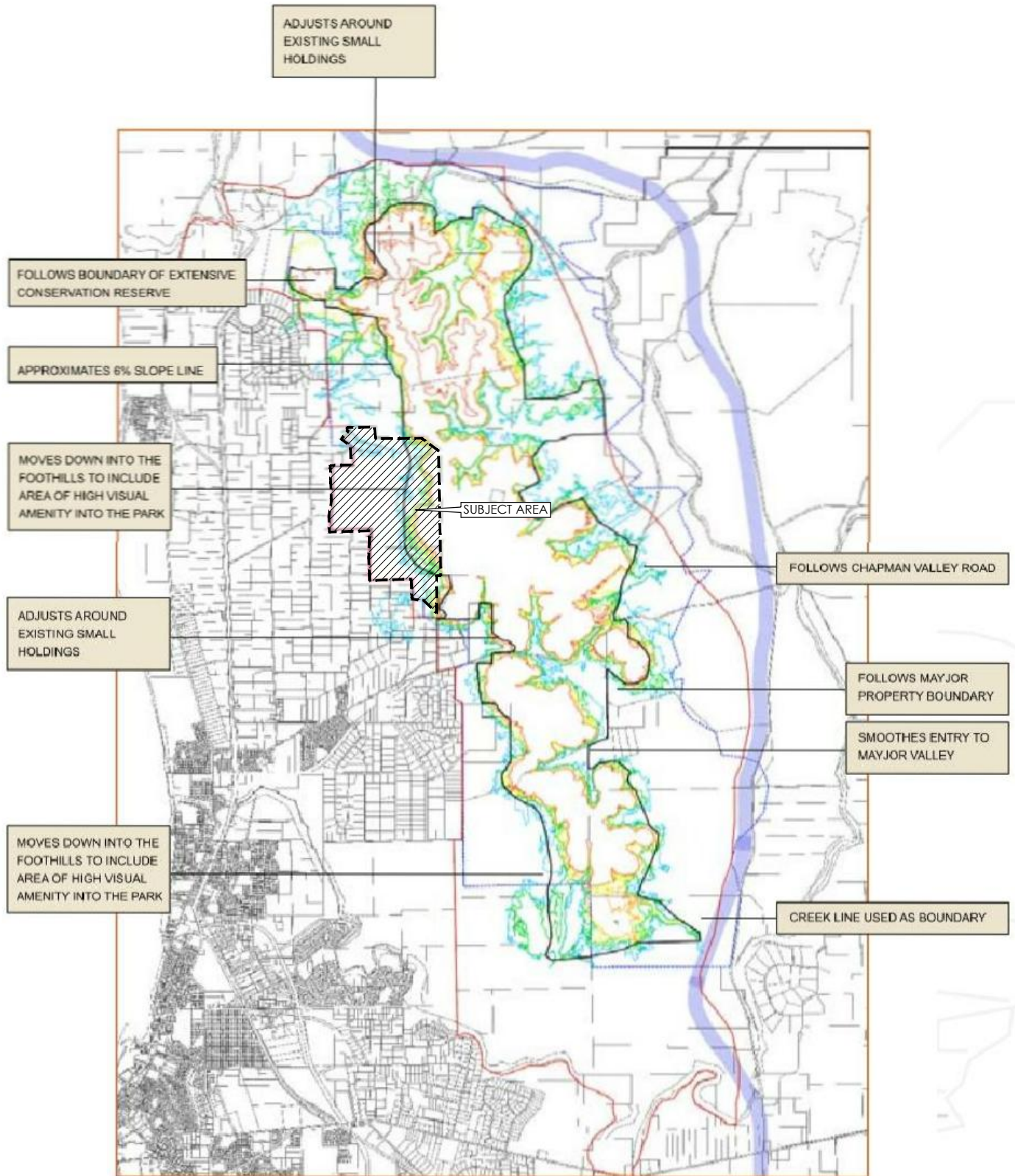
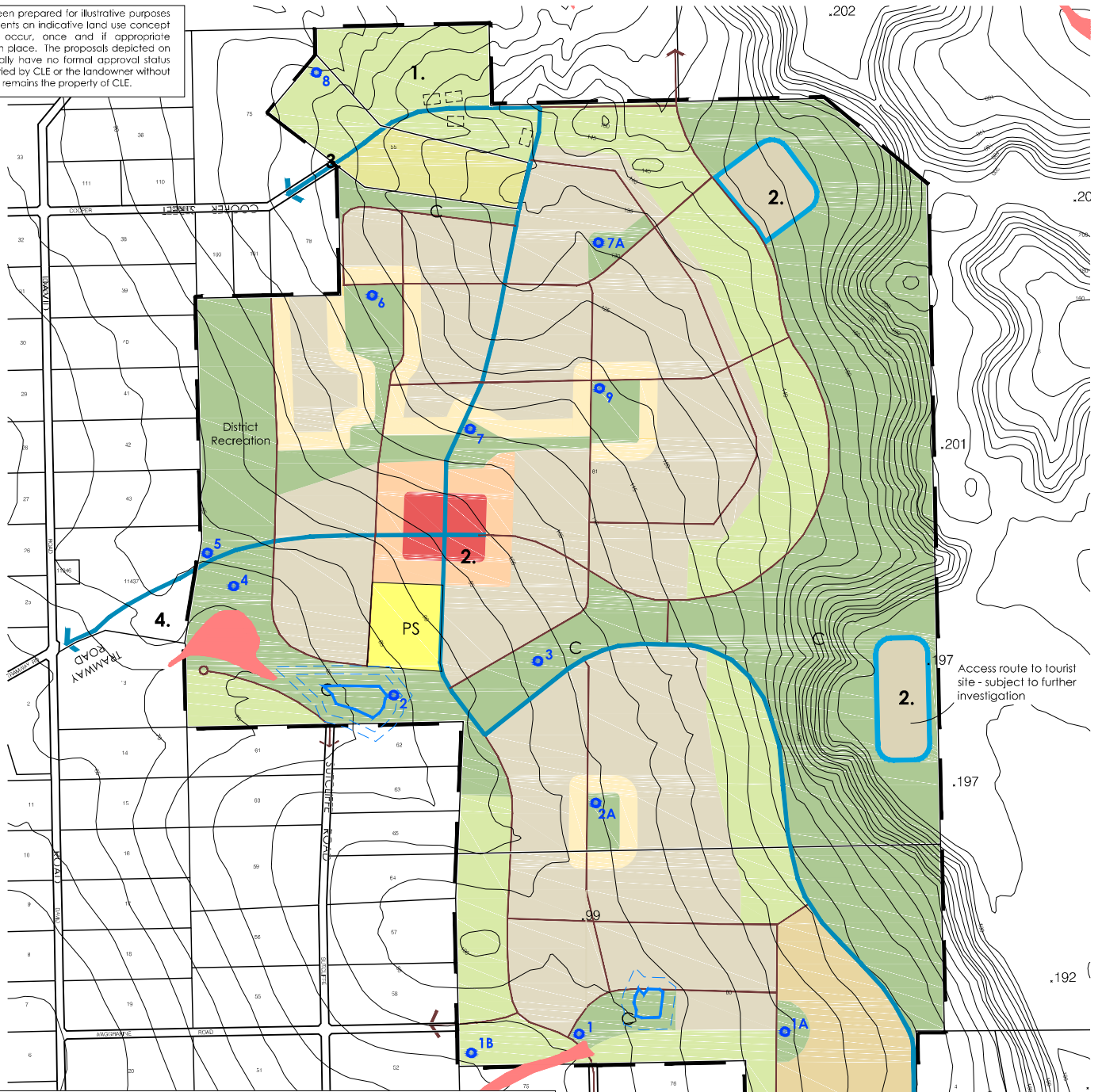


Figure 03.1 The Range Precinct boundary with examples of how the criteria in Section 3.2 were applied to identify the boundary.



This Plan has been prepared for illustrative purposes only and represents an indicative land use concept of what may occur, once and if appropriate approvals are in place. The proposals depicted on this Plan generally have no formal approval status and can be varied by CLE or the landowner without notice. This Plan remains the property of CLE.

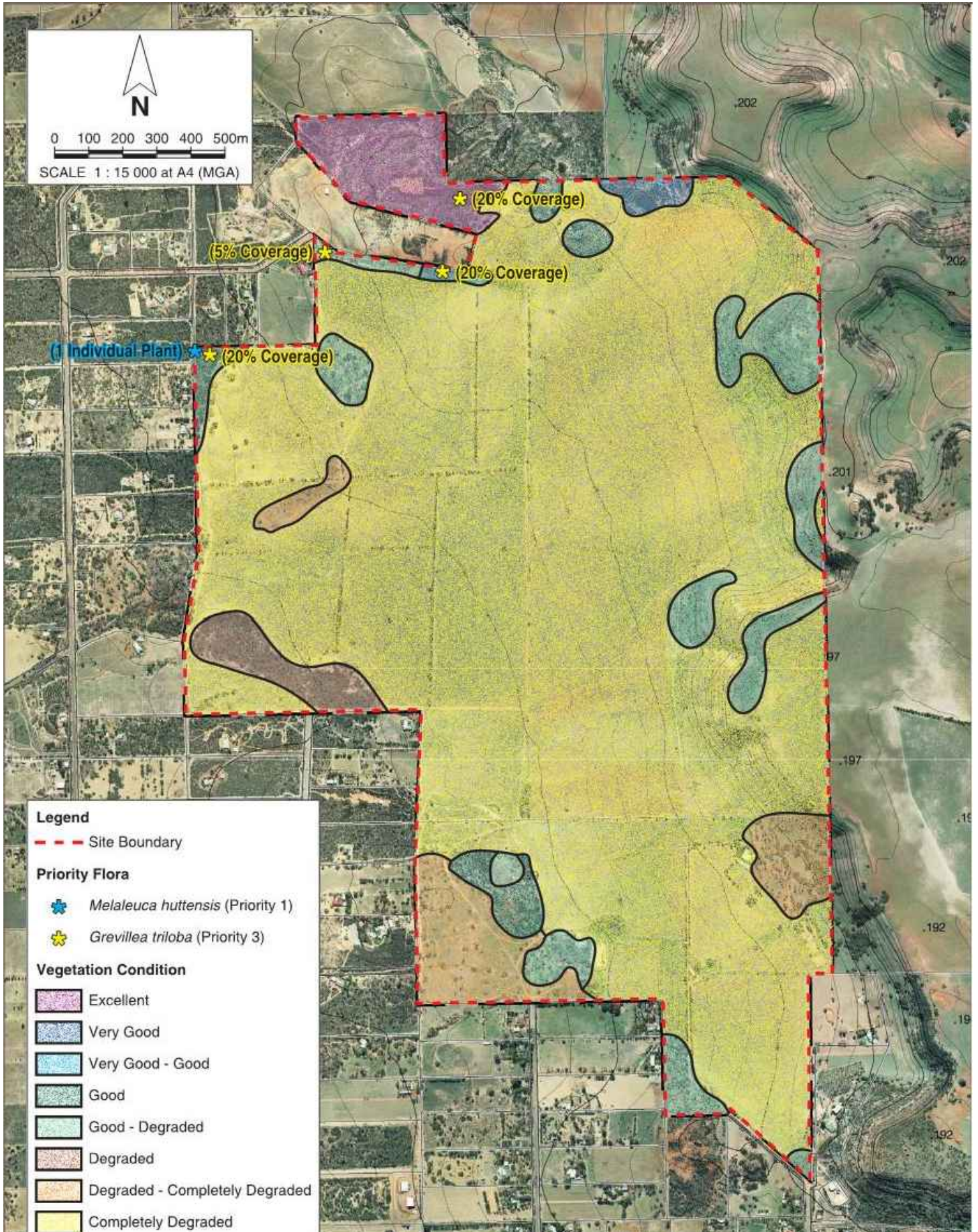


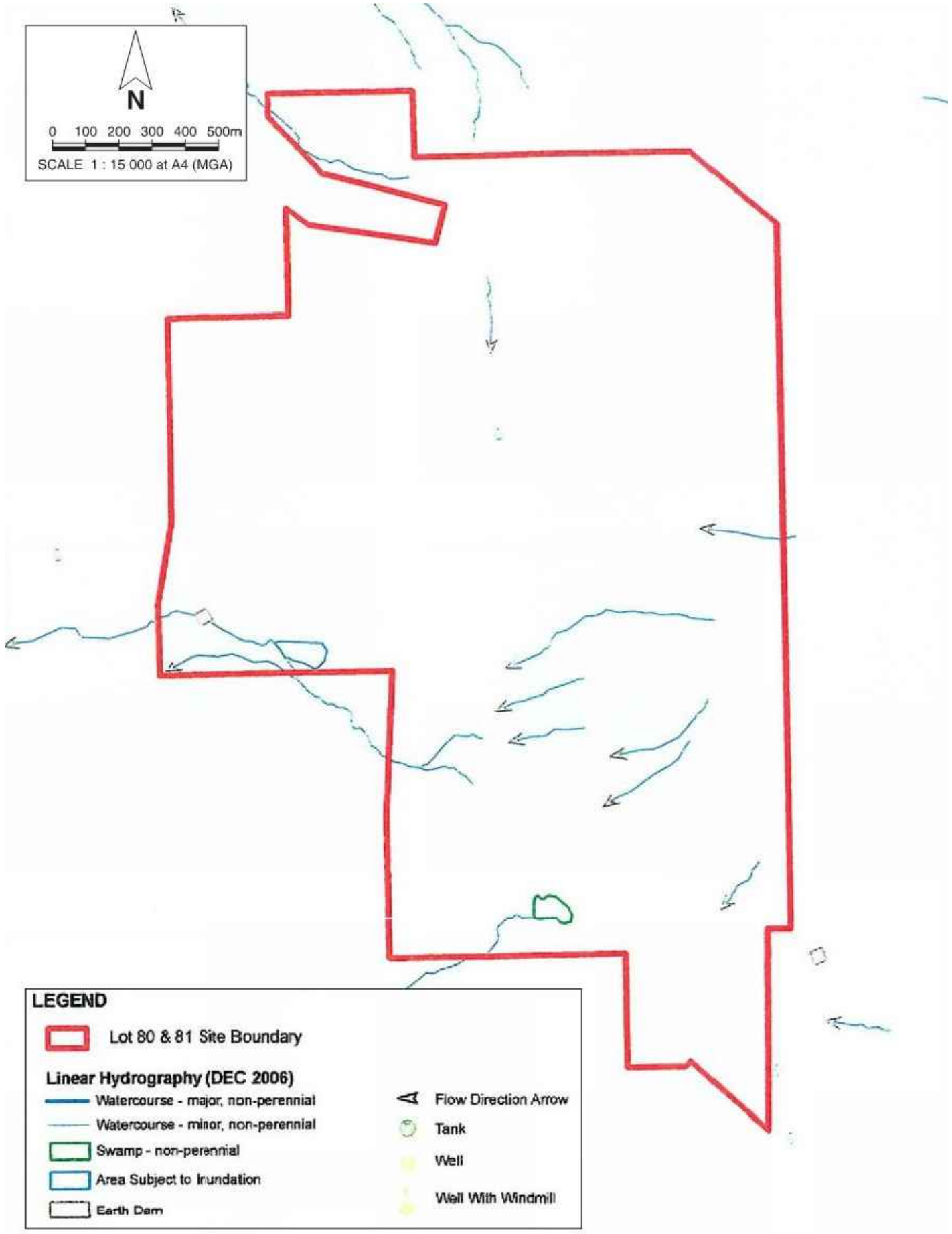
LEGEND

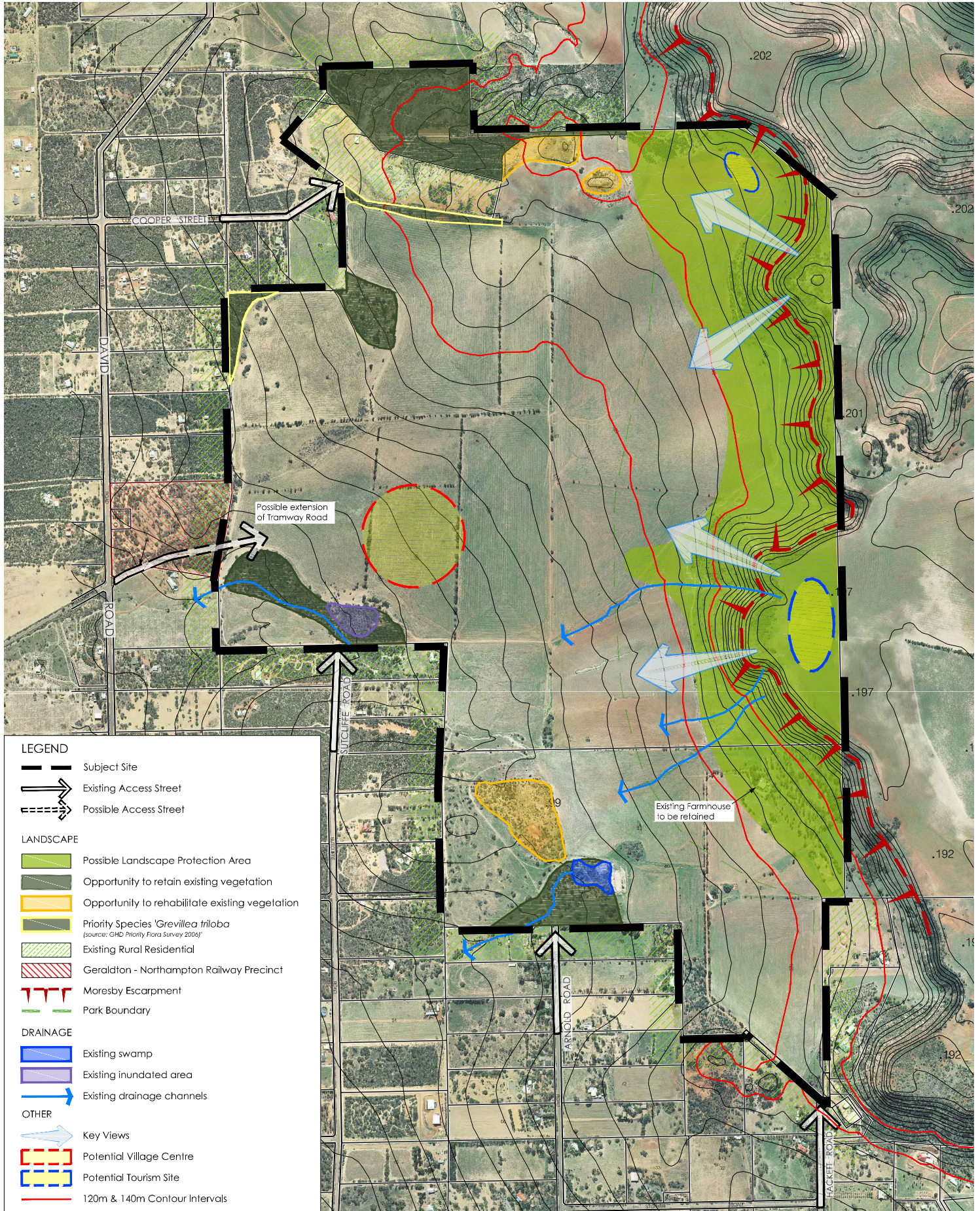
Tourist	Structure Plan Boundary
Public Open Space <i>(C - Designates Conservation Function)</i>	Road <i>(Neighbourhood Connector)</i>
Commercial <i>(Neighbourhood Centre - R80)</i>	Road <i>(Key Access Street)</i> - Subject to refinement
PS Public Purpose <i>(Primary School)</i>	Building Envelope (1000m ²)
Rural Residential <i>(min. 1ha)</i>	Integrated Drainage Location - Subject to refinement
Residential R40	1. Conservation Lot <i>(Restrictions Apply)</i>
Residential R30	2. Detailed Area Plan required
Residential R20	3. Cooper Street Extension <i>(Subject to agreement with local council & owner)</i>
Residential R10	4. Tramway Road extension <i>(Subject to agreement with Local Council)</i>
Residential R5	
Acid Sulphate Soil Risk	

DRAFT LOCAL STRUCTURE PLAN - ACID SULPHATE OVERLAY



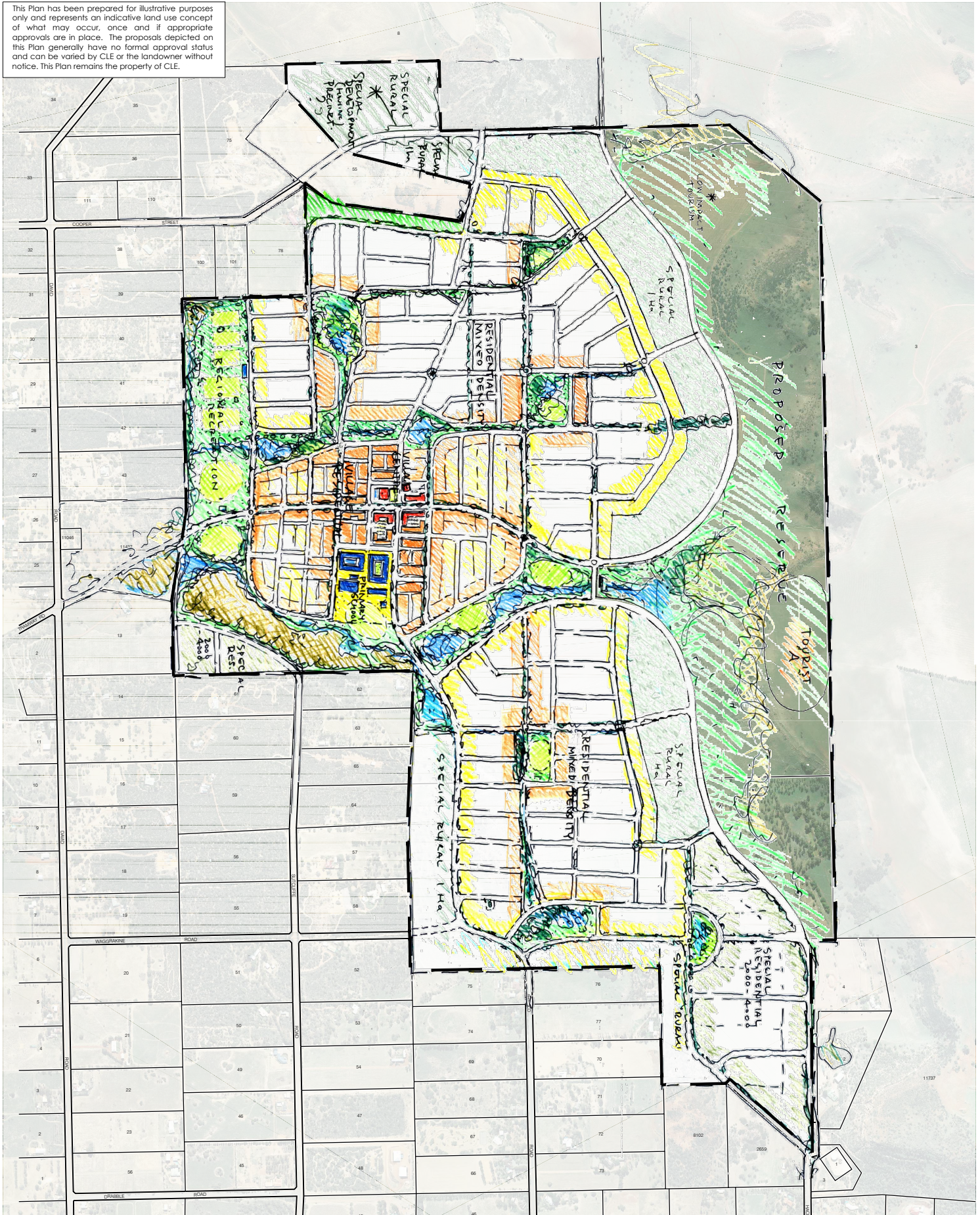




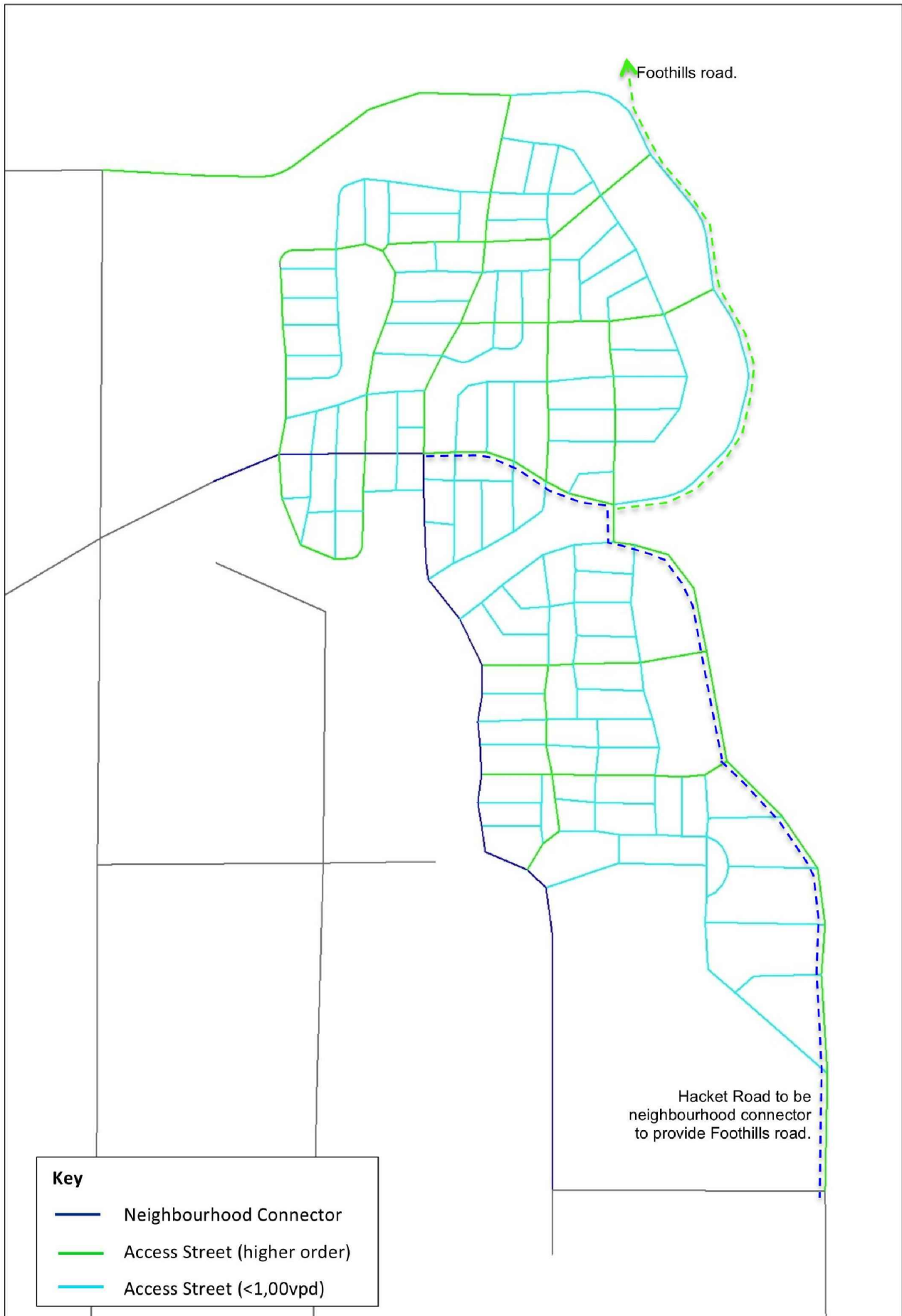


CONTEXT AND CONSTRAINTS

This Plan has been prepared for illustrative purposes only and represents an indicative land use concept of what may occur, once and if appropriate approvals are in place. The proposals depicted on this Plan generally have no formal approval status and can be varied by CLE or the landowner without notice. This Plan remains the property of CLE.



DEVELOPMENT CONCEPT PLAN



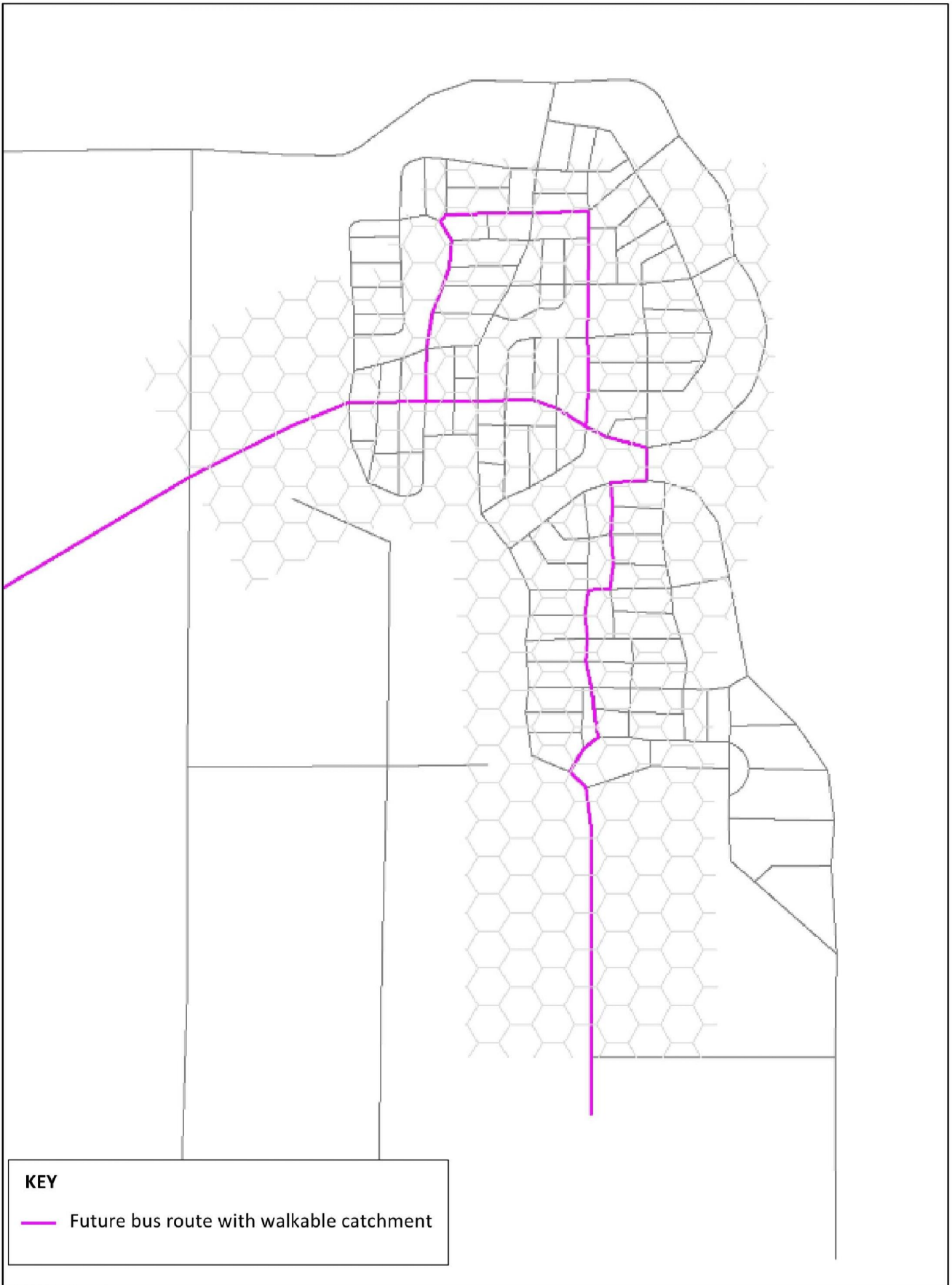
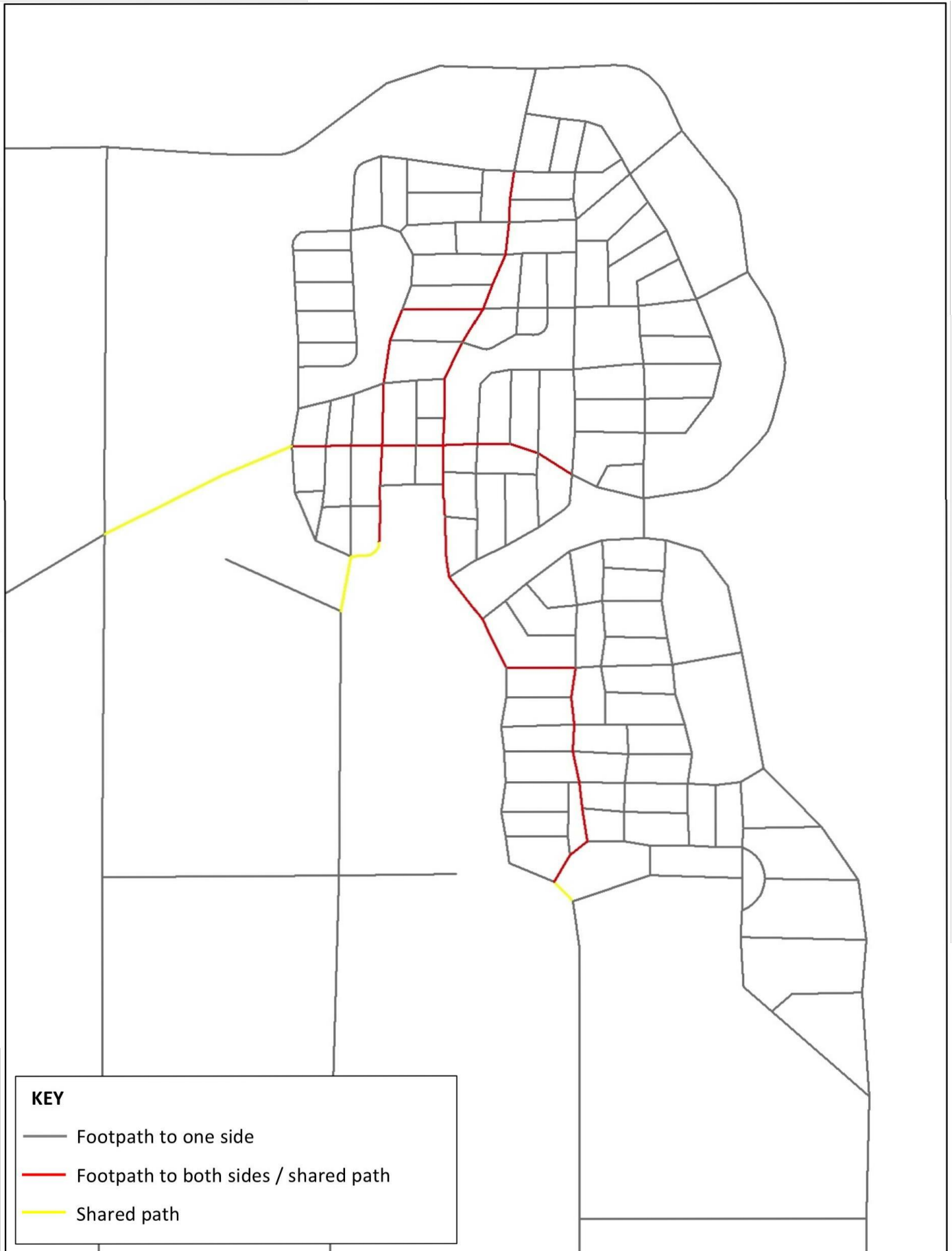
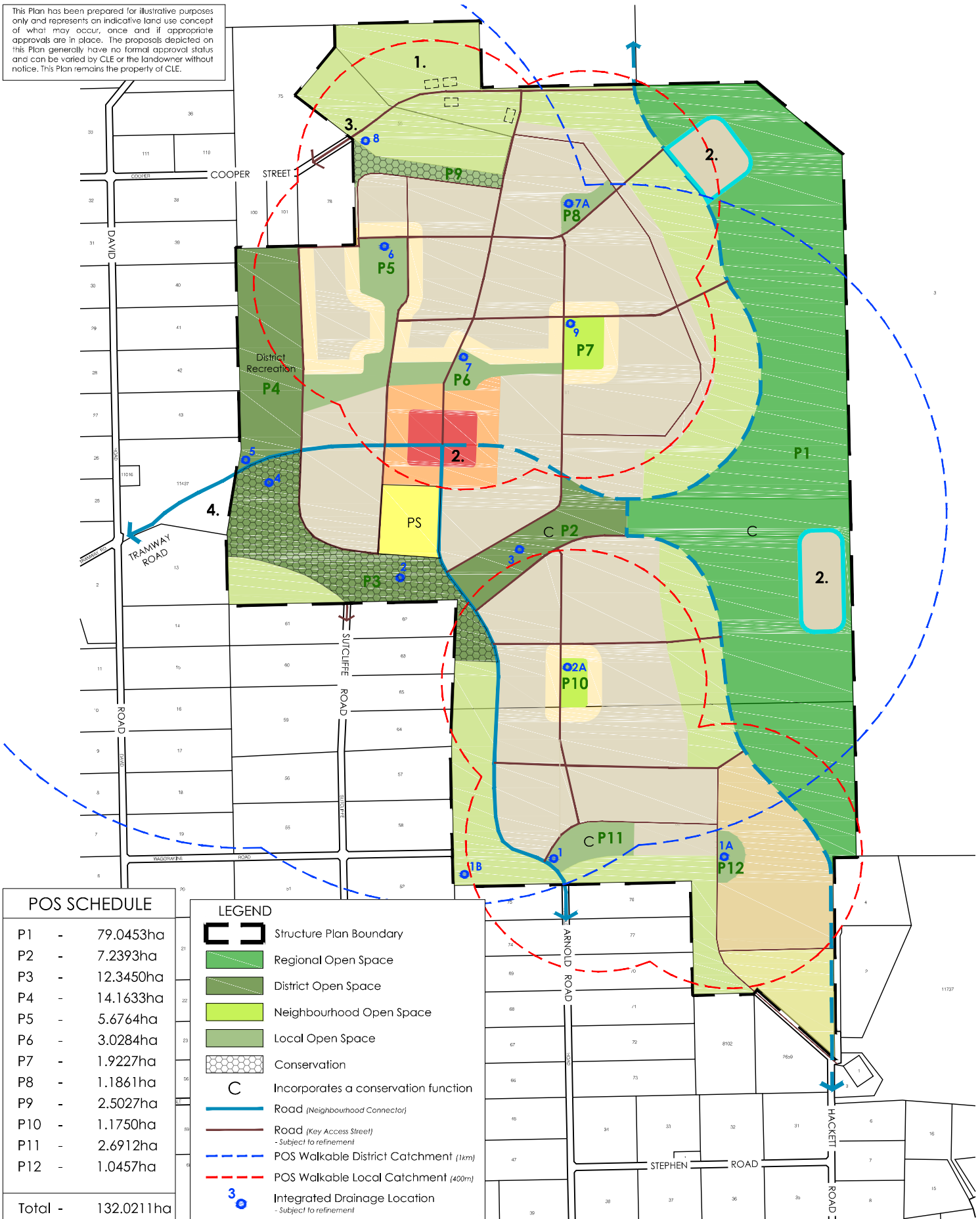


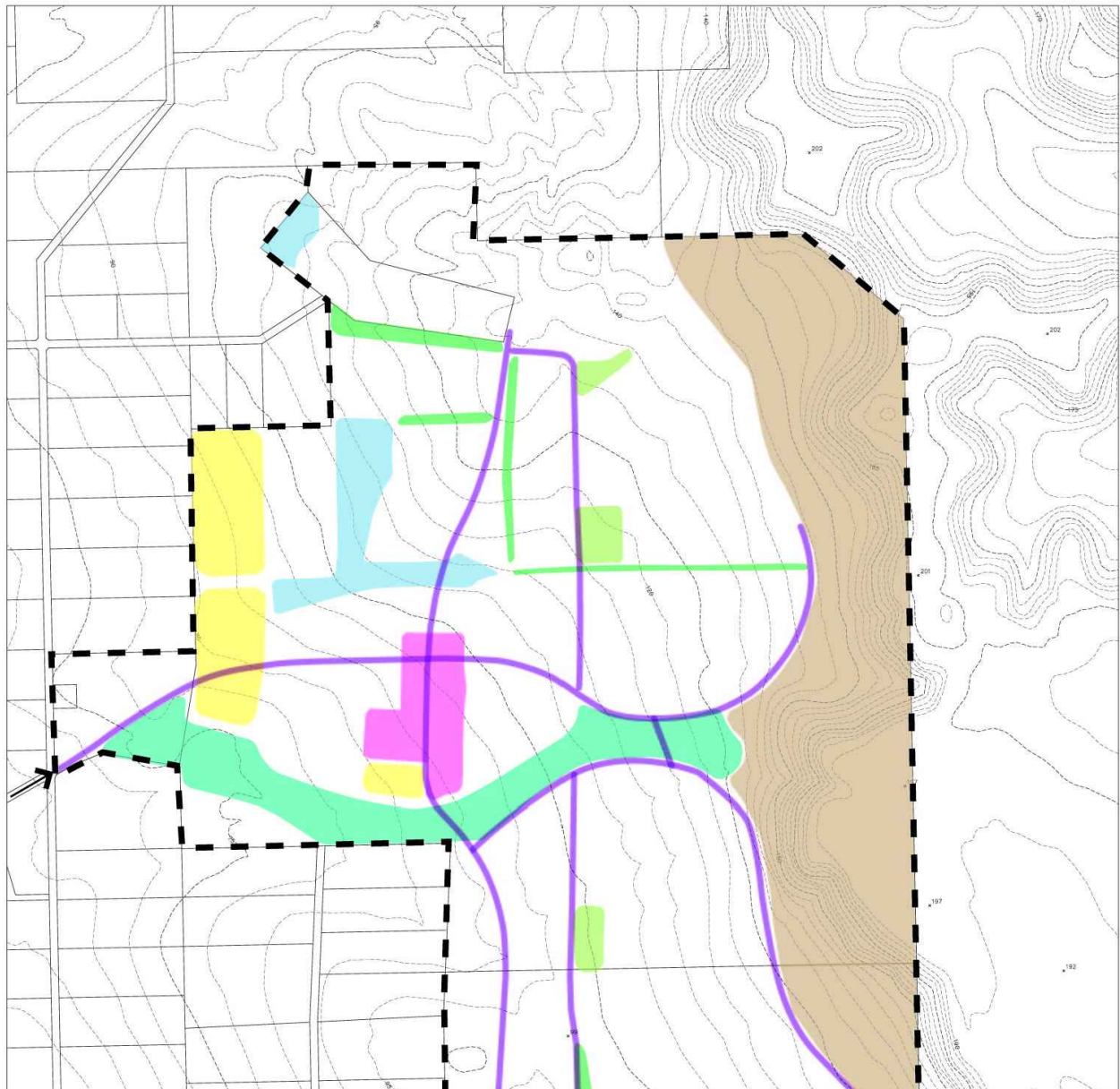
Figure 19 Roads for Future Bus Services







This Plan has been prepared for illustrative purposes only and represents an indicative land use concept of what may occur, once and if appropriate approvals are in place. The proposals depicted on this Plan generally have no formal approval status and can be varied by CLE or the landowner without notice. This Plan remains the property of CLE.



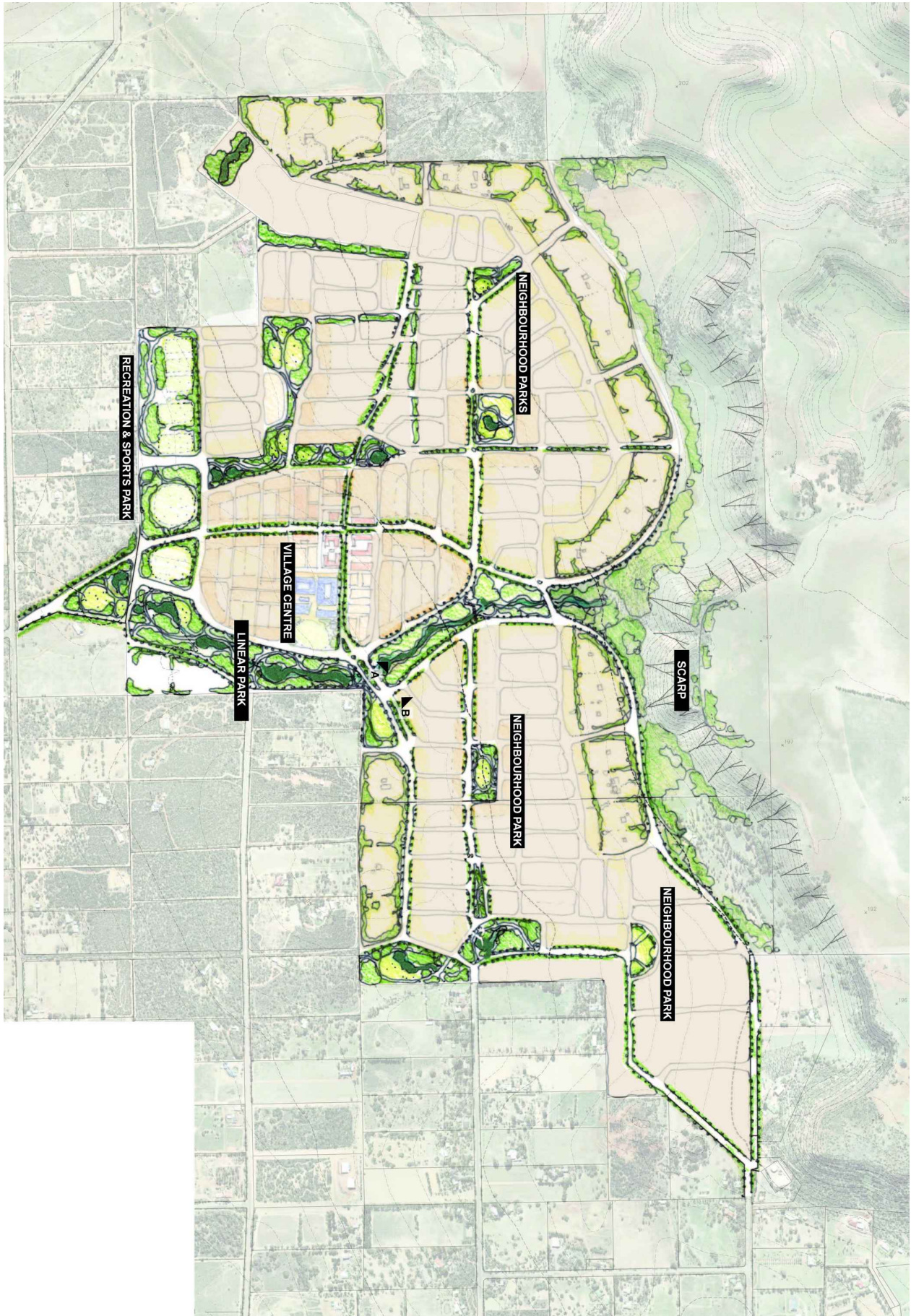


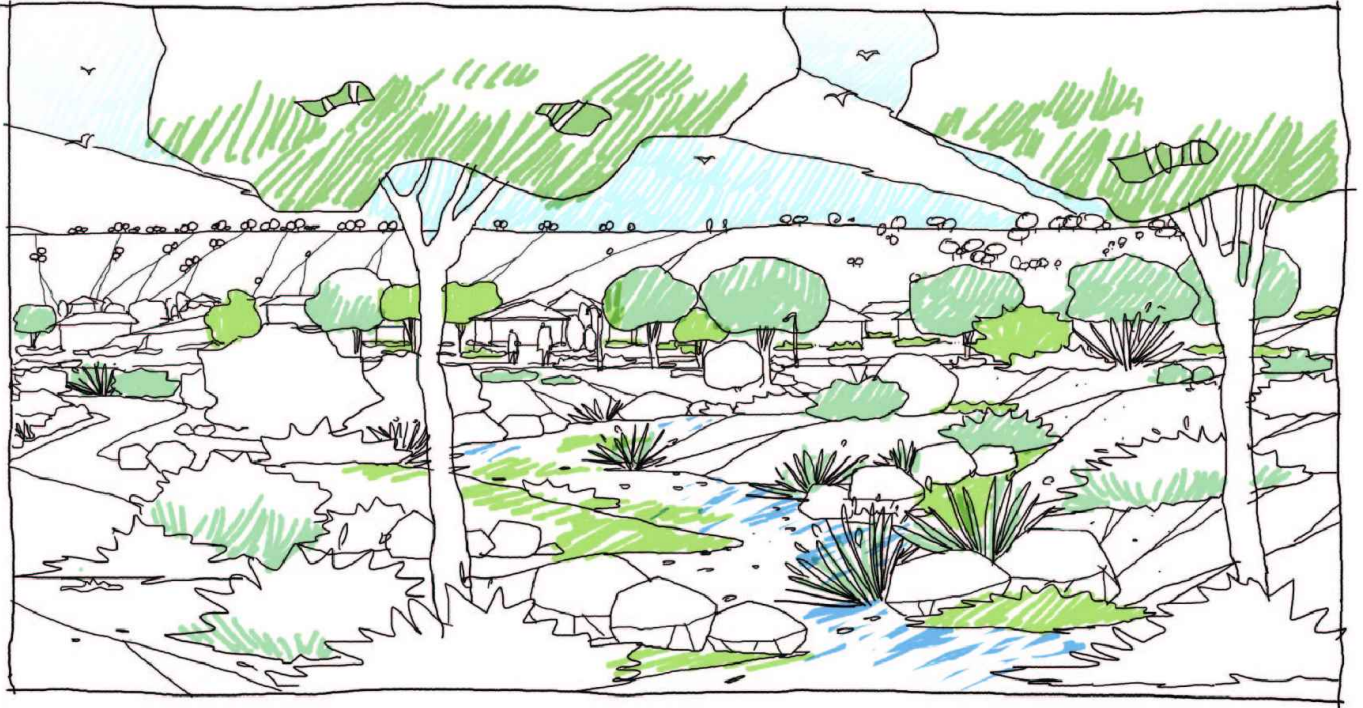
LEGEND

-  HIGH AMENITY RECREATION (OVALS + PLAYING FIELDS WITH BUFFER VEGETATION)
-  LINEAR PARK WITH INTEGRATED URBAN WATER MANAGEMENT+ FIRE MANAGEMENT (STRONG NATIVE PLANTS PALETTE)
-  INCIDENTAL OPEN SPACE WITH INTEGRATED DRAINAGE MANAGEMENT
-  NEIGHBOURHOOD PARKS FOCUSED TO PROVIDE AMENITY TO RESIDENTS
-  SCARP RECREATIONAL AREA WITH REHABILITATIVE PLANTING + PASSIVE RECREATION OPPORTUNITIES
-  GREEN LINK MOVEMENT NETWORK
-  CONNECTED STREETSCAPE NETWORK
-  VILLAGE STREETSCAPE LOOSELY INDIGENOUS PLANTING FOCUSING ON FUNCTIONALITY

0 100 200 400 800m
SCALE 1:15,000 @A4





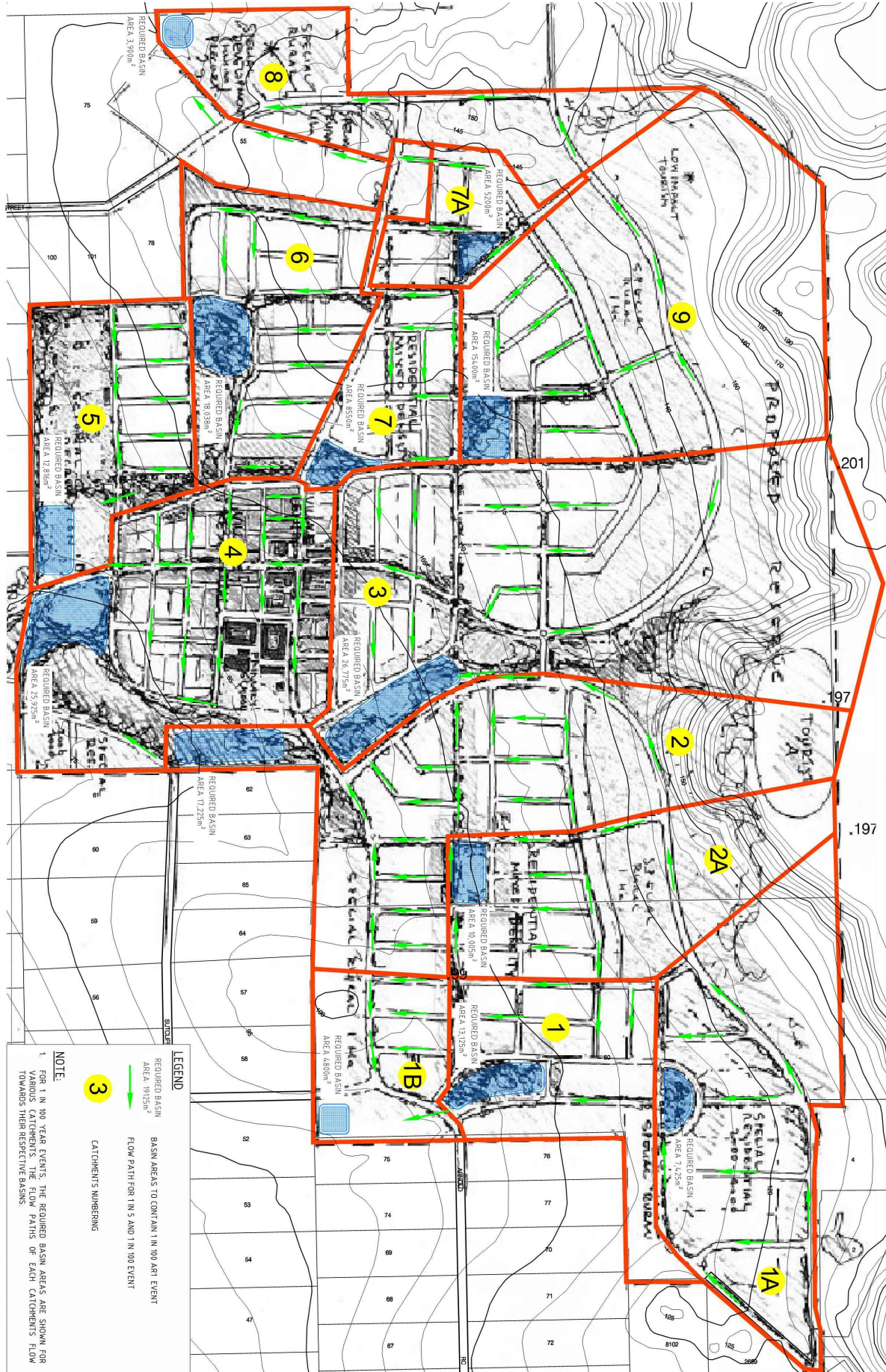


SKETCH IMPRESSION OF LINEAR PARK (LOCATION A)



SKETCH IMPRESSION OF WHERE VEHICLE CORRIDOR INTERSECTS LINEAR PARK (LOCATION B)





AECOM



APPENDIX 1

Certificates of Title

WESTERN




AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 19/11/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2669** FOLIO **491**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

R. Roberts
REGISTRAR OF TITLES 

THIS IS A SHARE TITLE

LAND DESCRIPTION:

2/3 UNDIVIDED SHARES OF
LOT 80 ON PLAN 15415

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

CAVERSHAM PROPERTY PTY LTD OF 272 FORESHORE DRIVE, GERALDTON
AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
(XA K37791) REGISTERED 15 OCTOBER 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

- E113642 EASEMENT TO WATER AUTHORITY OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1800 FOL 659. REGISTERED 29.5.1989.
- *K821219 CAVEAT BY ROBYN JUDITH HUNT LODGED 9.1.2009.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-659 (80/P15415).
PREVIOUS TITLE: 1800-659.
PROPERTY STREET ADDRESS: 131 HACKETT RD, WAGGRAKINE.
LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.

WESTERN



AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 19/11/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2669** FOLIO **492**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

B. Roberts

REGISTRAR OF TITLES



THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
LOT 80 ON PLAN 15415

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

PORTSTYLE NOMINEES PTY LTD OF 272 FORESHORE DRIVE, GERALDTON
AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
(XA K377791) REGISTERED 15 OCTOBER 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

- E113642 EASEMENT TO WATER AUTHORITY OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1800 FOL 659. REGISTERED 29.5.1989.
- *K821219 CAVEAT BY ROBYN JUDITH HUNT LODGED 9.1.2009.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-659 (80/P15415).
PREVIOUS TITLE: 1800-659.
PROPERTY STREET ADDRESS: 131 HACKETT RD, WAGGRAKINE.
LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.



Application D779604
Volume 1533 Folio 683

WESTERN



AUSTRALIA

VOL. 1800
FOL. 659

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.



REGISTRAR OF TITLES

Dated 10th June, 1988

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of Victoria Location 2659 and being Lot 80 on Plan 15415, delineated on the map in the Third Schedule hereto, limited however to the natural surface and therefrom to a depth of 609.6 metres.

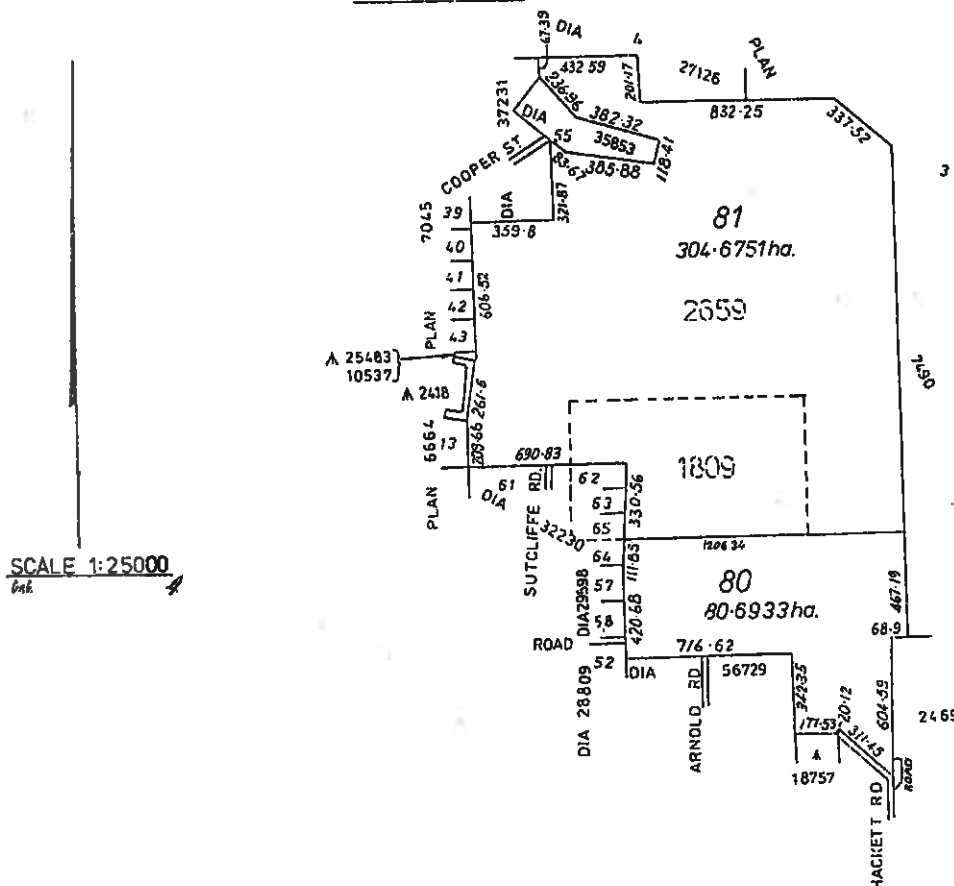
FIRST SCHEDULE (continued overleaf)

~~Joscelyn Beverley Percy of Willambury Station, Carnarvon, Station Manager and Gretchen Pty. Ltd. of 3rd Floor, 524 Hay Street, Perth, as tenants in common in equal shares.~~

SECOND SCHEDULE (continued overleaf)

1. ~~MORTGAGE D501770 to Westpac Banking Corporation. Registered 23.2.83 at 0.02~~
Discharged D779605 10.6.88

THIRD SCHEDULE



NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

Superseded - Copy for Sketch Only

Page 1 (of 2 pages) 1800 659

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

FIRST SCHEDULE (continued)

Superseded Copy for Sketch Only

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

Kevin Ernest Hunt and Robyn Judith Hunt, both of Lot 86 Lynch Street, Hyden, Agents.
The correct address of the registered proprietors is now Lot 80 Hackett Road, Waggrakine.

Table with columns: NATURE, NUMBER, CANCELLATION, REGISTERED OR LODGED, TIME, SEAL, INITIALS. Includes entries for Transfer and Mortgage.

SECOND SCHEDULE (continued)

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

Table with columns: INSTRUMENT, NATURE, NUMBER, PARTICULARS, REGISTERED, TIME, SEAL, INITIALS, CANCELLATION, NUMBER, REGISTERED OR LODGED, TIME, SEAL, INITIALS. Includes entries for Mortgage and Transfer.

WESTERN



AUSTRALIA

REGISTER NUMBER 55/D35853	
DUPLICATE EDITION 5	DATE DUPLICATE ISSUED 8/9/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **136** FOLIO **190A**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.


REGISTRAR OF TITLES 

LAND DESCRIPTION:

LOT 55 ON DIAGRAM 35853

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

PAUL JAMES DOSSETTER
VICKI LEE NEIL
BOTH OF 32 HARWELL WAY, WEDGEFIELD, PORT HEDLAND
AS JOINT TENANTS

(T K307121) REGISTERED 15 AUGUST 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. K317444 MORTGAGE TO WESTPAC BANKING CORPORATION REGISTERED 23.8.2007.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 136-190A (55/D35853).
PREVIOUS TITLE: 1307-235.
PROPERTY STREET ADDRESS: 219 COOPER ST, WAGGRAKINE.
LOCAL GOVERNMENT AREA: CITY OF GREATER GERALDTON.

Superseded - Copy for Sketch Only

INDEXED

Transfer A84116
Volume 1307 Folio 235

WESTERN



ORIGINAL

REGISTER BOOK

AUSTRALIA

VOL 136

FOL 190A

Certificate of Title

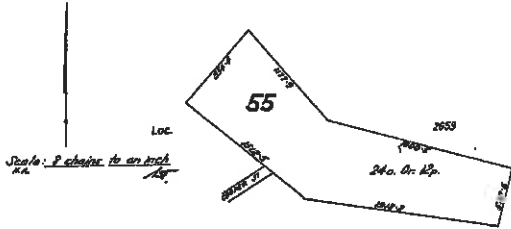
CT 0136 0190A F



UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

Her Majesty Queen Elizabeth the Second, is now the proprietor of an estate in fee simple subject to the easements and encumbrances notified hereunder in the natural surface and therefrom to a depth of two thousand feet of all that piece of land delineated and coloured green on the map hereon containing twenty-four acres and twelve perches or thereabouts, being portion of Victoria Location 2659 and being Lot 55 on Diagram 35853.

Dated the 17th day of September, 1968.



D. Brindley
REGISTRAR OF TITLES.
Transfer A84116 for Shire of Ipswich of 41 Fitzgerald Street, Queensland Registered 17th September 1968 at 10.47 a.m.
D. Brindley
REGISTRAR OF TITLES.

44014/6/66 - M - 0/150

For encumbrances and other matters affecting the land see back

Superseded - Copy for Sketch Only

EASEMENTS AND ENCUMBRANCES REFERRED TO

CERTIFICATE OF TITLE

VOL. 136 FOL. 190 A

CT 0136 0190A B



WESTERN




AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 4/10/2007

RECORD OF CERTIFICATE OF TITLE
 UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2670** FOLIO **71**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

R. Roberts
 REGISTRAR OF TITLES 

THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
 LOT 81 ON PLAN 15415

**REGISTERED PROPRIETOR:
 (FIRST SCHEDULE)**

VICTOR JOSEPH NEWTON
 JANICE MARGARET NEWTON
 BOTH OF 18A HARGRAVE STREET, STIRLING
 AS JOINT TENANTS

OF THE SHARE SHOWN IN THE LAND DESCRIPTION

(XA K348804) REGISTERED 19 SEPTEMBER 2007

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
 (SECOND SCHEDULE)**

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
 * Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
 Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-660 (81/P15415).
 PREVIOUS TITLE: 1800-660.
 PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
 LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.

WESTERN



AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 4/10/2007

RECORD OF CERTIFICATE OF TITLE
 UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2670** FOLIO **72**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

R. Roberts

REGISTRAR OF TITLES



THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
 LOT 81 ON PLAN 15415

**REGISTERED PROPRIETOR:
 (FIRST SCHEDULE)**

SEATONE NOMINEES PTY LTD OF 272 FORESHORE DRIVE, GERALDTON
 AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
 (XA K348804) REGISTERED 19 SEPTEMBER 2007

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
 (SECOND SCHEDULE)**

- 1. *K035831 CAVEAT BY CAVERSHAM PROPERTY PTY LTD LODGED 22.12.2006.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
 * Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
 Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-660 (81/P15415).
 PREVIOUS TITLE: 1800-660.
 PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
 LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.

WESTERN




AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 4/10/2007

RECORD OF CERTIFICATE OF TITLE
 UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2670** FOLIO **73**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

JG Roberts
 REGISTRAR OF TITLES 

THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
 LOT 81 ON PLAN 15415

**REGISTERED PROPRIETOR:
 (FIRST SCHEDULE)**

CAVERSHAM PROPERTY PTY LTD OF LEVEL 1, 66 KINGS PARK ROAD, WEST PERTH
 AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
 (XA K348804) REGISTERED 19 SEPTEMBER 2007

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
 (SECOND SCHEDULE)**

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
 * Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
 Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-660 (81/P15415).
 PREVIOUS TITLE: 1800-660.
 PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
 LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.



Application D779604
Volume 1533 Folio 683

WESTERN



AUSTRALIA

VOL. 1800
FOL. 660

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.

R. Mulcahy



REGISTRAR OF TITLES

Dated 10th June, 1988

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of each of Victoria Locations 1809, 2659 and being Lot 81 on Plan 15415, delineated on the map in the Third Schedule hereto.
As to the said Location 2659 only: limited however to the natural surface and therefrom to a depth of 609.6 metres.

FIRST SCHEDULE (continued overleaf)

~~Jocelyn Beverley Percy of Williambury Station, Carnarvon, Station Manager and Gretchen Pty. Ltd. of 3rd Floor, 524 Hay Street, Perth, as tenants in common in equal shares~~

Checker 14

SECOND SCHEDULE (continued overleaf)

~~C501770
1. MORTGAGE D501770 to Westpac Banking Corporation. Registered 23.2.83 at 9.02 o.c.~~

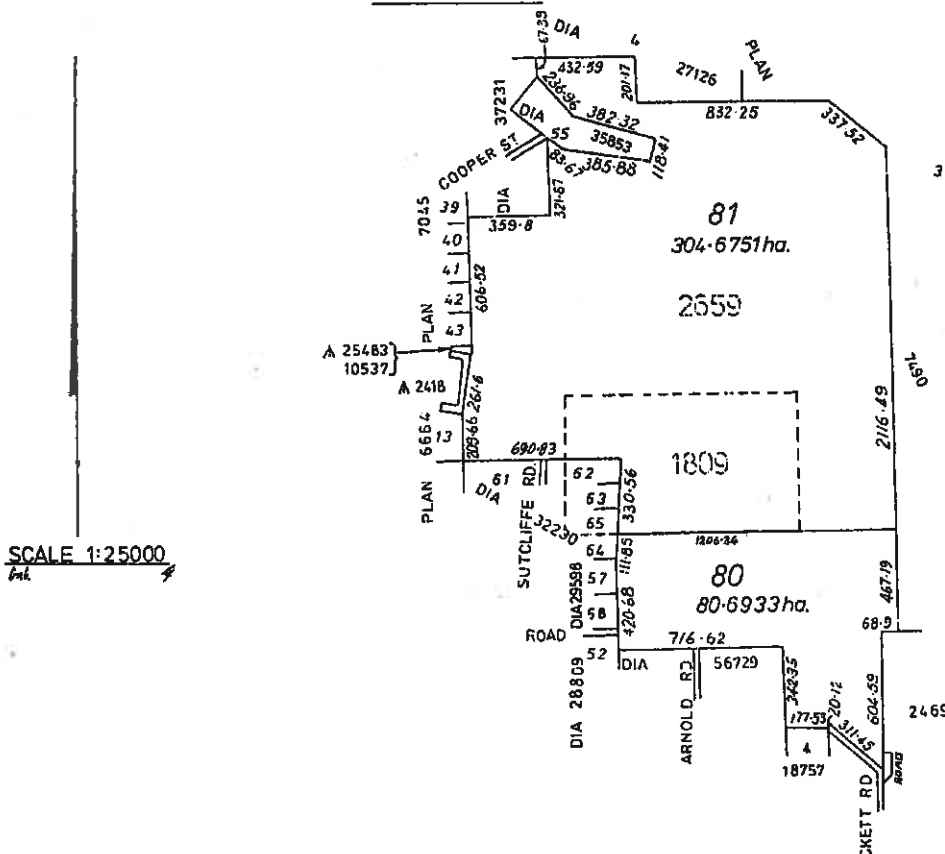
~~Discharged
Asst. Registrar of Titles 3/8/88~~

~~Discharged D885832 28.9.88~~



Checker 14

THIRD SCHEDULE



NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

Page 1 (of 2 pages) 1800 660 FOL
Superseded - Copy for Sketch Only

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

Superseded Copy for Station Only

THE RULES OF THE OFFICE OF THE CLERK OF THE SUPERIOR COURT OF THE STATE OF CALIFORNIA IN AND FOR THE COUNTY OF SAN DIEGO, CALIFORNIA, PROVIDE THAT THIS INSTRUMENT IS VOID AND OF NO EFFECT FROM THE DATE OF THIS NOTICE TO SUPERSEDE THE INSTRUMENT HEREIN REFERRED TO. THE SUPERSEDED COPY MAY BE AFFIXED TO THE INSTRUMENT BY THE REGISTERED PROPRIETOR.

Victor Joseph Newton and Janice Margaret Newton both of 7 O'Collins Street, Geraldton as joint tenants.

NATURE	NUMBER	REGISTERED	TIME	SEAL	INITIALS
Transfer	D885833	28.9.88	9.07		

SECOND SCHEDULE (continued)

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

INSTRUMENT NATURE	NUMBER	PARTICULARS	REGISTERED	TIME	SEAL	INITIALS	CANCELLATION	NUMBER	REGISTERED OR LODGED	SEAL	INITIALS
			28.9.88	9.07			Discharged	F996177	4.10.95		
Mortgage	D885834	to Westpac Banking Corporation.	28.9.88	9.07			Discharged	F996177	4.10.95		
Mortgage	H38660	to Westpac Banking Corporation.	2.3.99	8.04							

CERTIFICATE OF TITLE VOL. 1800 FOL. 660

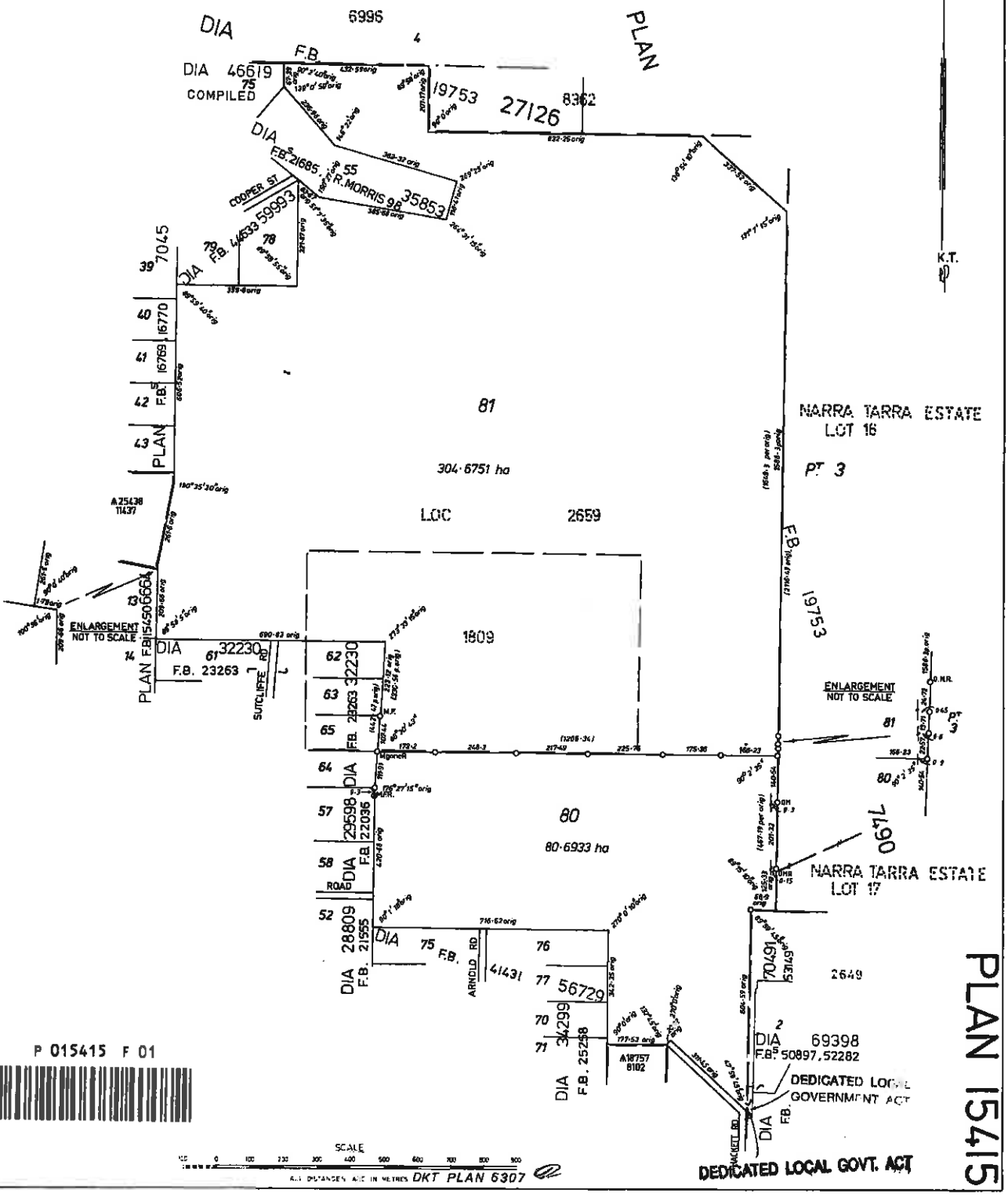
PLAN 15415

PT VICTORIA LOCS. 1809 & 2659

SURVEYOR J. J. F. DELFOS
F.B. 52435
TOTAL AREA 385.3684 ha
INDEX PLANS CHAPMAN 2000 17.24, 17.25, 17.26, 17.27,
18.23, 18.24, 18.25, 18.26
C.T. 1533-683

APPROVED
24.2.86

LIMITED IN DEPTH TO 609.6 METRES
AS TO LOC. 2659 ONLY



P 015415 F 01



SCALE
0 100 200 300 400 500 600 700 800 900
ALL DISTANCES ARE IN METRES DKT PLAN 6307

DEDICATED LOCAL GOVT. ACT

PLAN 15415

APPENDIX 2

Moresby Range Design Response
(Ferart Design for Shire of Chapman Valley & City of Greater Geraldton, 2010)

Table 04.1 Design responses to improve visual transitions across the foothills

Criteria affecting visual transitions	Nature of effect	Design response
Housing density and lot sizes	Number of roof tops seen in a specific area	In urban areas close to the city it is proposed that lots down to 1ha will present roughly the same density of housing as is currently found in existing outer urban areas. Close to the Foothills road and the possible Park lots should typically be 4ha in size decreasing to 2ha in size in the mid zone between the Foothills Road and the existing urban areas
Stream lines and bush land areas revegetated	Fingers of green reaching from the Range down into urban areas linking to urban bush land areas	See Recommendation 04.3
Orientation of roads and blocks	Views across the road network can either open up the landscape or help provide screens to hide buildings	Generally orientate the roads and blocks of future urban developments on the north-south/contour line axis to create the opportunity for tree plantings along the boundaries and access roads. This will provide a staggered series of tree lines across the foothills which, from distant vantage points, will merge and create the appearance of extensive tree cover spreading across the foot hills. Curvilinear suburb design is not supported because it creates visual gaps in tree screens due to the random alignment of the roads and lots
Location	Certain locations are more visible than others when viewed from high points in the City	Figure 04.1 provides a general summary of areas of high visibility compared to areas of lower visibility, based on the information shown in Figure 04.3. Areas shown as low visibility could typically have lots with a minimum size of 1ha, those shown as high visibility would have lots starting at 2ha and going up to 4ha next to the proposed Park boundary
Amount of vegetation cover	The greater the amount of vegetation cover the more it appears that the area is well vegetated and bushy	Ensure there is at least 30% vegetation cover on lots with the plantings along boundaries, roads, building envelopes and high points in the landscape with the overall objective of creating the impression that the landscape is continuously well vegetated when viewed from distant locations
Siting of buildings in the landscape	Buildings that sit high in the landscape, on ridge lines and unique features, or appear to be spreading across an area are more visually dominant	Cluster buildings on larger lots within strategically located building envelopes situated as far as possible down the side-slopes of the Range Ensure buildings are low in the local landscape to minimise visual impact on sky-lines Avoid siting buildings on, or immediately adjacent to, unique landforms e.g. rocky outcrops, stream lines, saddle points, ridge lines
Type of vegetation	Different types of vegetation can be used to improve the appearance of the landscape	Enhancing and recreating bush land areas are important particularly where there is an underlying ecological asset, e.g. creek lines or remnant bush, that can be built upon However on lots with little underlying ecological values there are opportunities for creating tree crops and other sustainable land use activities that stabilise the landscape and improve the appearance of the region
Location of recreation areas	Recreation areas can be used to improve the appearance of an area	Strategically locate urban parkland areas to link in with other vegetated features in the landscape

APPENDIX 3

Visual Impact Assessment Report (EPCAD, August 2013)

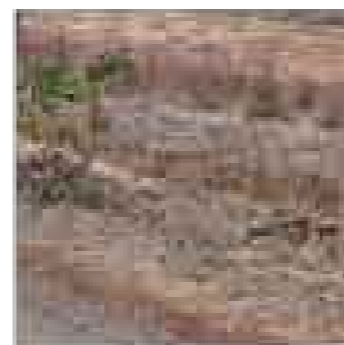
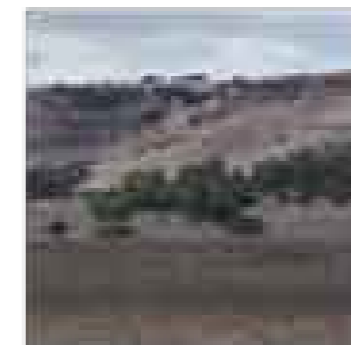
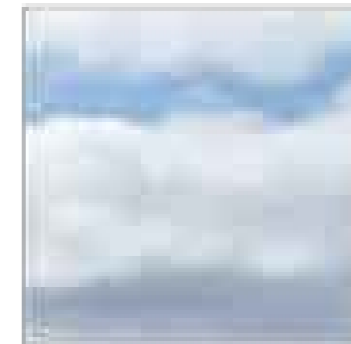
Wavecrest Estate, Geraldton

Visual and Landscape Assessment

B0749: EDIT 3 / 20.08.2013

Prepared by: EPCAD Pty Ltd Landscape Architects and Environmental Planners

Prepared for: Humfrey Land Developments



Document Control

EPCAD reports are prepared for a specific purpose for specific client requirements. EPCAD is not liable for any loss or damage incurred by any person relying on such reports or advice, except where they are created by EPCAD expressly for that person.

Nothing in these terms shall be taken as excluding, limiting or modifying any term, condition or warranty implied by any applicable act of parliament that cannot be so affected. To the extent that such a term, condition or warranty is implied, the liability of EPCAD for breach of that term, condition or warranty is, where permitted, limited at the option of EPCAD to:

The supplying of the relevant goods or services again; or

The payment of the cost of having the relevant goods or services supplied again.

Job Number	B0749
Document Title	Wavecrest Estate,Geraldton: Visual & Landscape Assessment
File Name	B0749_MH_VLA_Issue 3
Author	EPCAD pty ltd
Client	Humfrey Land Developments

Issue	Issued to	Date	Reviewed	Approved
1 / 29.10.2010	HLD (KT) CLE (PR)	29.10.2010	AD/HM	HM
2 / 09.05.2011	CLE (PR)	09.05.2011	AD	HM
3 / 20.08.2013	CLE (PR)	20.08.2013	CB	HM

1 Contents

2	Introduction	5	
2.1	Glossary of Terms Featured in this Report	5	
3	Visual Landscape Evaluation	6	
3.1	Scope and Context	6	
3.2	Site Description	6	
3.2.1	Context	6	
3.2.2	Topography	7	
3.2.3	Vegetation	9	
3.2.4	Drainage	9	
3.2.5	Built Form	9	
3.2.6	Adjacent Property	9	
3.3	District Landscape Area	13	
3.3.1	District Landscape Character	13	
3.3.2	Urban Development in the Landscape	13	
3.3.3	Viewing Experience and Values: How is the Landscape Viewed	13	
4	Visual Impact Assessment	14	
4.1	The Proposed Development	14	
4.2	Likely Changes in the Landscape	14	
4.2.1	Anticipated Short Term Effects	14	
4.2.2	Anticipated Mid-Term Effects	14	
4.2.3	Anticipated Long-Term Effects	14	
5	Key Locations & Assessment of Changes	14	
5.1	Scope	14	
5.1.1	Sydney Memorial Lookout Geraldton;	17	
5.1.2	North West Coastal Highway: Northbound at Trigg Street;	19	
5.1.3	North West Coastal Highway: Northbound at Railway Street;	21	
5.1.4	Northbound North West Coastal Highway from Railway Street to Beattie Road	23	
5.1.5	440 Roadhouse: North West Coastal Highway;	25	
5.1.6	440 Roadhouse Exit: North West Coastal Highway;	27	
5.1.7	Beattie Road: Waggrakine Rural-Residential Area	29	
5.1.8	Intersection of Beattie Road and Tramway Road;	31	
5.1.9	Tramway Road;	33	
5.1.10	Intersection of Tramway Road and David Road;	35	
5.1.11	David Road;	37	
5.1.12	Suttcliffe Road: 800m North of intersection with Drabble Road;	39	
5.1.13	Waggrakine Primary School Kiss & Ride: Hall Road;	41	
5.1.14	Lot 267 Hall Road;	43	
5.1.15	Hall Road: 1.3Km North of intersection with Chapman Valley Road	45	
5.1.16	Hackett Road: 800m North of intersection with Chapman Valley Road;	47	
5.2	Conclusions	49	
6	Visual Management Objectives	51	
6.1.1	Proposed Visual Management Measures	51	
6.1.2	Recommendations and Monitoring Assessment Criteria	51	
7	APPENDIX A	53	

2 Introduction

EPCAD have been commissioned to study the landscape qualities of the site at Lot 80 & 82 Hackett Road, Waggrakine and to assess the visual implications of development at Wavecrest Estate, Geraldton. This study has been undertaken under the instruction of Humfrey Land Developments and briefing by Chappell Lambert Everett (Town Planners) in response to comments and broad boundaries laid out in the Draft Moresby Range Management Plan (September 2009) undertaken by the Shire of Chapman Valley, City of Geraldton Greenough.

EPCAD also acknowledges recommendations made in the Moresby Range Management Strategy (WAPC, August 2009).

2.1 Glossary of Terms Featured in this Report

EPCAD/The landscape architect: EPCAD Pty Ltd, Landscape Architects and Planners; Author of this report and conductor of this Visual Amenity Impact Assessment.

HLD/ Humfrey Land Developments: client for which this assessment was conducted for.

CLE/Chappell Lambert Everett: the project Town Planners and authors of the Preliminary Development Concept (Figure 2).

Wavecrest Estate, Geraldton/ The site/ The development site/ The proposed development site/ Wavecrest Estate: The site as identified on the Location Plan (Figure 1).

CoGG: City of Geraldton Greenough as the local government authority.

DEC: Department of Environment and Conservation.

NWCH: North West Coastal Highway

WAPC: Western Australian Planning Commission

3 Visual Landscape Evaluation

3.1 Scope and Context

Guidance for undertaking a Visual Landscape Evaluation is provided by the state planning authority, Department of Planning & Western Australian Planning Commission within *Visual Landscape Planning in Western Australia;2007* (VLPWA).

This study has been undertaken in accordance with the principles set out in the VLPWA using two methods;

- Site Survey by two Landscape Architects

- Desktop study of cartographic and photographic material

This initial study is to ascertain the local and district visual assets and characteristics and to evaluate the likely effects of development of any nature at the Moresby Heights Site within the context of the overall landscape, its character and values.

3.2 Site Description

3.2.1 Context

The Site as identified in *Figure 1: Wavecrest Estate Location Plan*, is found directly at the Western base of the Moresby Ranges and 2Km North of Chapman Valley Road. It is located due north-east of the Geraldton city centre, at a distance of 10 Km.

North West Coastal Highway runs parallel to the Moresby Ranges 2km from the western-most edge of the Development Site. With the existing Waggrakine Rural Residential area sited between.

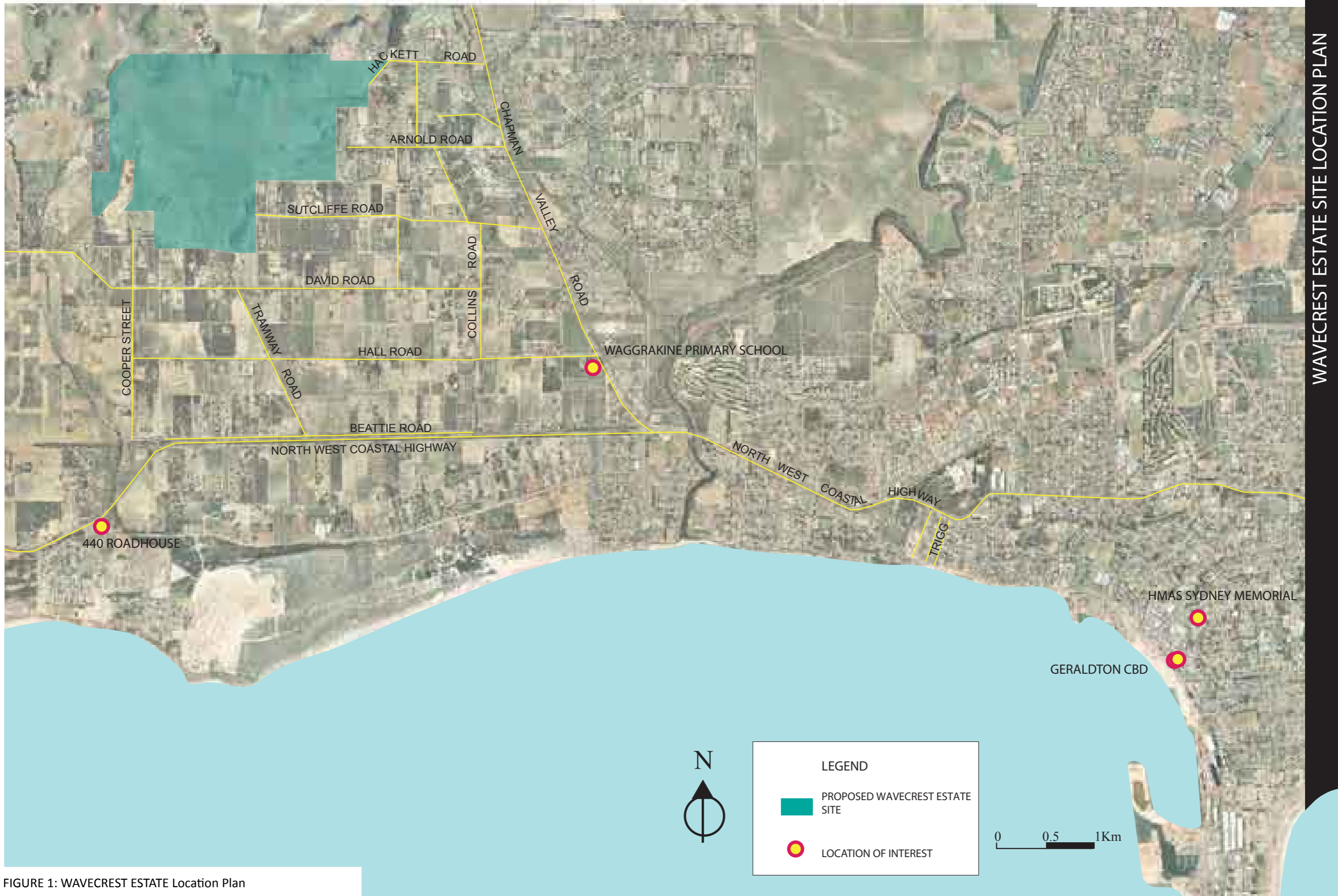


FIGURE 1: WAVECREST ESTATE Location Plan

3.2.2 Topography

Refer to *Figure 2: Wavecrest Estate Site Plan*.

The western boundaries of the site are located at an elevation of 75-95m above sea level. The ground rises gently upwards toward the base of the scarp across a distance of approximately 1.75 km, creating a long incline at on average 1:25 gradient.

The base of the scarp sits at between 140-160m above sea level. The scarp rises sharply upwards to 190-200m above sea level at a typical gradient of 1:1-1:2. The scarp produces a near-sheer face approximately 50m tall with exposed dark rock and scattered vegetation. This is the most prominent feature of the site.

The eastern-most portion of the site sits atop the Moresby Ranges at an elevation of 200m above sea level. The top of the Moresby Ranges is not flat, but instead, has a concave shape that is not clearly shown by 5m contour intervals.

Within the site there are several small features, including a shoulder that is prominent when viewed from within the site, but not prominent from outside the site. There are also two rocky knolls at the northern edge of the site. They are distinct when viewed from within the site and from nearby properties, but are difficult to distinguish when viewed from public roads due to immediate vegetation.



SITE PLAN
 LOT 80 & 82 HACKETT ROAD, WAGGRAKINE
 WAVECREST ESTATE
 CITY OF GERALDTON - GREENOUGH

REVISION: 18.09.09
 DATA: MAPS, LGR
 SCALE: 1:5000 (A1)
 PLAN NO.: 2118-07-01




TOWN PLANNING + URBAN DESIGN
 THE FIRM IS CURRENTLY REGISTERED AS A CONSULTING ENGINEER &
 ARCHITECTS UNDER THE PROFESSIONAL ENGINEERING ACT 1996

FIGURE 2: WAVECREST ESTATE Site Plan

3.2.3 Vegetation

The site is almost fully cleared of vegetation for farming purposes. The paddocks contain crops such as feed grasses and lupins that grow up to 50cm tall, but appear golden and dry most of the year.

Rows of windbreak trees dissect the site. These trees are affected by the prevailing winds and noticeably lean over. These trees are typically 3-5m tall with clear stems up to 1.5-2m below the canopy.

There are areas of remnant vegetation within the site as shown on *Figure 03: Site Features Plan*. These areas are generally degraded vegetation of a scrubby nature, growing to between 1 and 3m tall, or as groundcover species and introduced grasses. The variety of species is limited with between 5-10 tall/ upper canopy/ sheltering species across majority of the site.

An ephemeral wetland is found in the southern half of the site containing remnant vegetation, but generally degraded. Within the western corners of the development area larger pockets of remnant vegetation coincide with localised low points.

Generally the scarp within the property boundaries is not densely vegetated as is typical of the Moresby Ranges. The scarp has not been cleared of vegetation, however previous grazing of the scarp has degraded and eroded the existing vegetation. There are portions of the scarp that have been revegetated and areas of remnant vegetation, but these are generally considered to be of poor quality.

At the top of the Moresby Ranges small patches of remnant vegetation or revegetation are scattered along the western edge of the ridge. This vegetation is subject to strong prevailing winds and therefore are low growing scrubby species. These portions of vegetation are not always visible from the bottom of the scarp as they are set back from the edge. When they are visible they create a low skyline that does not detract from the horizontal nature of the top of the Moresby Ranges.

3.2.4 Drainage

Currently drainage across the site is predominantly overland runoff from the scarp. The nature of the topography and typical levels of rainfall have resulted in shallow channels that have eroded down across the site as shown in *Figure 03: Site Features*.

The sharp topography of the escarpment does not provide adequate growing conditions for plants, and seed stock and small plants are often washed away during high rainfall occasions. The lack of vegetation on the scarp face allows the overland water to flow faster, and leads to subsequent scarring down the face of the scarp.

An ephemeral dampland is located in the lowest area of the site. This supports an area of medium to tall vegetation, but typically does not have any visible surface water, except during high rainfall occasions.

3.2.5 Built Form

In the south eastern edge of the site an existing domestic building stands at the immediate base of the scarp. The existing building can be seen from limited locations where it is prominent in the landscape due to the colour of westward surfaces that do not blend with the surrounding vegetation and landscape.

The building is built on a low, limestone-block retaining wall. This building is occupied, and also has associated outbuildings.

Vegetation is kept clear from the building. There is an area of taller vegetation behind the house, that creates a backdrop to the light shades of the building, and also conceals the building from some viewpoints. Low trees planted along fence lines in front of the building do not conceal the building, but do conceal the retaining wall to some extent.

3.2.6 Adjacent Property

Properties adjacent to the site host a variety of activities and building types. Many properties are vegetated with informal plantings of local and introduced plant varieties to create a bushland setting. Other properties are cleared of trees and large scrub, and are used for agistment or hobby farming.

Large sheds are built on some properties for the storage of large vehicles (trucks, tractors etc) or for workshops. Sheds vary in colour and materials and can stand out visually in the landscape.

Most properties are separated by rural-style fences, post and wire with a barbed wire running along the top row. The fence typically runs down the centre of a maintained firebreak that is void of any vegetation. This is not visually obvious unless viewed from close proximity or from above in an elevated position (like on top of the scarp) or from an aerial photograph.

Some properties are more visual obtrusive than others, with lightly coloured buildings or with reflective surfaces. Properties with a large clearing around the building envelop are also more prominent in the landscape. Occasional mature palm trees (likely to have been planted 10-20 years ago) are also obvious in the landscape as they easily stand 10-15m above any local vegetation.

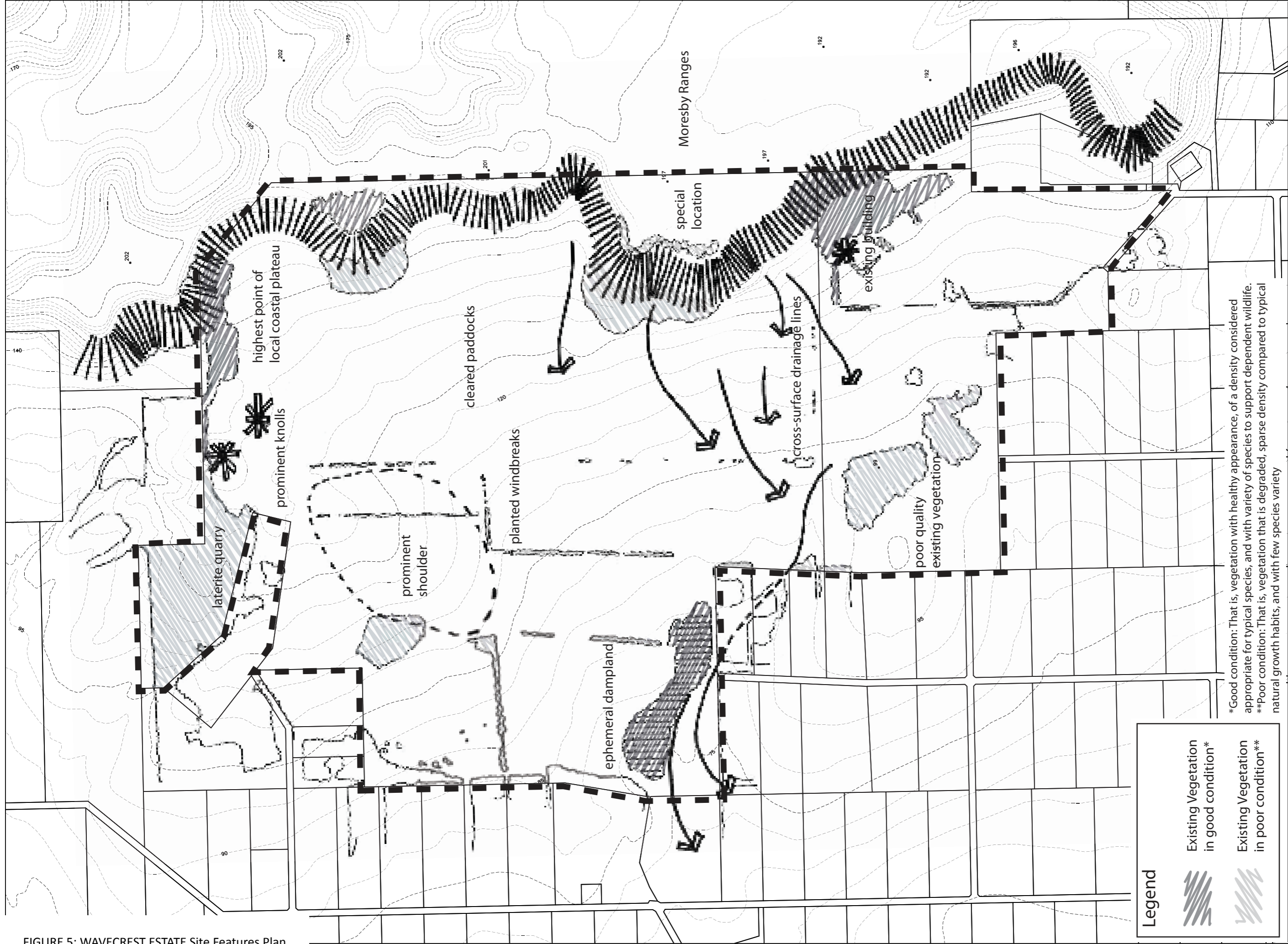
The figures opposite illustrate existing buildings that are lightly coloured and are very prominent in selected views, whilst those that are darker colours blend into the landscape, especially when viewed from a distance.



FIGURE 3: Existing adjacent dwelling with light coloured roof at base of scarp.



FIGURE 4: Dwellings and associated sheds with scarp in the background. View East from Hall Road.



Legend

- Existing Vegetation in good condition*
- Existing Vegetation in poor condition**

*Good condition: That is, vegetation with healthy appearance, of a density considered appropriate for typical species, and with variety of species to support dependent wildlife.
 **Poor condition: That is, vegetation that is degraded, sparse density compared to typical natural growth habits, and with few species variety

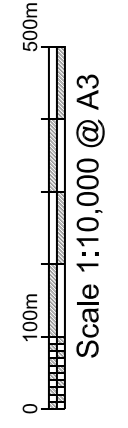


FIGURE 5: WAVECREST ESTATE Site Features Plan

3.2.7 Key Views and Viewing Locations

From within the site, panoramic views of the Geraldton coastline can be accessed from almost every location, over than low points and at the western and southern boundaries where immediate vegetation restricts views out of the site.

There are two particularly special viewing locations within the site.

The first special viewing location is in the north eastern corner of the site at the base of the scarp. Tucked into the elbow of the scarp, this location is the highest point of the local coastal plateau at 140m above sea level and allows panoramic views of the City of Geraldton, Point Moore, Geraldton Port, Drummonds Cove and the associated coastline, in excess of 15km in optimum conditions.

The second special viewing location is at the top of the Moresby Ranges. This location sites at a spot height of 197m above sea level and allows views to the Greenough River, Point Moore, The Fairway Marker and north to Buller River, as far as 20km in optimum conditions.

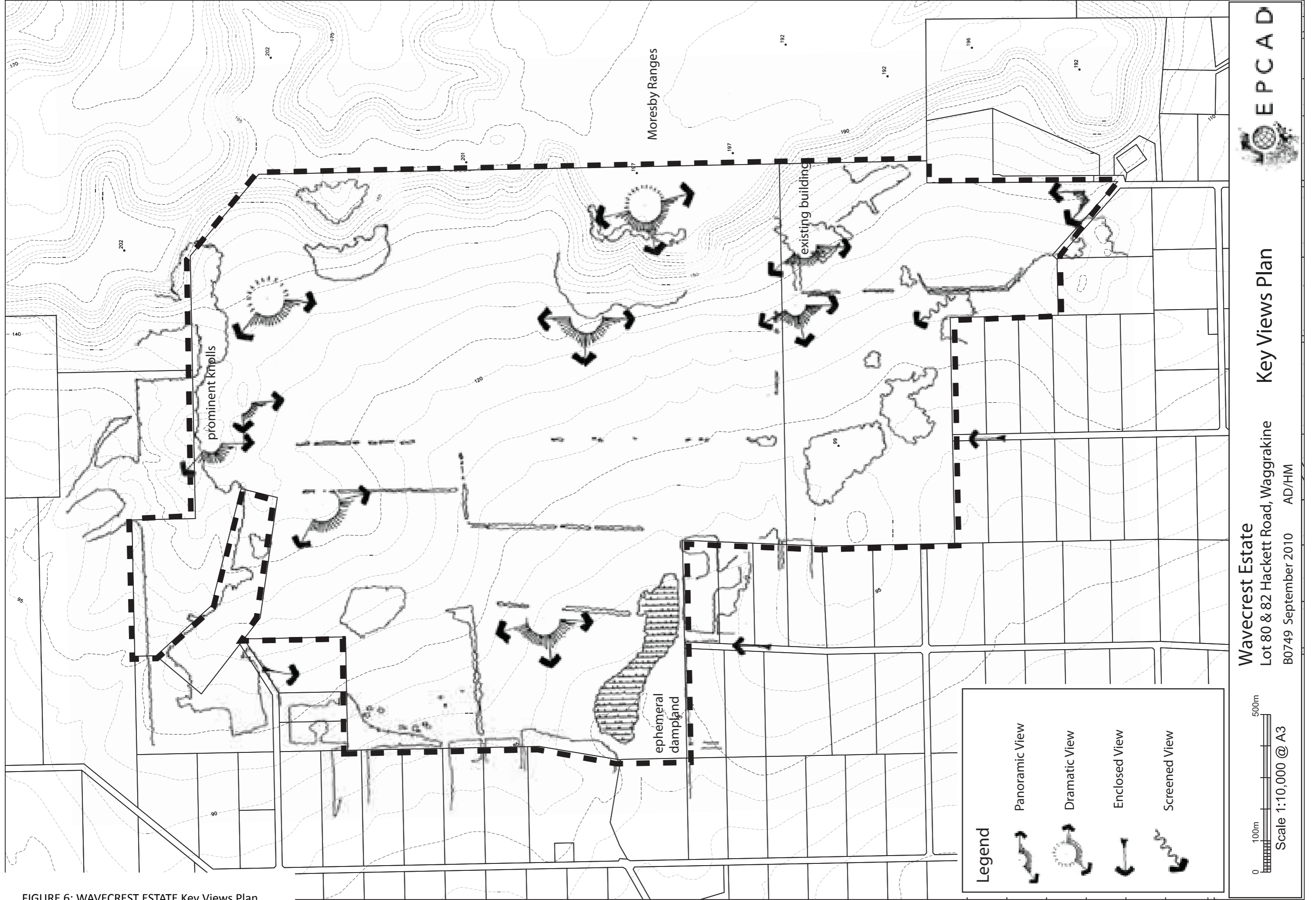
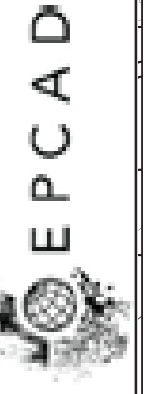


FIGURE 6: WAVECREST ESTATE Key Views Plan



Wavecrest Estate
 Lot 80 & 82 Hackett Road, Waggrakine
 B0749 September 2010 AD/HM

Key Views Plan

Scale 1:10,000 @ A3

3.3 District Landscape Area

3.3.1 District Landscape Character

The key landscape character of the Waggrakine and proposed Wavecrest Estate Areas are as follows;

A matrix of large lots separated by mature trees and shrubs;

Gently sloping land, generally down to the west; and

A visual mix of built form and vegetation.

3.3.2 Urban Development in the Landscape

The district surrounding the proposed development area has been subject to subdivision, however urban development is not a strong characteristic of the district landscape. There are individual urban-style buildings located on subdivided rural-residential lots. These buildings are not typically rural structures, quite often resembling suburban housing.

South of the subject land there is a combination of newly developed urban-form and well-established urban-form on opposing sides of Chapman Valley Road. The most distinguishing feature between the two urban forms is the prominence and abundance of tall trees and established back and front yard vegetation (especially upper-storey) within the established urban areas (averaging approximately 20 years old).

The divisive fencing is also prominent in the newly developed urban form. *Hardy Fencing* or *Super-6* has since been substituted with *colourbond neighbourhood friendly* fencing. Although a great colour variety is available, the density of lots constrains opportunities to grow screening vegetation between buildings and fences.

Rural Residential lots within the district have a diverse character with varied building styles and amounts of medium to tall vegetation. Most building envelopes are located in the centre of the lot, allowing for maximised buffering between homes, typically in the form of vegetation. Most driveways are aligned along maintained firebreaks and crossovers occur at the corner of the lot, rather than in the centre of the frontage of the lot.

3.3.3 Viewing Experience and Values: How is the Landscape Viewed

In publicly accessible locations the landscape character is experienced from roads. The roads and traffic conditions allow speeds of 60 to 110 kilometres-per-hour and typically do not host footpaths or Dual-Use paths. Pedestrian viewing is therefore not normal and views are generally obtained from vehicles.

The North West Coastal Highway (110 kilometre-per-hour) is flanked by dense vegetation and passengers within a vehicle are usually more likely to be looking westward towards the ocean and southward at views of Geraldton central and the Geraldton port.

Local roads within the Waggrakine Rural Residential area, allow speeds up to 70 kilometres-per-hour and traffic is typically local-only and mostly only light-vehicles (Cars and 4-wheel-drives). Views of the site can be achieved at very specific locations and only with intention of seeking out a view as the roads are typically flanked by dense vegetation to a height typically 2-7m. Where these specific views are possible, the foreground is occupied by existing buildings and vegetation. The site is almost always viewed from a distance, with the perimeter vegetation restricting views to internal areas.

There are no designated walking trails or tourist lookouts within the district from which the site can be seen.

The Sydney Memorial, is located within the centre of Geraldton and grants near 180° views from Point Moore (due West), Geraldton Marine Terrace (below, and stretching to the North-west), Bluff point to Drummonds Cove (due North) and the full length of the Moresby Ranges (as covered within the Moresby Range Management Plan Draft September 2009). The site is located 10km (as the crow-flies) from the Sydney Memorial.

From the Sydney Memorial the site is not easily identified within the greater landscape context. Development on the site would not be prominent if visual management measures and guidelines are in place. The distance of the site is such that only a very small area of the site can be seen and this is the scarp which is not proposed to be subdivided.

5 Visual Impact Assessment

5.1 The Proposed Development

This assessment has been undertaken prior to the development concept in order to outline the opportunities and constraints for planning and design at the site.

5.2 Likely Changes in the Landscape

Landscape is not a static amenity and the local character is continuously changing and has evolved in response to mans actions in the area.

The likely changes described here are based on professional opinion and based on development of varying nature and scale. It is also anticipated that the recommendations made at the end of this report will be undertaken to ensure any visual changes occurring at a district level are minimised.

5.2.1 Anticipated Short Term Effects

Initially the site will remain similar to its current state and relatively indistinct from adjacent property. During construction portions of the site may become more visible from viewpoints until buildings are completed (in accordance with colour and material recommendations and guidelines).

During the initial stages of development the site will host various activities associated with development and construction of infrastructure such as roads. The movement of construction vehicles may be more obvious than any other activity as they are brightly coloured for safety purposes. In these circumstances the site may be more visually obvious when viewed from close proximity and more easily discernable from the distant views. However, these views are at a distance of up to 10 kilometres and will typically be a very small part of a large expansive panorama view and are unlikely to be discernable when viewing the broader landscape.

Works associated with construction would be staged, driven by financial implications, workforce availability, property sales releases and design documentation by project consultants.

The scarp will be largely unchanged. Lower areas of the scarp may be revegetated by seed and planting of small tubestock. These will germinate and grow over several years before being visible from distant views.

Preliminary street lighting may be visible at night, until such a time as recommended street tree vegetation grows to maturity.

5.2.2 Anticipated Mid-Term Effects

During the mid-life of the development the site will be partially built-out and partially undergoing construction at various stages. A proportion of the site will be developed with dwellings. The majority of roads and other infrastructure will be installed. Trees and vegetation planted within the initial stages of works will be more mature, and will begin to screen built form and infrastructure. The introduction of new vegetation in the area is likely to result in a change of texture over the area of the site from un-vegetated farmland to vegetated development. Incremental buildings and structures combined with new street tree planting are

likely to be seen but typically from a distance of 5-10km and only in the context of other existing development.

The scarp will remain largely unchanged, other than lower areas where revegetation will mature.

5.2.3 Anticipated Long-Term Effects

The growth of trees will aid to screen built form at Moresby Heights from most viewpoints in the district. The site will constitute a small portion of the greater landscape and panorama when viewed from tourist viewpoints including the Sydney Memorial.

When viewed from specific locations along nearby roads roofs could be prominent if colours are not restricted to those that relate to the local landscape.

There is likely to be textural changes of the view resulting from planted vegetation and roof materials within the development site. These changes are unlikely to be detrimental to the experience of the viewer. Revegetation will be associated with Public Open Space throughout the development area and parts of the Moresby Scarp and lower slopes.

6 Key Locations & Assessment of Changes

6.1 Scope

The following chapter assesses locations along public and tourist routes, at key tourist locations and at areas where the viewer is most likely to be able to see the development area at the proposed Wavecrest Estate.

Comments and assessments are based on experience and professional opinions and refer to the possible impact, and ability to lessen the impact of any development at Moresby Heights on the visual qualities and characteristics of the district landscape.

Note: "Panorama #a" refers to the colour photograph image, whilst "Panorama #b" refers to the black & white annotated duplicate image.

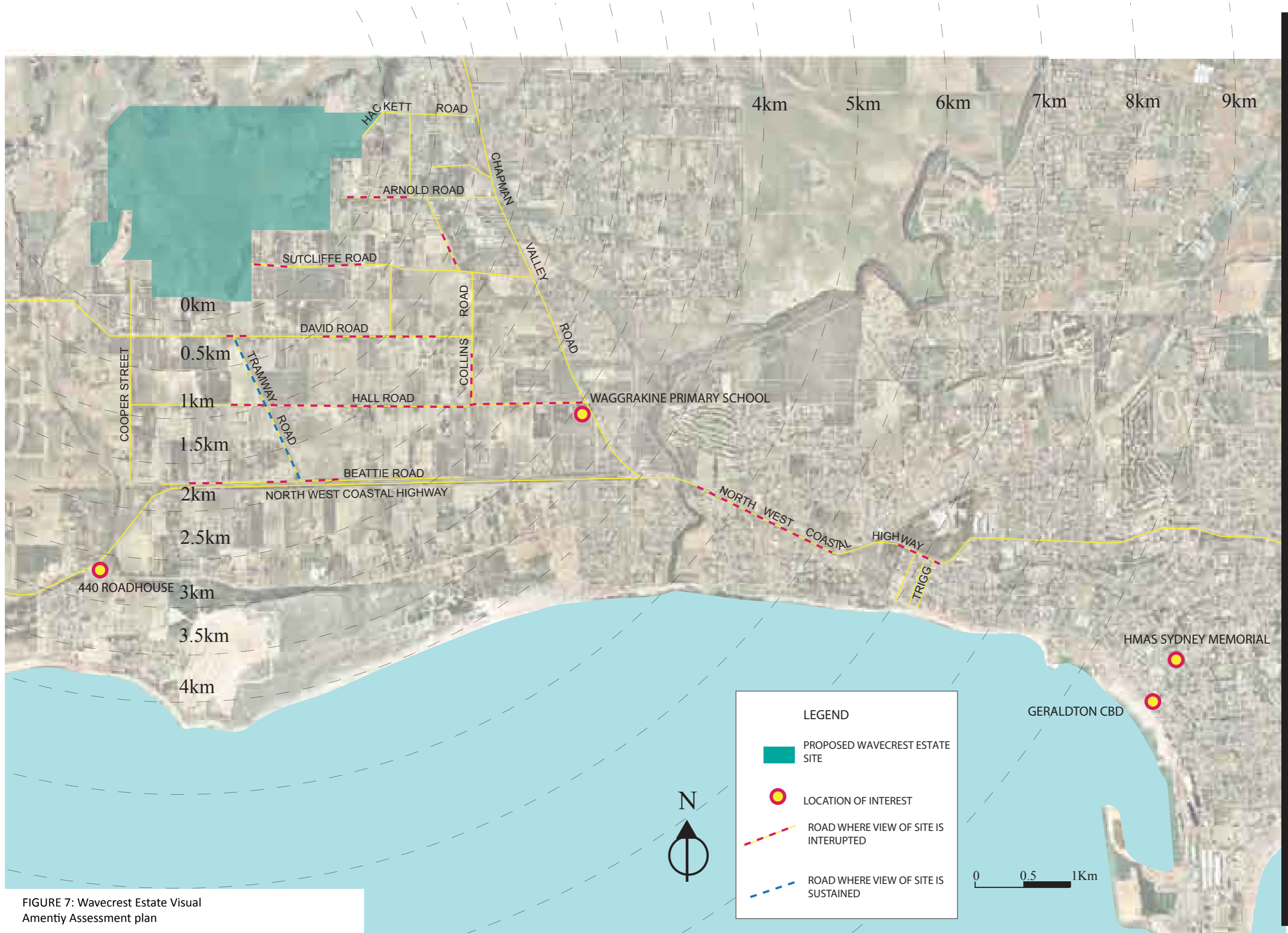


FIGURE 7: Wavecrest Estate Visual Amenity Assessment plan

6.1.1 **Sydney Memorial Lookout Geraldton;**

6.1.1.1 **The key characteristics of this viewpoint are;**

- The scale of the sky and clouds;
- The rooftops and buildings;
- The distant landform forming the horizon; and
- Elements in the immediate foreground associated with the memorial (walls, paths, planting etc.).

6.1.1.2 **Other important features of this view are;**

- Monotone colours and textures of vegetation when viewed from this distance;
- Existing suburban form that is an accepted component of the view; and
- The communications aerials above the site are barely discernable from this distance.

6.1.1.3 **Changes likely to occur in this view are;**

- A pocket of low density development proposed at Wavecrest Estate will hardly be visible from this distance of 10km. If the viewer is intending to view the site it may appear as a very small portion of the larger view, as a variation in texture to the surrounding landscape;
- Any built form, infrastructure or human activity that occurs on top of the scarp may be visible at certain instances;
- Planting and revegetation works on the face of the scarp may be visible from this distance as a change in texture and colour compared with the degrading existing landscape under enabling light conditions.

6.1.1.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings;
- Align roads to ensure that they do not bisect slopes or expose large faces of un-vegetated earth;
- Further visual assessment of detailed design should occur in relation to any built form, infrastructure or human activity that occurs on top of the scarp; and
- Ensuring that all roof surfaces are coloured to blend with the surrounding landscape with dark shades.



FIGURE 8b: Sydney Memorial Lookout



FIGURE 8a: Sydney Memorial Lookout

6.1.2 **North West Coastal Highway: Northbound at Trigg Street;**

6.1.2.1 The key characteristics of this viewpoint are;

- The road itself, with frequent vehicles travelling at 60 Kilometres-per-hour;
- The overhead powerlines within the road reserve; and
- The corridor created by tall trees and fencelines.

6.1.2.2 Other important features of this view are;

- The portion of Ranges visible at a distance of 9Km;
- Existing suburban infrastructure; and
- Other road users including light to heavy vehicles.

6.1.2.3 Changes likely to occur in this view are;

- Development proposed at Wavecrest Estate is not likely to be visible due to existing vegetation and structures;
- Built form and/or associated infrastructure (vehicular or pedestrian access route) on top of the scarp may be visible at certain instances, eg. a windscreen may reflect the sun causing an instantaneous flash in the distance; and
- Planting and revegetation works on the face of the scarp may be visible from this distance as a change in texture and colour compared with the degraded existing landscape.

6.1.2.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings;
- Align roads (especially tourist route to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated earth;
- Further visual assessment of detailed design should be undertaken with regards to any activity or built form proposed on top of the scarp; and
- Roof surfaces should be coloured to blend with the surrounding landscape in dark shades.



FIGURE 9b: NWCH intersection with Trigg Street



FIGURE 9a: NWCH intersection with Trigg Street

6.1.3 **North West Coastal Highway: Northbound at Railway Street;**

6.1.3.1 The key characteristics of this viewpoint are;

- The road carriageway and associated light poles;
- The frequency of intersections and traffic hazards along this stretch of road, travelling at 60-70 kilometres-per-hour; and
- The broad, flat shape of the Moresby Ranges;

6.1.3.2 Other important features of this view are;

- Existing suburban infrastructure;
- Texture and colour variations on the escarpment at 8Km; and
- Existing vegetation between 3-7m and as high as 12-18m along the verge reserve.

6.1.3.3 Changes likely to occur in this view are;

- Urban development proposed at Wavecrest Estate may be visible behind the existing and recommended street vegetation at a distance of 8Km;
- Built form and associated infrastructure (vehicular or pedestrian access route) may be visible on top of the Moresby Ranges; and
- Planting and revegetation works at the base of the scarp will be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.3.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Align roads to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in relation to any built form or infrastructure that is proposed on top of the Moresby Ranges or lower slopes of the scarp;
- Situate any built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 10b: NWCH intersection with Railway Street



FIGURE 10a: NWCH intersection with Railway Street

6.1.4 Northbound North West Coastal Highway from Railway Street to Beattie Road

(Not photographed due to traffic speed, and that views are only taken from travelling vehicles)

Glimpses of the Moresby Ranges and the Development Site can be seen from the highway travelling at speeds between 60 and 110 Kilometres-per-hour. These views are typically short and can only be sustained for a length of 100m at the most between stretches of verge-side vegetation and low-density urban development.

As the viewer travels further from Geraldton, past Chapman Valley Road intersection, the viewing lengths are shortened to brief moments between spaces in roadside vegetation 3-8m tall. The dense vegetation restricts views of the Moresby Ranges and also restricts immediate views into the adjacent Waggrakine Rural-Residential Area.

When the viewer can see the Moresby Ranges they are usually looking at the top of the ranges and the smooth table-top shape, or the scarp face that is illuminated at the end of the day. The viewer is rarely looking for the existing lightly coloured buildings that protrude from areas of dark vegetation and therefore these areas are considered a part of the view but not a key characteristic.



This page is intentionally clear

6.1.5 **440 Roadhouse: North West Coastal Highway;**

6.1.5.1 The key characteristics of this viewpoint are;

- The expanse of bitumen associated with the service station; and
- The dense mid-level vegetation at a height of 3-7m tall;

6.1.5.2 Other important features of this view are;

- Signage and elements of the service station display characteristics associated with urban development; and
- The two-lane highway carrying light to very-heavy vehicles at speeds up to 110kilometres-per-hour.

6.1.5.3 Changes likely to occur in this view are;

- A pocket of urban development proposed at Wavecrest Estate may be visible at precise locations behind the existing vegetation at a distance of 3Km;
- Built form and especially associated infrastructure (vehicular or pedestrian access route) may be visible on top of the ranges; and
- Planting and revegetation works at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.5.4 Measures advised to reduce visual impact on this view are;

- Vegetate lateral road reserves with species that grow to between 4-8m minimum;
- Minimise reflective materials used in buildings and private development;
- Align roads (especially any tourist route to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in relation to any proposed development on top of the Moresby Ranges;
- Situate any built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 11b: 440 Roadhouse, NWCH



FIGURE 11a: 440 Roadhouse, NWCH

6.1.6 **440 Roadhouse Exit: North West Coastal Highway;**

6.1.6.1 The key characteristics of this viewpoint are;

- The road carriageway that disappears into the adjacent vegetation and corners, also the associated approaching vehicles at 100 kilometres-per-hour;
- The expanse of sky above the horizon created by the Moresby Ranges; and
- The rural character and lack of buildings in the immediate vicinity;

6.1.6.2 Other important features of this view are;

- Existing mid-level vegetation between 3-7m tall;
- Clear view of the Moresby Ranges and development area at a distance of 3Km that is more prominent under optimum light conditions; and
- The stretch of highway that enters into a corridor of verge-side vegetation.

6.1.6.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate may be visible from this location at a distance of 2-3Km;
- Any built form and associated infrastructure (vehicular or pedestrian access route) may be visible at the top of the ranges; and
- Planting and revegetation works at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.6.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves within the development area with species that grow to between 4-8m tall as a minimum;
- Align roads (especially to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in relation to any proposed development on top of the Moresby Ranges;
- Situate any built form and associated infrastructure back from the edge of the escarpment; and
- roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 12b: 440 Roadhouse Exit, NWCH



FIGURE 12a: 440 Roadhouse Exit, NWCH

6.1.7 **Beattie Road: Waggrakine Rural-Residential Area**

6.1.7.1 The key characteristics of this viewpoint are;

- The ridgeline is important as a backdrop to this rural scene;
- The expanse of sky;
- The very flat topography of the local landscape;
- The existing buildings and activity in the foreground; and
- Mid-level vegetation behind the buildings forms a dense definition of the boundary;

6.1.7.2 **Other important features of this view are;**

- Lack of vegetation within the verge-reserve enables clear view into and through this private property;
- The scale of this building is associated with light-industrial or rural uses, rather than rural-residential; and
- Existing buildings with white or lightly coloured surfaces do not blend with colours of vegetation or landscape.

6.1.7.3 **Changes likely to occur in this view are;**

- The low-density development proposed at Wavecrest Estate is not likely to be visible from this exact location due to the existing buildings and rural infrastructure;

6.1.7.4 **Measures advised to reduce visual impact on this view are;**

- There is not likely to be any visual impact as the site is not visible from this particular location.



FIGURE 13b: Beattie Road



FIGURE 13a: Beattie Road

6.1.8 **Intersection of Beattie Road and Tramway Road;**

6.1.8.1 The key characteristics of this viewpoint are;

- The road carriageway that is long, straight and flat;
- The expansive sky above the Moresby Ranges;
- The dense verge-side vegetation and pockets of pastoral land-use; and
- The framed view of the Moresby Ranges scarp and its texture and vegetation of the site at a distance of 2-3km. (See Figure 13c)

6.1.8.2 Other important features of this view are;

- Existing buildings with white or lightly coloured surfaces can be seen across the middle-ground of the panorama;
- This road is typically used by local traffic; and
- Vision into adjacent properties is restricted by verge-side vegetation to 3-5m height.

6.1.8.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of 2-3Km;
- Built form and associated infrastructure (carpark) may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible at this location; and
- Any future planting and revegetation works on the face and at the base of the scarp are very likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.8.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves within the development area with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur in relation to any development on top of the Moresby Ranges
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.

FIGURE 14b: Intersection Beattie Road and Tramway Road

WAVECREST ESTATE



FIGURE 14c: Zoomed view focusing on the development site

FIGURE 14a: Intersection Beattie Road and Tramway Road



6.1.9 **Tramway Road;**

6.1.9.1 **The key characteristics of this viewpoint are;**

- The expanse of sky above the distant Moresby Ranges;
- The long, flat carriageway that continues into the distance;
- The corridor created by verge-side vegetation; and
- The framed view of the Moresby Ranges scarp and its texture and vegetation of the site at a distance of approximately 2km. (see Figure 14c)

6.1.9.2 **Other important features of this view are;**

- Existing buildings with white or lightly coloured surfaces can be seen across the middle-ground of the panorama;
- This road is typically used by local traffic; and
- Vision into adjacent properties is restricted by verge-side vegetation to 3-5m height.

6.1.9.3 **Changes likely to occur in this view are;**

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 2Km;
- Built form and associated infrastructure (carpark) may be visible atop the ranges;
- Vehicular access to the top of the scarp may be visible at this location; and
- Any future planting and revegetation works on the face and at the base of the scarp are very likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.9.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves within the development area with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially any route to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur in relation to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.

FIGURE 15b: Tramway Road



FIGURE 15c: Zoomed view focusing on the development site

FIGURE 15a: Tramway Road



6.1.10 **Intersection of Tramway Road and David Road;**

6.1.10.1 The key characteristics of this viewpoint are;

- The rural, semi-degraded infrastructure (fence and overhead power pole)
- The verge-side vegetation; and
- The vegetation within the immediate private lot;

6.1.10.2 Other important features of this view are;

- The firebreak behind the fence-line delineates the property, but when travelling along the road at 70 kilometres-per-hour the viewer will hardly see into the property through the verge-side vegetation
- Glimpses of the ranges are barely discernable through the tops of the immediate vegetation; and
- Apart from the local road there is no visible habitation in this view.

6.1.10.3 **Changes likely to occur in this view are;**

- A pocket of low-density development proposed at Wavecrest Estate will not be visible from this location due to the density of immediate vegetation.

6.1.10.4 **Measures advised to reduce visual impact on this view are;**

- There is not likely to be any visual impact as the site is not visible from this particular location.



FIGURE 16b: Intersection of Tramway Rd and David Rd



FIGURE 16a: Intersection of Tramway Rd and David Rd

6.1.11 David Road;

6.1.11.1 The key characteristics of this viewpoint are;

- The cleared land in the foreground for rural/agricultural purposes;
- Mid-level vegetation creates a band across the middle of the image;
- An existing building with a lightly coloured roof at one side of the view; and
- The expanse and scale of the sky.

6.1.11.2 Other important features of this view are;

- Existing vegetation between 3-10m along the edges of this particular property create the mid-level band;
- The property gateway; and
- This road is typically used by local traffic.

6.1.11.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 1Km, buildings on lower elevations are less likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible at this location; and
- Future planting and revegetation works on the face of and at the base of the scarp are very likely to be visible from this distance as a change in texture and colour compared with the degrading existing landscape.

6.1.11.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should be undertaken with regards to any development proposed on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 17b:David Rd



FIGURE 17a: David Rd

6.1.12 **Suttcliffe Road: 800m North of intersection with Drabble Road;**

6.1.12.1 **The key characteristics of this viewpoint are;**

- The horizontal landscape;
- The unimpeded skyline (other than vegetation);
- The lack of built form within this view;
- Low to medium height broken vegetation on either side of the road;
- The road that disappears over a low ridge in 80m from this location; and
- The expanse and scale of the sky.

6.1.12.2 **Other important features of this view are;**

- The overhead power line and power poles that continue into the mid-ground;
- The cleared land in the distance for rural/agricultural purposes;
- The line of trees just below the horizon in the distance;
- This road that is typically used by local traffic; and
- The view 90° to the left is of the Indian Ocean. (see Figure 17c)

6.1.12.3 **Changes likely to occur in this view are;**

- The low-density development proposed at Wavecrest Estate will be visible from this location;
- This road may be extended into the development area as one of the main entry routes for proposed local traffic; and
- Future planting of street trees will be introduced to this view.

6.1.12.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially any route to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should be undertaken in regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 18b:Suttcliffe Rd



FIGURE 18a: Sutcliffe Rd



FIGURE 18c: View 90° to the left of the Indian Ocean

6.1.13 **Waggrakine Primary School Kiss & Ride: Hall Road;**

6.1.13.1 **The key characteristics of this viewpoint are;**

- The flat cleared land in the foreground for agricultural purposes;
- The scale of the sky that is not impeded by any human intervention; and
- The strong presence of urban structures, especially the pocket of urban development within 500m to the right-hand-side of the panorama.

6.1.13.2 **Other important features of this view are;**

- Small groups or clumps of existing vegetation in the immediate view;
- The Moresby Ranges that form the horizon at a distance of 2-3km; and
- Existing building with a stand of tall vegetation to the left-hand-side of the view.

6.1.13.3 **Changes likely to occur in this view are;**

- A pocket of urban development proposed at Wavecrest Estate may be visible from this location at a distance of approximately 2-3km, development on lower elevations are not likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges; and
- Future planting and revegetation works on the face and at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing rural landscape.

6.1.13.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 19b:Waggrakine Primary School Kiss&Ride



FIGURE 19a:Waggrakine Primary School Kiss&Ride

6.1.14 Lot 267 Hall Road;

6.1.14.1 The key characteristics of this viewpoint are;

- The expansive sky above the horizon created by the Moresby Ranges;
- The existing cleared land in the foreground for agricultural uses;
- The agricultural/rural landscape infrastructure (eg. Fences, gates and sheds) and
- The band of mid-level vegetation;

6.1.14.2 Other important features of this view are;

- Existing buildings with lightly coloured surfaces scattered throughout the middle-ground;
- The communications towers are visible atop the Moresby Ranges;
- This road is typically used by local traffic; and
- The Moresby Ranges form the horizon at a distance of 2-3km.

6.1.14.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 1-2Km, development on lower elevations are not likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible from this location; and
- Future planting and revegetation works on the face and at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.14.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Recess all Eastward windows and/or extend eaves from buildings;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur with regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 20b:Lot 267 Hall Road



FIGURE 20a: Lot 267 Hall Road

6.1.15 **Hall Road: 1.3Km North of intersection with Chapman Valley Road**

6.1.15.1 **The key characteristics of this viewpoint are;**

- The expansive sky above the Moresby Ranges;
- The band of mid-level vegetation;
- The existing cleared land in the foreground for agricultural uses; and
- The agricultural/rural landscape infrastructure (eg. Fences).

6.1.15.2 **Other important features of this view are;**

- Along Hall Road views of the site can be achieved in particular positions along stretches of up to 100m long due to existing verge-side vegetation. This view shows the existing rural-residential development which will be viewed in the foreground when viewing the proposed development site.

6.1.15.3 **Changes likely to occur in this view are;**

- The proposed low-density development will be visible from this location at a distance of 500m;
- The bitumen road surface will be extended into the development, rather than changing to gravel road surface within 60m of this location;
- Further vegetation will supplement existing vegetation patterns and banding;
- Built form and its users on top of the Moresby Range may be visible from this location, depending on the position in relation to the edge of the table-top. Vehicular access route to the top of the Moresby Ranges would not be visible from the location; and
- The proposed low-density development is not likely to introduce any elements that are not already a part of this view.

6.1.15.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Recess all West-facing windows and/or extend eaves from buildings;
- Vegetate road reserves with species that grow to between 4-8m (minimum) in height;
- Further visual assessment of detailed design should occur in regards to development on top of the Moresby Ranges; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 21b:Hall Road



FIGURE 21a: Hall Road

6.1.16 **Hackett Road: 800m North of intersection with Chapman Valley Road;**

6.1.16.1 The key characteristics of this viewpoint are;

- The expansive sky;
- The sudden rise of the Moresby Range;
- The agricultural/rural landscape infrastructure (eg. Fences, gates and sheds); and
- The band of mid-level vegetation;

6.1.16.2 Other important features of this view are;

- Existing buildings with lightly coloured surfaces;
- The existing cleared land in the foreground for agricultural uses; and
- The expansive scale of the sky.

6.1.16.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 1-2Km, development on lower elevations are not likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible from this location; and
- Future planting and revegetation works on the face and at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.16.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Recess all West-facing windows and/or extend eaves from buildings;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur in regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



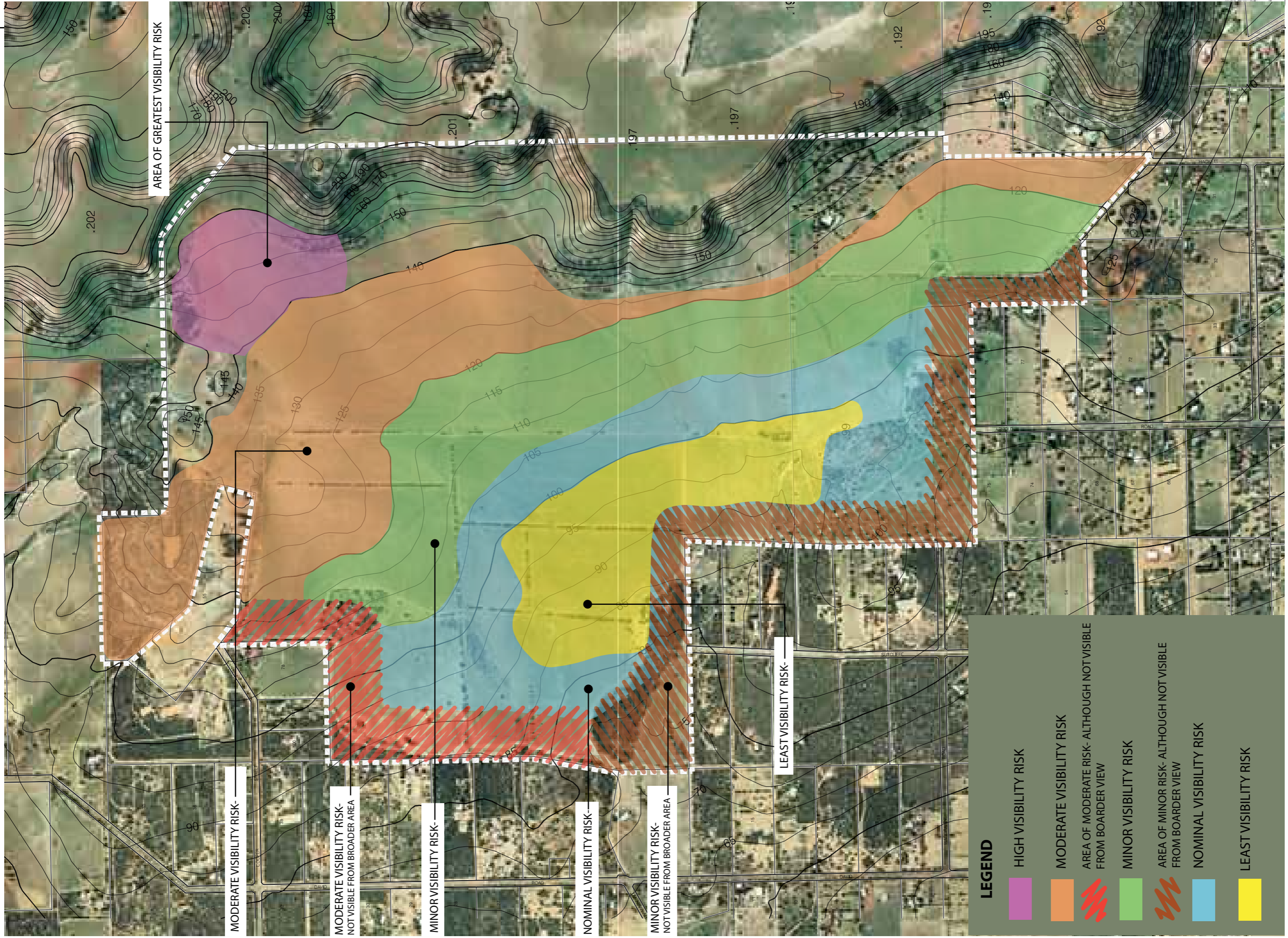
FIGURE 22b:Hackett Road



FIGURE 22a: Hackett Road

6.2 Conclusions

- The site is seen from many areas but only at a distance and where the site is a minor component of a broader extensive view;
- The Development Site can be seen from a number of specific locations along local roads within 2-3km of the Development Site by local traffic users, tourists do not typically use these roads;
- The existing landscape character includes many structures and from viewing points of 3-10 km distance, low-density development at Wavecrest Estate will not introduce an element that does not already exist. Nor does low-density development at Moresby Heights create a feature that will be prominent or dominant in these views;
- The proposed development does not break the skyline created by the Moresby Ranges from any key view; and
- The siting and design of any development (tourist or otherwise) on top of the Moresby Ranges or at the immediate base of the scarp will require detailed analysis of the design to ensure that the construction and location of elements including roads, paths and built form will not be prominent in the overall view.
- The subject site is not prominent in the broader landscape and if developed, taking into consideration proposed visual management measures (refer to Items 7.2.1.1 and 7.2.1.2) urban development in this location will be integrated within the contextual landscape and will not be an obtrusive element, and thus preserving public views of the scarp.



LEGEND

- HIGH VISIBILITY RISK
- MODERATE VISIBILITY RISK
- AREA OF MODERATE RISK- ALTHOUGH NOT VISIBLE FROM BOARDER VIEW
- MINOR VISIBILITY RISK
- AREA OF MINOR RISK- ALTHOUGH NOT VISIBLE FROM BOARDER VIEW
- NOMINAL VISIBILITY RISK
- LEAST VISIBILITY RISK

WAVECREST ESTATE
 LOT 80 & 82 HACKETT ROAD, WAGGRAKINE
 CITY OF GERALDTON - GREENOUGH

VISIBILITY RISK ASSESSMENT

NOTE: THIS ILLUSTRATION SHOWS APPROXIMATE AREAS OF SENSITIVITY TO VISUAL CHANGE WHEN VIEWED FROM PUBLICLY ACCESSIBLE LOCATIONS.

REV B. 29.10.10
 OCTOBER 2010
 SCALE: 1:5000 @ A1



FIGURE 23: WAVECREST ESTATE Visibility Risk Assessment

7 Visual Management Objectives

The most important aspect of the district landscape character is the integrity of the skyline defined by the Moresby Ranges.

On this basis the development objectives at Wavecrest Estate are;

- Integration of development within the broader landscape character;
- Maintaining an uninterrupted skyline of the Moresby Range when viewed from the west; and
- Preserving the character of the scarp (in topography, vegetation and specifically the skyline).

7.2.1 Proposed Visual Management Measures

7.2.1.1 Landscape Response

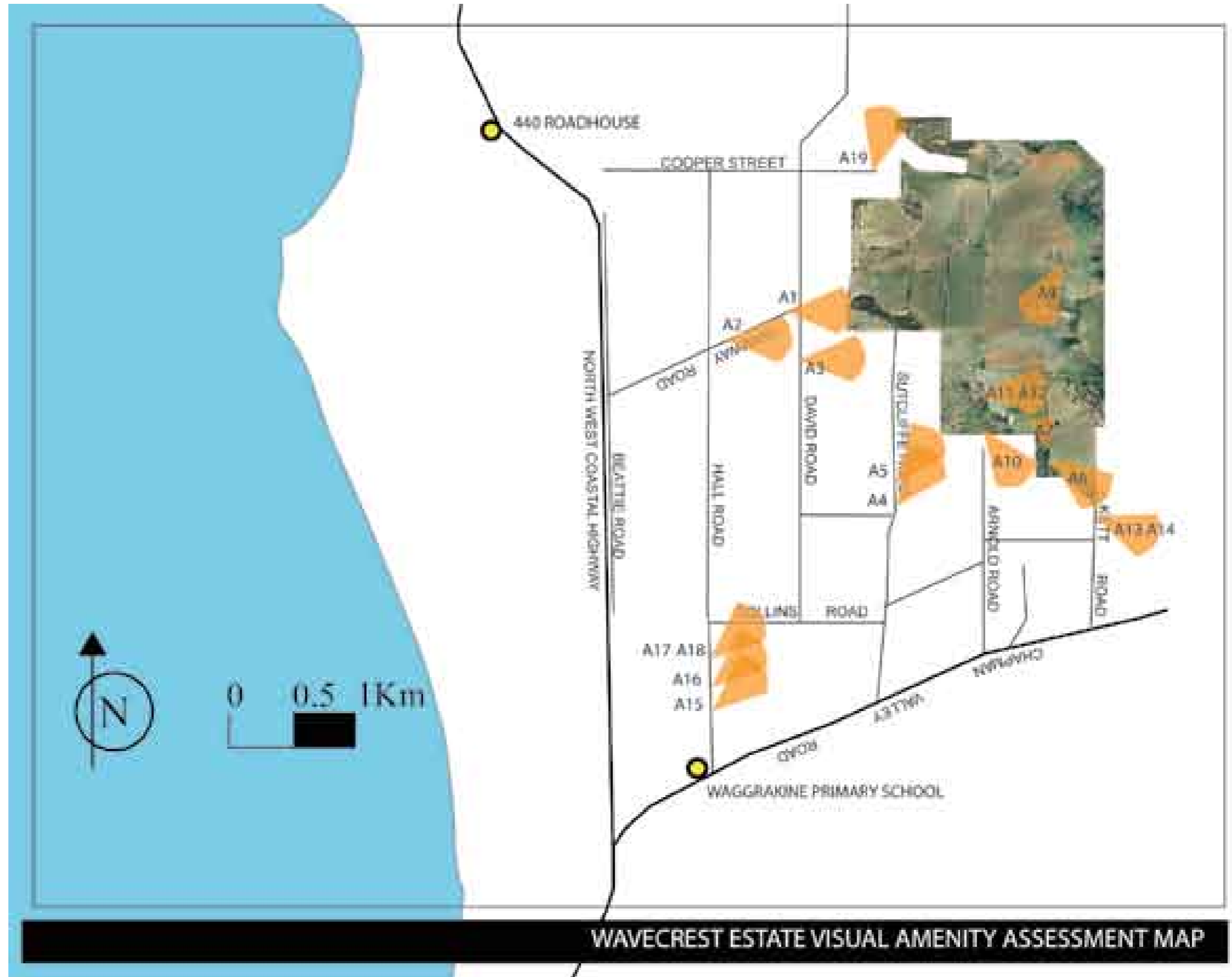
- Vegetation should be retained inside the development site within public open space, verges and private properties where possible to maintain as much mature vegetation and canopy as possible.
- Street tree planting of trees along all new roadsides within the development will reduce the visibility of roads and road-users from viewpoints outside of the development site.
- Where possible local plant species should be used or plant species with similar colour and textural characteristics as local plant species within the public open space and street landscape proposals.
- Promotion of local tree and shrub species-use by residents within the development site will reduce contrasts between existing vegetation adjacent to the development site and new or introduced vegetation within the development site.
- Revegetation of the scarp will generate a change to the visual character, however the environmental benefits outweigh the visual change. The visual change caused by revegetating the degraded slopes is not considered to be detrimental to the visual landscape experience.

7.2.1.2 Development Response

- Secure the escarpment as Open Space.
- Detailed design of development on top of the scarp (tourist or otherwise) should be assessed to ensure visual integration and appropriate siting.
- More intensive or dense development should be focused on areas of lesser visual risk within the site (refer to figure 23).
- Larger lot sizes should be designed in higher areas of the site.
- Roads should be aligned so as not to transect slopes or expose un-vegetated rock face. Detailed design of access to the top of the scarp will require assessment to ensure visual intergration and appropriate siting.
- Formulate effective building design guidelines that address the following aspects;
 - Building materials should be non-reflective,
 - Facade colours of buildings should be selected from a palette of local landscape colours to reduce contrasts with existing and proposed vegetation,
 - Minimise light colours (especially white) and restrict primary colours,
- To ensure that the development fits into the local and district landscape character and to ensure that no buildings are seen as dominant in the landscape Building Requirements must address the following at such a time that Building Approval is assessed and granted;
 - Roof colours of all built form and structures within the development site will be darkly coloured to minimise contrast with existing vegetation;
 - Any built form within the northern and southern edges of development must have facade colours that are selected from a palette of dark and muted local landscape shades.
 - All windows are to either feature over-hanging eaves or be recessed into walls.

7.2.2 Recommendations and Monitoring Assessment Criteria

These visual management objectives should be reviewed on a two-yearly basis during construction phases, and any changes to the recommendations should be made accordingly.



WAVECREST ESTATE VISUAL AMENITY ASSESSMENT MAP



Figure A1: P1020244.jpg
20m East of Tramway Rd + Hall Rd Intersection



Figure A2: P1020248.jpg
20m West of Tramway Rd + David Rd Intersection

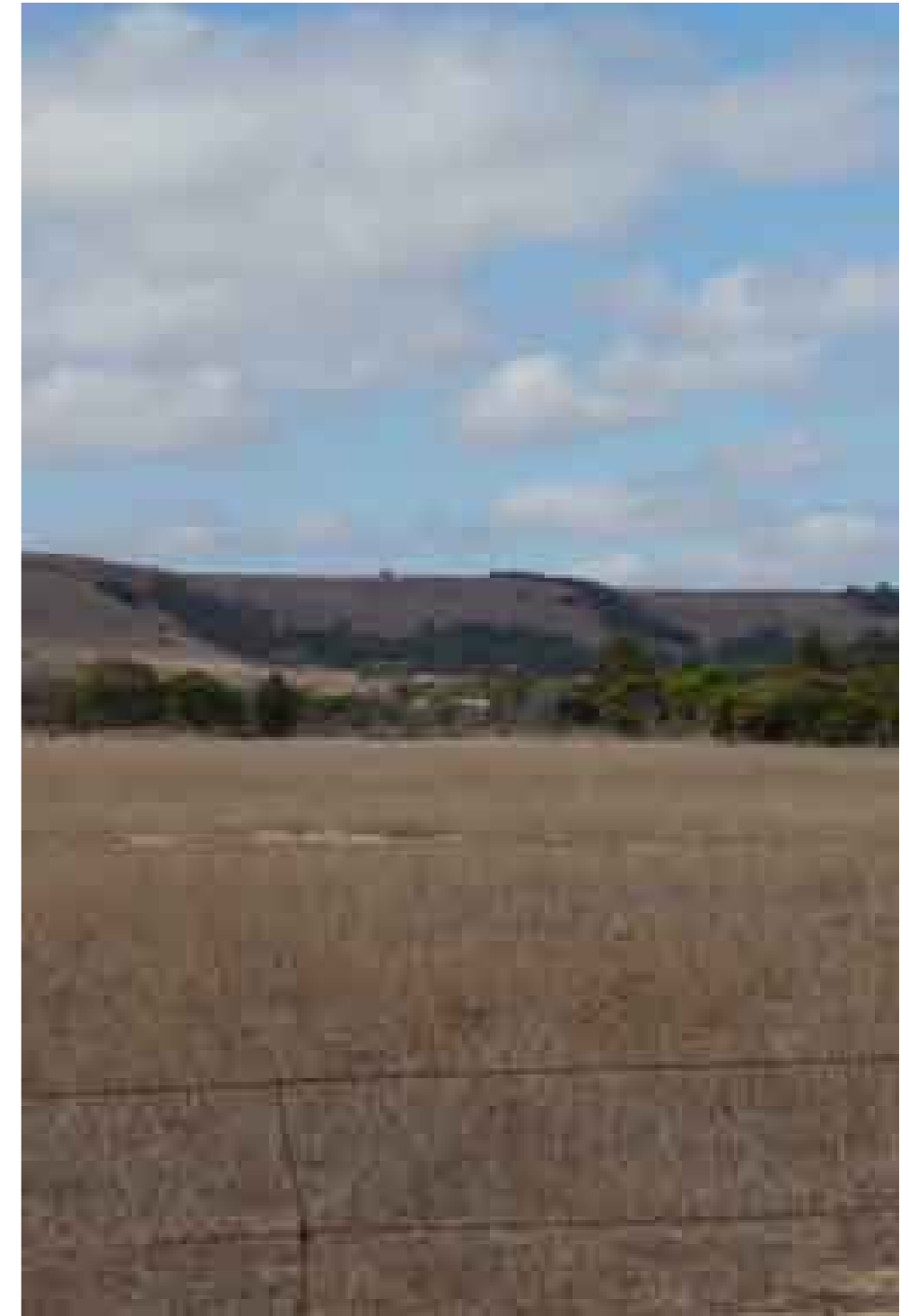


Figure A3: P1020255.jpg
David Road: Zoomed image showing vegetation down scarp



Figure A4: P1020262.jpg
20m North of Sutcliffe Rd + Drabble Rd Intersection



Figure A5: P1020267.jpg
100m North of Sutcliffe Rd + Drabble Rd Intersection



Figure A6: P1020271.jpg
800m North of Hackett Rd + Chapman Valley Rd Intersection:
Looking South-Eastward at adjacent property.



Figure A7: P1020274.jpg
1Km North of Hackett Rd + Chapman Valley Rd Intersection:
Travelling into the proposed Development Site.
Existing mature vegetation along future road verges could restrict internal views of buildings. Strong vegetation will be visible from outside the development site as bands of vegetation rather than roads/tracks across the site.



Figure A8: Composed Panorama
 2Km North of Chapman Valley Road: Onsite Internal View
 Looking South-South West.
 Existing site is cleared for agricultural purposes.
 View to Geraldton town is very distant (9-12Km)
 Scarp is degraded. There are no erosion controls in place.



Figure A9: P1020288.jpg
 2Km North of Chapman Valley Road: Onsite
 Looking South-South West.
 Zoomed view of Geraldton City Centre and Port.



Figure A10: P1020305.jpg
30-50m Due East of the terminus of Arnold Road.
Existing adjacent property 'tucked' into vegetation.
Roof colour contrasts with vegetation colours



Figure A13: P1020310.jpg
1Km North of Hackett Rd + Chapman Valley Rd
View of existing adjacent property 'tucked' into vegetation.
Darker house roof colour blends with adjacent vegetation while lighter shed colour contrasts with vegetation colours.

Below: Figure A14: P1020311.jpg
Zoomed view of above



Figure A11: P1020306.jpg
100m Due East of the terminus of Arnold Road.
Existing adjacent property.
Roof colour contrasts with vegetation colours



Figure A12: P1020307.jpg
100m Due East of the terminus of Arnold Road.
Zoomed view of existing adjacent property. No development is proposed to be higher than this building.
Roof colour contrasts with vegetation colours





Figure A15: P1020317.jpg
 500m North of Hall Road + Chapman Valley Road
 Zoomed view of existing rural residential development.
 Prominent roof colours at same height as vegetation would be less visible if colours were closely matched to vegetation.



Figure A17: P1020322.jpg
 1Km North of Hall Road + Chapman Valley Road
Zoomed view of existing rural residential development with portion of the proposed development site behind.
 This pocket of the site may be visible from various locations in a context of existing visible rural-residential buildings and proposed vegetation onsite.



Figure A16: P1020320.jpg
 800m North of Hall Road + Chapman Valley Road
 Zoomed view of existing rural residential development.
 Prominent roof and buildings coloured white do not fit with the landscape and detract from the Ranges.



Figure A18: P1020323.jpg
 1Km North of Hall Road + Chapman Valley Road
 View of existing rural residential development with indistinct portion of the proposed development site behind. This pocket of the site may be visible from various locations in a context of existing visible rural-residential buildings and proposed vegetation onsite.



Figure A19: P1020336.jpg
 At the Terminus of Cooper Street
 An example of exposed unvegetated retaining walls. It is recommended that built form of this nature is restricted within Moresby Heights to reduce visual prominence.

APPENDIX B: Outline Design Guidelines for Eco-Tourist Site

1 Introduction

The identified eco-tourist site, as illustrated on the Preliminary Development Concept Plan by Chappell Lambert Everett (2118-33) is located on the plateau of the Moresby Ranges above the proposed Wavecrest Estate Development Site. The tourist site is located to optimise views and the experience of the Moresby Range. It is therefore located in an area that may be seen in an elevated location.

In response to the findings of the Visual Amenity Impact Assessment this brief outline design guide has been prepared to guide further detailed site planning and building design at the eco-tourist site. Additional detailed landscape and visual analysis should be undertaken for the eco-tourist site at the appropriate planning stages to fully inform the planning and design of the tourist node.

The objective is to integrate the tourist node, reduce its prominence when viewed from the west and south, and to respect the landform of the Moresby Ranges.

2 Eco-tourist Site

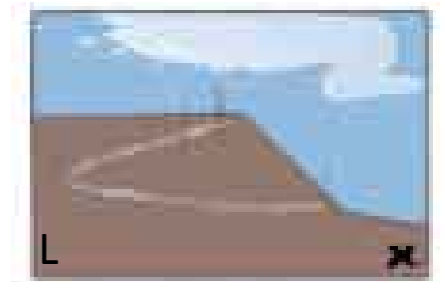
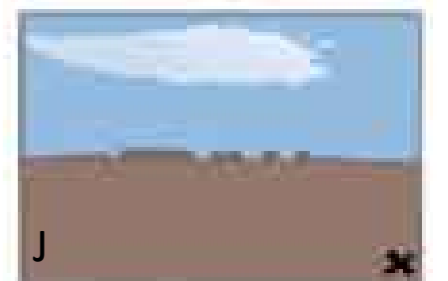
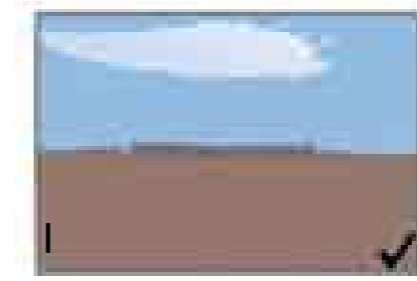
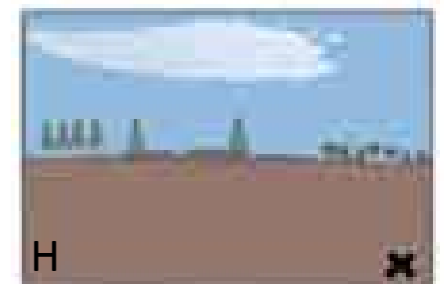
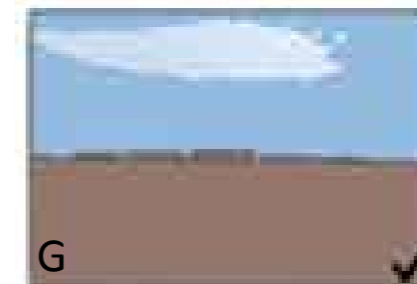
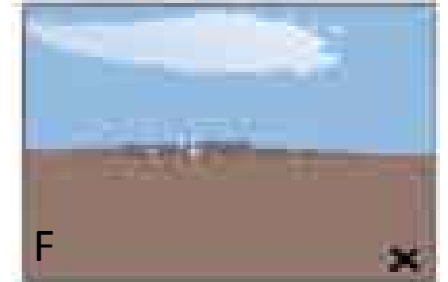
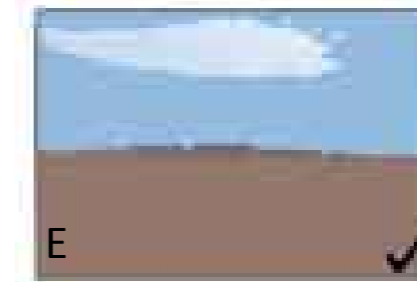
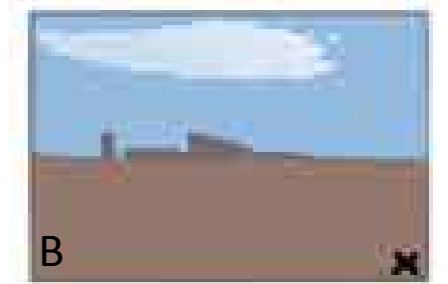
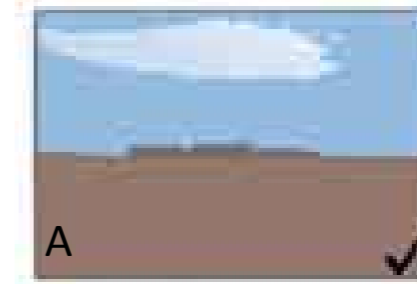
The eco-tourist site, currently shown as being setback from the edge of the plateau, is likely to feature built-form and public facilities including a carpark. Following is general guidance to visually integrate development into the landscape, all built-form and facilities should be subject to this guidance.

- Built-form should be horizontal in-nature when viewed from the west. See Figures A-B right.
- Buildings should be sited 30m back from the 190m contour. See Figures C-D right.
- Ground modelling should be incorporated to integrate and reduce the scale of the buildings and to emphasise the horizontal nature of the site. See Figure E right.
- Minimise any reflective surfaces. See Figure F. That is;
 - Eaves should be constructed to create appropriate shading of reflective surfaces.
 - Zincalume or metallic surfaces should not be situated in places where they can or may reflect.
 - Windows or glass should be tinted, glazed or detailed in such a manner as will not create a highly reflective surface especially late in the day.
- Siting of carparks and roads should minimise visibility and reflectivity towards Geraldton central, especially the Sydney Memorial Lookout.
- Vegetation should not create strong vertical accents along the skyline. See Figures G-H right.
- Siting of out-buildings should not detract from the natural skyline created by the scarp when viewed from below. See Figures I-J right.

3 Access Road

The detailed alignment and design of the road, its lighting, treatments of any necessary abutments, retaining structures, walls and barricades need to address the issue of visibility from the west and south. To minimise the potential of visual intrusion;

- The greatest proportion of the route should not be visible from the south,
- The road should be designed so as to minimise the need for cut,
- The road should be designed so as to minimise exposing faces of rock taller than 2m,
- The verge should be designed so as to allow revegetation works to occur,
- It should be noted that significant street lighting or pole lights may have a negative visual impact on the broader landscape and therefore alternatives should be investigated. See Figures K-L right.



APPENDIX 4

EPA Comments on Amendment 5 to Local Planning Scheme No. 5 (October 2011)



Chief Executive Officer
City of Greater Geraldton
PO Box 101
GERALDTON WA 6531

Your Ref LP/15/0001
Our Ref A412136
Enquiries Patrick Cavalli
Phone 6467 5411

Attention: Mr Murray Connell

Dear Sir/Madam

**DECISION UNDER SECTION 48A(1)(a)
*Environmental Protection Act 1986***

SCHEME AMENDMENT TITLE: City of Greater Geraldton Local Planning
Scheme 5 Amendment 5 - rezoning from
'Rural' to 'Development' zone
LOCATION: Lots 80 & 81 Hackett Road
LOCALITY: Waggrakine
RESPONSIBLE AUTHORITY: City of Greater Geraldton
DECISION: Scheme Amendment Not Assessed –
Advice Given (no appeals)

Thank you for referring the above scheme amendment to the Environmental Protection Authority (EPA).

After consideration of the information provided by you, the Environmental Protection Authority (EPA) considers that the proposed scheme amendment should not be assessed under Part IV Division 3 of the *Environmental Protection Act 1986* (EP Act) but nevertheless provides the following advice and recommendations.

ADVICE AND RECOMMENDATIONS

1. Environmental Issues

- Moresby Ranges

2. Advice and recommendations regarding Environmental Issues

Moresby Ranges

Environmental Values

The majority of the amendment area occurs within City of Greater Geraldton's (CGG) Moresby Range Landscape Special Control Area (SCA 2) and is included

in the *Moresby Range Management Strategy 2009* and *Moresby Range Management Plan 2010* documents as part of a Detailed Investigation Area. The focus of these documents, in terms of use and management, was on areas most commonly recognised as the Moresby Range, and these were labelled Detailed Investigation Areas. Thus management measures described in these documents should apply to the amendment area.

Native vegetation in the amendment area is known to be remnants of Geraldton Regional Flora and Vegetation Survey (GRFVS) Plant Communities 10, 13 and 15, which are poorly represented in the GRFVS area (i.e. <30%). Vegetation in the northwest of the amendment area is known to sustain populations of Priority 1 and 3 Flora species. Additionally, the amendment area is considered to contain potential foraging habitat for Carnaby's Black Cockatoo and other general habitat values for specially protected fauna.

The EPA considers that the environmental report submitted with the scheme amendment documentation adequately documents these factors combined with proposed management to minimise the potential impacts of the proposed rezoning within SCA 2.

Proposed Management

The amendment report and supporting documentation demonstrates consideration of the significant values the amendment area possesses, and seemingly proposes adequate management to preserve the majority of these values.

The amendment report states that approximately 30% of the amendment area is proposed for retention as Public Open Space (POS), which appears to include the large majority of the existing remnant vegetation located within the amendment area. The report also states that all portions of the amendment area containing Priority Flora will be retained in POS or larger covenanted lots and a linear section of POS will be provided in the eastern portion of the site to protect the most significant portion of the Moresby Range that occurs in the amendment area. Revegetation with native species is also proposed to be undertaken within areas of POS following development.

Conclusion

The EPA considers the proposed delineation of POS and preparation of a POS Management Plan in accordance with the proposed Local Structure Plan provisions (Appendix F) to the satisfaction of the Western Australian Planning Commission on the advice of the CGG and Department of Environment and Conservation (DEC), to be a suitable measure for ensuring the long term protection and viability of the environmental values that exist within the amendment area. However the indicative Development Concept Plan provided is considered to be a rough sketch and does not adequately demonstrate the proposed POS delineation and provisions. The EPA expects the proposed allocation of POS and its provisions should be formalised prior to subdivision and that this should be done to the satisfaction of the DEC to ensure consistency with that proposed in the amendment documentation.

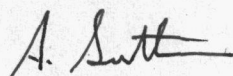
3. General Advice

- For the purposes of Part IV of the EP Act, the scheme amendment is defined as an assessed scheme amendment. In relation to the implementation of

the scheme amendment, please note the requirements of Part IV Division 4 of the EP Act.

- There is no appeal right in respect of the EPA's decision on the level of assessment of scheme amendments.
- A copy of this advice will be sent to relevant authorities and made available to the public on request.

Yours faithfully



Anthony Sutton
Director
Assessment and Compliance Division

17 October 2011

APPENDIX 5

Environmental Assessment Report (Coterra, January 2013)



COTERRA ENVIRONMENT



Environmental Assessment Report Local Structure Plan

Lots 80 & 81 Hackett Road, Waggrakine

Revision 1, January 2013

CALIBRE | COMMITMENT | COLLABORATION

This report was prepared by:

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): Luke Rogers
Report Version: Rev 1
Date: January 2013

This report was prepared for:

Sutcliffe Road JV
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Sutcliffe Road Joint Venture (JV) are proposing to develop Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre.

The site is currently being rezoned to 'Development' under the City of Geraldton-Greenough Local Planning Scheme (LPS) No. 5 (Figure 3).

As part of the rezoning of the site, the scheme amendment was referred to the Environmental Protection Authority (EPA) under Section 48A of the *Environmental Protection (EP) Act (1986)*. The EPA resolved to not assess the amendment (Ref: A412136), but provided advice and recommendations regarding environmental issues. This advice discussed the significance of the Moresby Ranges, and the remnant vegetation, however noted that the environment report submitted with the scheme amendment adequately documents these factors combined with proposed management to minimise the potential impacts of the proposed rezoning within SCA 2.

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009), and is bordered by Rural Residential development to the south and west.

The proponent is now progressing the submission and approval of the Local Structure Plan (LSP) with the recently formed City of Greater Geraldton (CoGG).

As part of the LSP documentation, this Environmental Assessment Report (EAR) has been prepared to inform the CoGG of the key environmental characteristics of the site, and how the proposed LSP reflects the environmental features and constraints, along with proposed management measures to minimise, avoid or mitigate potential environmental impacts.

The site is elevated and rises from 75m AHD on the western edge of the property, up to 210m AHD at the commencement of the Moresby Ranges to the east. The site has been previously used for agricultural purposes and is therefore mostly cleared, however some small pockets of vegetation remain scattered across the site (Figure 2).

Land Capability mapping for the site indicates that the soils on the site are generally suitable for development and on-site effluent disposal.

The site's vegetation condition and type has been assessed and mapped (Figure 9). The majority of the site can be broadly classified as cleared paddocks in 'Degraded' to 'Completely Degraded' condition, mainly consisting of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives. Remnant vegetation in the north to northwest portion of the site was in 'Excellent' condition, with only small patches of cleared vegetation (Figure 9). Remaining patches of vegetation were assessed as being in 'Good' to 'Completely Degraded' condition.

Regional vegetation mapping by Beard et. al. (1976) indicates the following vegetation associations as occurring within the site:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The site contains two areas subject to seasonal inundation, which have been historically grazed and are subsequently degraded. The areas are not recognised as regionally significant in the *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention (1971).

TABLE OF CONTENTS		Page
1.0	INTRODUCTION	1
1.1	Project Description and Planning Context.....	1
1.2	EPA Scheme Amendment Assessment	1
1.3	Scope of Report	2
2.0	KEY ENVIRONMENTAL POLICIES	3
2.1.1	Environmental Protection Act 1986.....	3
2.1.2	Moresby Range Management Strategy.....	3
2.1.3	Moresby Range Management Plan.....	3
2.1.4	Geraldton Regional Flora Survey 2010	4
2.1.5	EPA Bulletin 891 . Geraldton Region Plan	4
2.1.6	Guidance Statement No. 33 . Environmental Guidance for Land Development.....	5
3.0	EXISTING ENVIRONMENT.....	6
3.1	Site Location and Land Use.....	6
3.2	Topography, Landforms and Soils.....	6
3.2.1	Topography	6
3.2.2	Landforms and Soils.....	6
3.2.3	Land Soil Capability for Erosion and On-site Effluent Disposal	7
3.2.4	Acid Sulfate Soils	8
3.3	Hydrology	8
3.3.1	Groundwater	8
3.3.2	Wetlands	9
3.3.3	Surface Water and Drainage	9
3.4	Vegetation and Flora.....	10
3.4.1	Interim Biogeographical Regionalisation of Australia.....	10
3.4.2	Beard Vegetation Associations	10
3.4.3	Geraldton Regional Flora and Vegetation Survey.....	11
3.4.4	Vegetation Type and Condition.....	12
3.4.5	Flora.....	13
3.5	Fauna and Habitat	14
3.6	Cultural Heritage	16
3.7	Potential Contamination	16

4.0	LOCAL STRUCTURE PLAN.....	17
4.1	Description	17
4.2	Environmental Aspects of the LSP Design	17
4.2.1	Public Open Space and Regional Open Space	17
5.0	IMPACTS AND MANAGEMENT	19
5.1	Vegetation and Flora.....	19
5.1.1	LSP Design Measures	19
5.1.2	Other Management Measures	20
5.2	Fauna and Habitat	21
5.2.1	LSP Design Measures	21
5.2.2	Other Management Measures	21
5.3	Wetlands.....	22
5.4	Moresby Ranges.....	22
5.5	Acid Sulfate Soils.....	23
5.6	Construction Impacts.....	23
5.7	Water Management	24
5.8	Erosion and On-site Effluent Disposal.....	24
6.0	IMPLEMENTATION STRATEGY	26
6.1	Vegetation.....	26
6.2	Fauna and Habitat	26
6.3	Additional Environmental Management Items	26
7.0	REFERENCES	27

TABLES (Compiled within the report)	Page
Table 1: Land Capability of the Soil Units On-site	8
Table 2: Vegetation Complex Statistics.....	11
Table 2: GRFVS Plant Communities.....	11
Table 3: Explanation of Vegetation Condition Rating.....	13
Table 4: List of Threatened Fauna Species.....	15

FIGURES (Compiled at the end of the report)

Figure 1: Site Location
Figure 2: Aerial Photo
Figure 3: City of Geraldton-Greenough Local Planning Scheme Zoning
Figure 4: Topography and Geology
Figure 5: Acid Sulfate Soils
Figure 6: Wetlands and Surface Water Flow
Figure 7: Regional Vegetation Complexes
Figure 8: Site Assessed Vegetation Complexes
Figure 9: Vegetation Condition and Locations of Priority Flora
Figure 10: Draft Local Structure Plan

APPENDICES

Appendix A: Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007)
Appendix B: Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011)
Appendix C: DEC Threatened Fauna database search results
Appendix D: Protected Matters Search Result – EPBC ACT
Appendix E: Department of Indigenous Affairs – Registered Sites Search Results
Appendix F: Results of UXO Search and FESA Confirmation
Appendix G: Proposed draft Local Planning Scheme text provisions

1.0 INTRODUCTION

1.1 Project Description and Planning Context

Sutcliffe Road JV are proposing to develop Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Greater Geraldton (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. An aerial photograph of the site is shown as Figure 2.

The site is currently being rezoned from 'Rural' to 'Development' under the City of Greater Geraldton Local Planning Scheme (LPS) No. 5 (Figure 3).

A Local Structure Plan (LSP) has now been prepared by project planning consultants CLE, proposing a mixture of Residential, Special Rural, Town Centre and Tourism land uses, and the proponent wishes to now advance approval of the LSP.

In order to facilitate development of the site in accordance with this LSP, this environmental assessment report has been prepared to inform and support the LSP. As a result, this Environmental Assessment Report (EAR) is to be read in conjunction with the LSP documentation prepared by CLE.

The LSP has been prepared to respond to the site's key opportunities and constraints and provides for an integrated planning outcome, complementing the site's context between Waggarakine Rural Residential area and the Moresby Range, whilst making best use of its strategic attributes (CLE, 2011).

The LSP provides for:

- Development of a residential community of between 1500-2000 lots, centring around a main-street style village centre;
- Provision of a local primary school adjoining the village centre;
- Retention of the majority of existing native vegetation on site within open space or as covenanted vegetation on large lots;
- Provision of an integrated network of public open space including:
 - Preservation of the Moresby Range 'tops' as regional park land;
 - District Open Space (playing fields and the like);
 - A variety of local open spaces, to service the local community, allow retention and enhancement of remnant vegetation and wetlands, and to provide recreation linkages to the Range;
- Integrated urban water management; and
- Establishment of a tourist facility on top of the Range to enhance public access to the range and provide a genuine tourist destination for both regional and local visitors.

1.2 EPA Scheme Amendment Assessment

As part of the rezoning of the site to 'Residential' under the City's TPS No. 5, the amendment was referred to the Environmental Protection Authority (EPA) under Section 48A of the *Environmental Protection (EP) Act (1986)*. To assist the EPA in determining the level of assessment on the proposed land use change, a detailed

environment report was submitted with the amendment documentation to outline the environmental features and proposed management measures to ensure the development would progress in a manner that would limit potential environmental impact in accordance with the EPA's objectives.

As a result, the EPA resolved to not assess the amendment (Ref: A412136), but nevertheless provided advice and recommendations regarding environmental issues. This advice discussed the significance of the Moresby Ranges, and the significance of the remnant vegetation as detailed in the Geraldton Regional Flora and Vegetation Survey. The EPA also noted that the environment report submitted with the scheme amendment documentation adequately documents these factors combined with proposed management to minimise the potential impacts of the proposed rezoning within SCA 2. The EPA advice concludes:

"The EPA considers the proposed delineation of POS and preparation of a POS Management Plan in accordance with the proposed Local Structure Plan provisions (Appendix F) to the satisfaction of the Western Australian Planning Commission on the advice of the CGG and Department of Environment and Conservation (DEC), to be a suitable measure for ensuring the long term protection and viability of the environmental values that exist within the amendment area. However the indicative Development Concept Plan provided is considered to be a rough sketch and does not adequately demonstrate the proposed POS delineation and provisions. The EPA expects the proposed allocation of POS and its provisions should be formalised prior to subdivision and that this should be done to the satisfaction of the DEC to ensure consistency with that proposed in the amendment documentation".

1.3 Scope of Report

This Environmental Assessment Report (EAR) has been prepared to inform the CoGG on the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives by detailing proposed management measures and appropriate planning design to minimise, avoid or mitigate potential environmental impacts. This report will also adequately address the advice of the EPA as detailed in their decision letter on the CoGG Scheme Amendment for the site (dated the 17th October, 2011) and summarised above. The DEC will be consulted and a copy of this report along with the structure plan design, will be forwarded to the regional DEC office in Geraldton to demonstrate the formalisation of the location and alignment of the POS areas in accordance with the EPA advice.

2.0 KEY ENVIRONMENTAL POLICIES

2.1.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* ('the Act') is the pre-eminent environmental legislation in Western Australia. Development projects are regulated under Part IV of the Act.

Assessment opportunities under the Act occur at the rezoning stage (Region Scheme and/or Town Planning Scheme) under Section 48A of the Act and the subdivision/ development stage under Section 38 of the Act.

2.1.2 Moresby Range Management Strategy

The Moresby Range Management Strategy was prepared by the Western Australian Planning Commission and adopted in 2009. It recognises the high landscape significance of the Range, and seeks to:

- Protect, conserve and enhance its natural values;
- Protect the indigenous and non-indigenous cultural values;
- Improve public access and recreation opportunities;
- Manage the risk of erosion and bushfire; and
- Ensure a consistent and coordinated policy approach to the areas planning.

To achieve these objectives, the WAPC makes a range of recommendations, of which the following are relevant to this site:

- Opportunities to retain biodiversity through the eradication and control of weeds and feral animals, and the protection and rehabilitation of remnant vegetation;
- Revegetation around areas of conservation significance with key target corridors identified. A small patch of remnant vegetation is identified in the south-west corner of the subject site;
- To ensure that development proposals maintain and enhance conservation values;
- Incorporation of public access to watercourses in development proposals;
- To incorporate linkages and walk trails through the area;
- To limit and manage erosion and bushfire risk;
- Minimisation of intensive development on the flat tops and side slopes, and in key view corridors and ensuring that that which occurs is consistent with the Strategy objectives; and
- To ensure that the landscape value of the area is taken into account in any development proposal and appropriate management responses are incorporated.

2.1.3 Moresby Range Management Plan

The Moresby Range Management Plan was prepared for the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning to provide further

direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range (closest to Geraldton).

It states that any development proposal should address the objectives stipulated for the area west of the Range, namely:

- Ensuring that the ecological dynamics of the landscape are protected and enhanced;
- Placing larger lots closer to the Range Precinct and in areas of high visibility;
- Ensuring that the transport network minimises trip distances, allows for walking, bicycling and other forms of transport, provides easy linkages to commonly used facilities and the Range, and provides the basis for strategic tree plantings and ecological linkages between the foothills and the Range;
- Creating a visually smooth transition from the obvious dominance of buildings in the centre of the City to the bushy and green appearance of the Range;
- Ensuring that buildings sit in with the landscape and create the overall impression that buildings become more sensitive and integrated into the landscape the closer the observer is to the Range.

2.1.4 Geraldton Regional Flora Survey 2010

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed in 2010 by the WAPC. The objective was to provide a regional context for land use planning and environmental impact assessment of proposals affecting native vegetation in the Geraldton region.

Information collected through the GRFVS is intended to assist land use planning by the Department of Planning (DoP) and local governments, environmental impact assessments by the EPA, and conservation planning by DEC.

The report, associated maps and data provide useful information for landowners and developers, but does not preclude the requirement for site-based ecological assessments of areas likely to be impacted by development. Importantly, the GRFVS will inform conservation and regional planning in the Geraldton region, including the preparation of a local biodiversity strategy that will identify priority natural areas for consideration in future land use planning.

2.1.5 EPA Bulletin 891 – Geraldton Region Plan

The Geraldton Region Plan was prepared by the WAPC in 1997, to provide a regional framework for planning decisions and to recognise the regional centre for the mid-west.

The stated objective of the EPA for native vegetation is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation types and communities. In assessing the Geraldton Region Plan under Section 16 of the *Environmental Protection Act 1986* (EPA Bulletin 891, 1998), the EPA supported the development of a remnant vegetation inventory in the Geraldton region and the conservation of regionally significant vegetation in both private and government ownership. A list of recommendations were also made by the EPA in respect to the

Regional Plan. Those recommendations that are potentially applicable for the site are listed below:

- *“Areas supporting regionally significant vegetation should be identified and appropriately designated for conservation”.*
- *“The regional landscape values of the Moresby Ranges should be appropriately protected in the Region Plan”.*

2.1.6 Guidance Statement No. 33 – Environmental Guidance for Land Development

Guidance Statement No. 33 (EPA, 2005) outlines the environmental protection process and provides the EPA’s advice on a range of environmental factors in order to assist in the protection, conservation and enhancement of the environment during the land planning and development process.

3.0 EXISTING ENVIRONMENT

3.1 Site Location and Land Use

The site is located within the City of Greater Geraldton (CoGG), and is bordered by Rural Residential development to the south and west, agricultural land to the north, and the Moresby Ranges to the east.

The site has been historically, and currently still is, used for cattle and sheep grazing. The site has therefore mostly been cleared for pasture, with some pockets of remnant vegetation scattered across landholding. A single residence is located at the base of the Moresby Ranges, near the south eastern corner which is occupied by the current farming caretaker of the property.

A gravel pit which is no longer in operation is located outside the north western tip of the site.

3.2 Topography, Landforms and Soils

3.2.1 Topography

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009). The site is therefore elevated with the topography rising from approximately 75 metres Australian Height Datum (mAHD) on the western edge, up to 210 mAHD at the highest point of the ranges on the eastern edge (Figure 4).

Within 100m to 200m of the eastern boundary is the steepest section of the site, where the Moresby Ranges scarp descends to the foothills.

3.2.2 Landforms and Soils

Regional geological mapping (WA Geological Survey, 1971) identifies the main geological unit over the site as being the Chapman Group, which is characterised as exhibiting Moonyonooka Sandstone (yellow feldspathic sandstone and arkose) and Greenough Sandstone (variegated clayey sandstone).

The lower slopes and the top of the ranges are classified as being Laterite with overlying quartz sand and underlying highly weathered rock. The steep portions along the scarp along the eastern side of the site are classified as either Champion Bay Group or Yarragadee Formation, characterised by non-marine fluviatile feldspathic, poorly sorted sandstones which are porous and poorly cemented, hence allowing for considerable groundwater reserves.

The Western Australian Geological Survey (2001) regional mapping indicates that the project site contains primarily colluvial foot slopes, with silty sand over mottled sandy clay soils. The other less prevalent soil units occurring in the site are outlined below:

- Alluvial stream channels (including stream beds and banks; seasonally active, silty sand clay, slope deposits and weathered bedrock).

- Alluvial swamps, having waterlogged organic soil over silty sandy clay.
- Eolian formed, deflated dunes of residual quartz sand over calcarenite.
- Residual ferruginous pisolitic duricrust and mottled soil (weathered bedrock).
- Colluvial formed, talus slope to the escarpement, consisting of weathered rock debris, gravel and boulders and the Cadda Formation of shale, siltstone and sandstone with shelly sandy limestone.

3.2.3 Land Soil Capability for Erosion and On-site Effluent Disposal

The Moresby Range Management Strategy (WAPC, 2009) discusses the risk of erosion based on the geology of the foothills and foot slopes of the Moresby Range in consideration of the steepness of these slopes.

Steep, shallow, rocky side slopes and recent colluvial foot slopes wrap around the flat tops. The profile of the side slopes is fairly uniform, with the slope increasing with height. The steepest side slopes are at Wokatherra Hill and north of White Peak Road, extending for a horizontal length of around one kilometre (WAPC, 2009).

The side slopes and sandy soils of the range are susceptible to wind and water erosion. This is particularly apparent on steeper slopes of the range, where there is clear evidence of landslips. Many sections of the side slopes are unstable and bare rock faces are visible (WAPC, 2009).

In addition the 'Geraldton Rural Residential Land Capability Study' prepared by the Department of Agriculture (DoAg, 1990) identifies the following land capability units within the development site (in order of area of representativeness) and are outlined on Figure 4:

(Ysp) – Yellow sandplain: Rapidly drained uniform yellow sand with a single grain structure. These soils commonly have a loose, brown or dark brown loamy sand surface soil over a yellowish brown loamy sand.

(Mf2) – Footslopes: Well drained red duplex soils with a brown or red sand to sandy loam surface texture, over sandy clay loam or sandy clay at depths between 40-100 cm.

(Mf1) – Footslopes: Yellow duplex soils with brown sand to loamy sand over mottled subsoil with texture ranging from sandy clay to heavy clay at depths between 40-120 cm.

(GrS) – Sandstone rises: Shallow, very gravelly sands (note this land capability unit only associated).

(Ty) – Deep yellow sands: Rapidly drained uniform yellow loamy sand with a single grain structure. These soils commonly have a dark brown loamy sand top soil overlying a yellowish brown to yellow loamy sand (note - only associated with far northern corner of site).

(Mss) – Sideslopes: Eroded duplex soils (note the ‘Mss’ unit is mapped almost entirely outside the intended development area, and as such is not assessed for its suitability for development or on-site effluent disposal).

Each of these land capability units has been assessed for the suitability for housing and road construction and on-site effluent disposal, and can be summarised in the table below:

Table 1 – Land Capability of the Soil Units On-site

<i>Unit</i>	<i>Ysp</i>	<i>Mf2</i>	<i>Mf1</i>	<i>Ty</i>
<i>Housing and Road Construction suitability</i>				
Wind Erosion Hazard	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>
Water Erosion Hazard	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Ease of Excavation	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Foundation Soundness	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>
Slope instability risk	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>
Flood Hazard	-	-	-	-
<i>Onsite Effluent Disposal</i>				
Microbial purification ability	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>
Soil absorption ability	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>

These results indicate the soils on the site are generally suitable for housing and road construction, and are capable of supporting on-site effluent disposal.

3.2.4 Acid Sulfate Soils

The Department of Environment and Conservation Acid Sulfate Soils risk mapping (WA Atlas, 2011), indicates that there is a small area (approximately 2ha) at the western boundary of the site which is mapped as having a high risk of encountering ASS within 3m of the natural surface (Figure 5). An additional small sliver of ‘moderate to low risk’ is located near the south west corner of the site. The remainder of the site is mapped as having a low to no risk of encountering ASS within 3 m of natural surface level (Figure 5).

3.3 Hydrology

3.3.1 Groundwater

The Department of Water has approximately 40 bores located within a 5 km radius of the centre of the landholding, including one bore which is located within the site. This bore (bore no. 20002923) indicated that the depth to groundwater at this location was at 6 metres below ground level. This depth however is not necessarily indicative of the average depth to groundwater across the entire site given the variability in the topographic levels. Depth to groundwater is therefore likely to vary considerably at different points. Data obtained from the nearby Department of Water (DoW) bores indicates a range in groundwater depths of between 1.8 m to

36.5 m below ground level (GHD, 2006). However based on the data obtained from the DoW, the depth to groundwater is likely to be on average greater than 6 metres below ground level across the site.

The site is situated within the proclaimed Arrowsmith Groundwater Area, which covers the northern-most extent of the Northern Perth Basin, from Geraldton to Green Head and east to Coorow, in the state's Mid West region. A groundwater allocation plan has been prepared by the Department of Water (2010) which details the objectives of the proclaimed Arrowsmith Groundwater Area and broad management requirements. These include:

- A guideline for the allocation and licencing of groundwater in the Arrowsmith Groundwater Area.
- Details on the effects of abstraction on groundwater quality and groundwater-dependent ecosystems.

This plan will guide the assessment of groundwater licence applications in respect to allocations entitlements in the Arrowsmith Groundwater Area.

3.3.2 Wetlands

There are two areas of seasonal inundation within the site, located in the south-west and near the western edge (Figure 6). These areas are not identified as wetlands, or are recognised as regionally significant in the *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention (1971).

The southern-most wetland, located near the south western corner of the site is labelled as a 'non-perennial swamp' by available Landgate mapping data (Landgate, 2011), with the wetland located near the central western area of the site labelled as 'an area subject to flooding or inundation'.

Therefore these areas of inundation have no level of significance or protection status as identified by the Department of Environment and Conservation or the Department of Water.

Furthermore, the vegetation condition for both wetland areas was noted as being between 'Good to Degraded' and 'Degraded' as determined through the botanical assessment (detailed in Section 3.4 below).

The developer intends on retaining and managing these areas, given they represent natural drainage features, and retain some environmental value with the remnant vegetation. However because boundaries of these wetlands are not well defined, the remnant vegetation will be used as a general guide for the area of wetland intended to be retained.

3.3.3 Surface Water and Drainage

Three natural drainage lines are present through the site, which have been highly modified due to clearing of vegetation (Figure 6). The drainage lines appear to be natural drainage channels for rainwater flowing off the scarp, however they remain

dry most of the year, with limited flow reported from the last few years (GHD, 2006).

3.4 Vegetation and Flora

The vegetation and flora data relevant to this site has been obtained from the following sources:

- Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007) – Attached as Appendix A.
- Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011) – Attached as Appendix B.
- Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).

Where overlap on the assessments exists, the more recent data obtained in the Level 1 Flora and Vegetation survey (Coterra, 2011) supersedes the results of the previous Priority Flora Survey (GHD, 2007).

Based on review of the above documents a summary of the vegetation and flora on the site is outlined below.

3.4.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway and Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2,242,033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

3.4.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The remaining extent of these two vegetation associations' within WA and the Geraldton Regional Flora and Vegetation Survey area (GRFVS), are presented in Table 1 below (WAPC, 2010).

Table 2 Vegetation Association Statistics

Area	Beard vegetation association 675	Beard vegetation association 359
Pre-European extent in GRFVS	3, 148 ha	17, 805 ha
Current (remaining) extent within GRFVS	240 ha (7.62%)	3, 077 ha (17.3%)
Area protected within GRFVS	79.4 ha	1.4 ha
Pre-European extent in WA	51, 850 ha	44, 493 ha
Current (remaining) extent in WA	10, 992 ha (21%)	8, 366 ha (19%)
Area protected in WA	328 ha	1.25 ha

The EPA conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) is 30% retention of pre-European vegetation complex extent outside of constrained areas (i.e. Perth Metropolitan Area is a constrained area). This retention target has therefore not been met for the above vegetation associations that are located within the site, for both the Geraldton region and in WA generally.

The locations of each of these vegetation associations are outlined in Figure 7.

3.4.3 Geraldton Regional Flora and Vegetation Survey

The Geraldton Regional Flora and Vegetation Survey (GRFVS) aims to provide information to assist in the assessment of proposals that may affect the native vegetation within the Geraldton region (GRFVS, 2010).

Using Beard's (1976) regional vegetation associations, the GRFVS maps vegetation at a local scale which are referred to as GRFVS plant communities. The original vegetation of study area, is likely to have consisted of three GRFVS plant communities, these are detailed in Table 2.

Table 3 GRFVS Plant Communities

Plant Community	Description	Beard Vegetation Association
10	Near Coastal: <i>Acacia rostellifera</i> shrubland	359
13	Sandplain: <i>Banksia prionotes/ Acacia rostellifera</i>	359
15	Thicket: <i>Melaleuca</i> spp. /mixed spp.	675

The GRVFS outlines the following in respect to the local conservation significance of each of the recognised plant communities occurring within the site:

"Plant community 10 is more widespread than the other identified communities in the GRFVS area; however better condition representatives have local conservation significance" (WAPC, 2010).

“Plant community 13 occupies 754.39 ha in the GRVFS area, however much of this area is degraded. The better representatives of this plant community occur in the Glenfield and Waggrakine areas. A low heath variant of this plant community occurs in Karloo and Utakarra. This plant community is considered to have conservation significance because, although it has a greater natural extent than most the other communities, it is largely degraded or threatened” (WAPC, 2010).

“Plant community 15 includes the area which matches the description of the ‘natural value’ ecosystem ‘Moresby Ranges’ (Australian Natural Resources Atlas 2009) and the P1 priority ecological community ‘Plant assemblages of the Moresby Range system’ (DEC 2009a). Consequently, this area is considered to have conservation significance (WAPC, 2010)”.

The GRVFS recognises the local significance of these plant communities due to the lack of original pre-European extent and due to ongoing degradation and clearing of the vegetation within the GRVFS study area.

The locations of the beard vegetation associations across the site are shown in Figure 7.

3.4.4 Vegetation Type and Condition

The majority of the site has been cleared due to historical agricultural uses, however there are some small pockets of vegetation remaining across the site. In most of these areas, the vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these remnants.

The dominant remnant vegetation units across the site were noted as being the following (Coterra, 2011):

- Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.
- *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladius asper*, **Avena barbata* and *Poaceae* sp.? Open Herbland/Grassland.
- *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
- Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, ?*Austrostipa* sp. and *Desmocladius asper* Herbland/ Grassland.

The vegetation units and their locations across the site are presented in Figure 8.

The condition of the vegetation present across the site was mapped during the Level 1 Flora and Vegetation survey undertaken in 2011 (Figure 9), and is described further below.

- The site can be broadly classified as cleared paddocks in 'Degraded' to 'Completely Degraded' condition (Figure 9). The vegetation that is present in the 'Degraded' to 'Completely Degraded' (cleared paddocks) areas consisted of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives.
- The remnant vegetation in the north to northwest portion of the site was in 'Excellent' condition, with only small patches of cleared vegetation (Figure 9).
- Remaining patches of vegetation were assessed as being in 'Good' to 'Completely Degraded' condition.

The condition ratings have been rated in accordance the vegetation condition scale used in Keighery (1994) outlined below:

Table 4 Explanation of Vegetation Condition Rating (Keighery, 1994)

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive specie
3	Very Good	Vegetation structure altered, obvious signs of disturbance
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species

Some of the results of the assessment of the vegetation condition in April 2011, vary from the vegetation condition results determined in 2007. This is likely due to continued degrading land uses (predominantly grazing activities) and could also be partly attributed to a regional reduction in rainfall (Bureau of Meteorology, 2011).

3.4.5 Flora

A search of the DEC Threatened (Declared Rare) Flora Database and the Western Australian Herbarium Specimen database for species of rare and priority flora located within the vicinity of the site was undertaken by GHD in 2007. Of the rare or priority species that were identified by the DEC as potentially occurring within the area, two priority flora species were confirmed as being located within the site as determined through the Level 1 Flora and Vegetation survey completed in April 2011. These species are:

- *Melaleuca huttensis* (Priority 1 Flora), and;

- *Grevillea triloba* (Priority 3 Flora).

A description of the significance of the priority species classification by the DEC is outlined below:

- *Priority 1 species are species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes (DEC, 2011).*
- *Priority 3 species are species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them (DEC, 2011).*

One individual *M. huttensis* was recorded within the northwest corner of the site. *G. triloba* was recorded in the northern and northwest corners of the site, in the areas classified as being in 'Good' to 'Excellent' condition, at densities of 20%, 5% and patches of 20% respectively. The location of these species across the site is shown in Figure 9.

A search of the DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database indicated that there was no previously known TECs or PECs identified as occurring within the site area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca macecephala* and *Hakea pycnoneura* thickets on the Morseby Range.

3.5 Fauna and Habitat

As the majority of the site is cleared and used for grazing of livestock, the fauna habitat value of the site is limited. However, pockets of remnant vegetation will provide islands of habitat for some species.

Vegetation condition is often used as an indicator of fauna habitat value. The majority of the remnants were rated as being in 'Good' to 'Completely Degraded' condition (Section 3.4.3), thereby offering varying habitat value for native fauna. The portion of vegetation in the very north-west tip, which has been assessed as being in 'Excellent' condition, is likely to contain greater fauna habitat value and viability (Figure 9).

A search of the DEC's Threatened Fauna database, and the federal Department of Sustainability, Environment, Water, Populations and Community's (DoSEWPC) database of listed matters of National Environmental Significance protected under

the Environmental Protection and Biodiversity Conservation Act (EPBC Act) (1999) was undertaken. The search indicated that the following Rare or Threatened fauna species could potentially occur within the site. This has been determined based on a comparison between the available fauna habitats within the site, and the information provided on the habitat requirements of each of the listed species:

Table 5 - List of Threatened Fauna Species

Fauna Species	Conservation Status	Likelihood of Being on-site
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)	Threatened	Possible - Limited foraging habitat available
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)	Threatened	Possible - Limited foraging habitat available
<i>Cyclodomorphus branchialis</i> (Slender Blue Tongue Skink)	Threatened	Possible, though unlikely due to lack of suitable habitat
<i>Falco peregrinus</i> (Peregrine Falcon)	Specially Protected Fauna	Unlikely - lack of suitable habitat
<i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)	Threatened	Possible, though unlikely due to disturbed nature of site
<i>Lerista lineata</i>	Priority 3	Possible, though unlikely due to disturbed nature of site
<i>Macropus irma</i> (Western Brush Wallaby)	Priority 4	Unlikely - habitat disturbed onsite
<i>Morelia spilota subsp. imbricata</i> (Carpet Python)	Specially Protected Fauna	Possible, though unlikely due to disturbed nature of site
<i>Pomatostomus superciliosus subsp. ashbyi</i> (White-browed Babbler (western wheatbelt))	Priority 4	Possible, though unlikely due to disturbed nature of site
<i>Psacadonotus seriatus</i> (Cricket)	Priority 1	Possible, though unlikely due to disturbed nature of site
<i>Tyto novaehollandiae subsp. Novaehollandiae</i>	Priority 3	Unlikely - lack of suitable habitat

The DEC database search results are presented in Appendix C, with the results of a protected matters search under the EPBC Act presented in Appendix D.

Whilst some of the habitats present within the site are considered suitable for a number of the Rare or Priority species listed above, the likelihood that these species can sustain viable populations within the site is low due to the fragmented and disturbed nature of the remnant habitats available.

Some of these species are listed as possibly occurring within the site, primarily due to the area of intact vegetation in the northwest corner. Ground dwelling species such as reptiles and insects may inhabit this portion of the site.

Foraging habitat for Carnaby's and Baudin's Cockatoo is present in some areas of existing vegetation across the site.

The level of impact on these species will need to be determined following final planning design, when the area of foraging habitat required to be cleared can be fully assessed in consideration of the significant impact thresholds under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act), 1999.

3.6 Cultural Heritage

A search of the Department of Indigenous Affairs website determined that there are no sites of Aboriginal significance which have been recorded on the site (Appendix E) (DIA, 2011). The closest registered site is located approximately 3km north-west of the northern edge of the site.

All contractors working on the development need to be made aware of their responsibilities under the *Aboriginal Heritage Act 1972* with regard to finding potential archaeological sites. In the event a site is discovered, all work in the area is required to cease and the Department of Indigenous Affairs is to be contacted.

3.7 Potential Contamination

The use of the site for agricultural and pastoral purposes is not viewed historically as intensive, therefore it is unlikely that contamination has occurred. Additionally, the site is not listed on the Department of Water, Water Information (WIN) information database for potentially contaminated sites, nor under the DEC's Contaminated Sites Database (DEC, 2011).

A former Shire of Greenough landfill was once located immediately west of the site, however operations ceased approximately 15 years ago and no contamination has been identified. Additionally groundwater flows in a westerly direction under the former landfill, away from the site.

A threat of UXO's (Unexploded Ordinances) from an area 2km north east of the site called Red Peak has previously been identified. A subsequent UXO threat analysis has, however, resulted in the Unexploded Ordinance Services section of FESA concluding that this area poses a minimal risk as, and that further searching for UXO is unnecessary (refer Appendix F). FESA advise that an Advice Note only will be recommended to be placed upon any subdivision approvals issued for the site.

4.0 LOCAL STRUCTURE PLAN

4.1 Description

The LSP has been developed to guide the subdivision and development of the 385ha of undeveloped land across Lots 80 and 81 Hackett Road, Waggrakine. The LSP is described in detail in the structure plan report (CLE, 2012) to which this report forms an Appendix.

Given the land use and environmental features and constraints to this landholding, the LSP details a number of separate land uses (Figure 10), including the following:

- Residential
- A Primary School
- Public Open Space
- Regional Open Space
- A local Commercial Centre
- Tourist Nodes
- Rural Residential (minimum 1ha Lots)

This report is primarily concerned with the natural areas to be retained within the LSP site.

4.2 Environmental Aspects of the LSP Design

4.2.1 Public Open Space and Regional Open Space

There are a number of environmental objectives which underpin the LSP design, these are to:

- Preserve areas of highest conservation value and create ecological linkages.
- Conserve examples of different natural areas on site and preserve biodiversity.
- Create sustainable conservation areas.
- Incorporate natural areas into new urban fabric.
- Interpret existing landscape and site memory in development areas.
- Incorporate the natural local landscape character within new public domain planting.
- Develop community awareness and involvement.

Retention of landform and natural vegetation and the preservation of key landscape features is one of the driving elements of the LSP design. The LSP design response was to include the retention of the Moresby Ranges within the developable area of the LSP in Regional Open Space (ROS). This area along with the portions of the site identified as containing area of environmental significance will be retained within Public Open Space (POS) areas in the future urban environment. The retention of these areas will provide examples of the pre-development landforms of the site and

will contribute to the retention of flora and fauna species and the preservation of biodiversity on the site.

Land attributes and functional values which have been accounted for in the process of identifying POS and ROS areas in the LSP include the following:

- conservation values;
- retention of significant landform;
- recreation opportunities;
- linkage values;
- fauna habitat values; and
- significant vegetation values (retention of areas vegetation containing Priority Flora species).

Areas of POS in the LSP have been developed to provide the necessary active recreation opportunities for the future residents of the area whilst also preserving as many ecological values as practicable on “Development” zoned land within the LSP area. Areas of native vegetation to be preserved in POS have been strategically located in order to maintain strategic linkages across the LSP site for flora and fauna, with a focus on connecting natural areas to the ROS and the Moresby Ranges.

The area allocated to open space within the LSP area is approximately 133 ha (or approximately 34% of the structure plan area). The total area of POS with a conservation function is approximately 95 ha (or 25% of the total area covered by the structure plan and 71% of the total area of POS and ROS). This represents a considerable portion of the structure plan area, and is reflective of the intent to retain the environmental features and landform associated with the Moresby Ranges.

Specific LSP design measures to manage and preserve the areas of most environmental value are detailed in the subsequent section below.

5.0 IMPACTS AND MANAGEMENT

5.1 Vegetation and Flora

The site contains limited pockets of vegetation due to historical agricultural uses that have resulted in the majority of the site being cleared. Most of the remaining vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these vegetation remnants.

However, the vegetation in the very north to northwest portion of the site is the exception, assessed as being in 'Excellent' condition, with only small patches of cleared vegetation. This area also sustains populations of Priority 1 and 3 species.

The EPA's conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) of 30% retention of pre-European vegetation complex extent has not been met for the vegetation complexes present within the site, for both the Geraldton region and in WA generally.

In addition, both the Moresby Range Management Strategy, the EPA's assessment of the Geraldton Region Plan, and the GRVFS refer to the significance of remnant vegetation and the need to ensure that development proposals maintain and enhance conservation values.

Therefore, despite the condition of the remnant vegetation, it is considered appropriate to retain existing vegetation wherever possible in an effort to preserve and enhance the ecological integrity of the site, and to increase amenity for prospective residents.

5.1.1 LSP Design Measures

The LSP is attached as Figure 10, and outlines the areas of vegetation proposed for retention within the development. The proposed development will allow for the retention of almost all vegetated areas. In addition, all areas with Priority Flora located in them will be retained in Public Open Space (POS) and in large covenanted lots. The LSP is compliant with the conservation measures demonstrated in the initial development concept submitted with the proposed Scheme Amendment, and therefore meets the EPA's expectations for the formalisation of the areas of POS aimed at conserving areas of environmental value, including:

- Two pockets of remnant vegetation located near the central western edge of the site and within the south western corner, are proposed to be reserved for POS. A long linear section of POS will also be provided on the eastern portion of the site to protect this section of the Moresby Range and associated vegetation.

Additional development design measures detailed in the LSP to preserve the environmental integrity of the site include:

- Large covenanted lots – proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will be designed and

conditioned for minimal clearing. Building envelopes will be designated in this portion of the site where vegetation is degraded or already cleared.

- Revegetation with native species will be undertaken following development, predominantly within selected areas of the open space and in streetscape landscaping. The proposed species list for revegetation will be approved by the CoGG prior to subdivision.
- Approximately 34% of the structure plan area is proposed for open space, to preserve areas of environmental and landform significance.
- The proposed reservation of these areas in POS and the covenanted large lot designs in the north-west of the site will be designed to ensure an ecological corridor runs between the vegetated larger semi-rural blocks to the west of the site, to the Moresby Ranges in the eastern portion of the site.
- This corridor will include the area of existing vegetation within the western portion of the site, with the objective of retaining this vegetation and enhancing its ecological integrity through revegetation and proposing a link to other areas of vegetation in open space.

5.1.2 Other Management Measures

To ensure the future viability of retained vegetated and revegetated areas the following management strategies are proposed:

- Delineate POS areas containing retained vegetation and revegetation zones from the development by separating them by a road or significant pedestrian access ways.
- Preparation of a POS Management Plan, to be signed off by the Local Authority in consultation with the DEC, which will provide details on the following:
 - minimisation of clearing and vegetation disturbance during construction,
 - access control (during construction and post-construction),
 - revegetation species and establishment,
 - weed control,
 - dieback control and management,
 - stormwater management,
 - ongoing maintenance and management of the vegetated areas,
 - protection of wetlands,
 - fire management, and
 - interface management.

This will ensure the long term protection and viability of the vegetation and associated vegetation retained in POS. The POS management plan will be prepared as a requirement of subdivision to the satisfaction of the Western Australian Planning Commission.

5.2 Fauna and Habitat

Habitat is generally limited due to the fragmented and degraded nature of the existing vegetation across the site. Key species of conservation significance which have been identified as potentially utilising habitat present at the site include Carnaby's Black Cockatoo and Baudin's Black Cockatoo.

Black Cockatoo's typically utilise areas of Banksia, Allocasuarina and Eucalyptus woodland, which can be found intermittently amongst the remnant vegetation areas across the site. The northwest corner of the site also contains potential habitat for some species of conservation significance, as well as other fauna species.

5.2.1 LSP Design Measures

The LSP is attached as Figure 10, and outlines the areas of vegetation and fauna habitat proposed for retention within the development. As is evident in this plan, the majority of the vegetation and habitat currently existing on the site will be retained in open space.

One of the key design initiatives, which underpins the environmental and aesthetic objectives of this project, is the retention and development of an ecological corridor, between the vegetated larger semi-rural blocks to the west, to the Moresby Ranges in the eastern portion of the site. This corridor will include the area of existing vegetation within the western portion of the development, with the objective of retaining this vegetation and enhancing the ecological integrity through revegetation and linking it with other areas of vegetation in open space.

This corridor will allow for the safe movement of fauna across the site, ensuring a continuous link between fauna habitats that are currently separated by agricultural land and increasing the overall fauna habitat viability of the landholding.

Large covenanted lots are also proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will ensure minimal clearing. Building envelopes will be strategically located in this portion of the site where vegetation is degraded or already cleared.

Overall, the majority of the existing vegetation is proposed for retention in Public Open Space, in large covenanted lots or as part of the Moresby Ranges open space. In addition individual and small clusters of trees will be retained where possible.

5.2.2 Other Management Measures

A POS Management Plan will be prepared at subdivision stage, prior to development, to be signed off by WAPC in consultation with the Local Authority and the DEC, which will provide details regarding:

- minimisation of clearing and vegetation disturbance during construction,
- access control (during construction and post-construction),
- revegetation species and establishment,
- weed control,
- dieback control and management,
- stormwater management,

- ongoing maintenance and management of the vegetated areas,
- protection of wetlands,
- fire management, and
- interface management.

This will ensure the long term protection and viability of the vegetation and associated fauna habitats retained in POS.

5.3 Wetlands

There are two areas of seasonal inundation within the site, which have been labelled as wetlands. These are situated in the southwest and the western edge of the site (Figure 6). The central eastern wetland will be retained in POS including a buffer of 30 m from the edge of the wetland to minimise edge effects from surrounding development. The southern wetland will also be entirely retained within POS, with a buffer varying from 0m to 30m from the edge of the wetland vegetation.

As outlined above, these wetlands have no current protection status and retain limited environmental value, however it is intended to retain and manage these wetlands as part of the development, with the allowance of passive open space within the buffer area.

Given the value of these wetlands, the application of these buffers along with some revegetation, and the commitment to retain and manage these areas for passive open space will likely result in a better environmental outcome.

Management measures for these wetlands will be detailed in the POS Management Plan.

5.4 Moresby Ranges

The WAPC prepared the *Moresby Range Management Strategy* in 2009 with the aim of protecting, enhancing and promoting the regional significance of the Moresby Range over the next 25 years.

In addition to this, the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning prepared the Moresby Range Management Plan in 2010, to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range.

The visual and landscape significance of the Range as a backdrop to Geraldton, and icon to the region, is recognised and discussed throughout both documents. Recognition of the biodiversity values and retention of these values within the Moresby Ranges is also recommended in these plans.

A specific set of recommendations applying to the site is outlined in Section 2 above. These recommendations in respect to environmental management are generalised and have been addressed through incorporation of the key objectives of this plan into the LSP. The Moresby Ranges will remain in ROS as part of this development, and will be retained and managed. Therefore the biodiversity values of the range will not be compromised. Further, management recommendations for

the foothills, in which the development portion of this site is part of, have been considered into the LSP design, and in this document.

In addition a specific visual and landscape assessment has been prepared for the site by EPCAD (2011) to determine limitations to development and to guide the preparation of the concept and structure plans. This provided a framework for the development of a development plan. This assessment concluded that:

“The development area of the site... will not be prominent in the landscape from contextual views, therefore the regionally important landscape of the scarp is not adversely affected from public viewpoints.” (EPCAD, 2011).

5.5 Acid Sulfate Soils

WAPC mapping indicates that the site contains a small area near the western edge of the site mapped as having a high risk of ASS (Figure 5).

In accordance with DEC guidelines, a Preliminary Site Assessment (PSA) will be undertaken prior to subdivision. Depending upon the results of the PSA, an Acid Sulfate Soil Assessment and Dewatering Management Plan will be prepared if required. This plan will be approved for implementation by the DEC prior to any ground disturbing works being undertaken.

5.6 Construction Impacts

Construction activities need to be managed to minimise the impact to adjacent residents, retained vegetation and wetlands. Impacts can include:

- Nuisance dust generation during bulk earthworks.
- Disturbance of Acid Sulfate Soils during earthworks and/or installation of services (if applicable).
- Silt and sediment run-off from uncontrolled run-off during site works.
- Inadvertent damage to trees and other vegetation earmarked for retention.
- Inappropriate disposal of waste building material and poor housekeeping on building sites leading to wind blown litter.

All of these potential impacts are manageable through appropriate engineering design and appropriate site management practices. Management of these potential impacts will be detailed in the POS Management plan for the protection of existing vegetation during construction, and through the provision of standard subdivision conditions on the subdivision approval.

5.7 Water Management

Infiltration within the site appears good with little current surface runoff. All additional runoff generated by the development will be contained within the site and disposed of through a network of infiltration basins integrated into POS.

AECOM has prepared a Local Water Management Strategy (LWMS) (2012) as part of the LSP submission. In accordance with the state government planning framework as outlined in *Better Urban Water Management* (BUWM) (WAPC, 2008), an LWMS is required for a local planning scheme amendment (or rezoning) application. The LWMS is attached to the LSP submission.

The LWMS details a conceptual stormwater management strategy, for the appropriate management of stormwater following development of the site, through the provision of safe conveyance of excess runoff from minor and major storm events. The stormwater management system has been prepared in accordance with the expectations of the DoW and the CoGG. Preliminary sizing of infiltration basins has also been provided, along with a groundwater management strategy.

Specific details on the management measures for water across the proposed development are outlined in the LWMS, attached to the planning submission.

Urban Water Management Plans (UWMP) will be required to accompany the subsequent development applications. This LWMS has been prepared for approval by the Western Australian Planning Commission (WAPC) on the Department of Water's (DoW) advice as part of the Local Planning scheme amendment endorsement and shall also be submitted for approval to the CoGG (AECOM, 2012).

The LWMS is attached to the LSP documentation.

5.8 Erosion and On-site Effluent Disposal

As detailed in Section 3.2.3, the following land capability units and their suitability for development and on-site effluent disposal can be summarised in the following table:

Table 6: Land Capability of the Soil Units On-site

	<i>Ysp</i>	<i>Mf2</i>	<i>Mf1</i>	<i>Ty</i>
<i>Housing and Road Construction suitability</i>				
Wind Erosion Hazard	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>
Water Erosion Hazard	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Ease of Excavation	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Foundation Soundness	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>
Slope instability risk	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>
Flood Hazard	-	-	-	-
<i>Onsite Effluent Disposal</i>				
Microbial purification ability	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>
Soil absorption	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>

ability				
---------	--	--	--	--

This indicates a general suitability for development and on-site effluent disposal, with some management potentially required for possible erosion issues, particularly for the steeper slopes associated with the foothills in the eastern portion of the site.

The Moresby Range Management Strategy (WAPC, 2009) recommends minimising clearing, limiting use, appropriate boundary allocation and revegetation. The steepest portion of the foothills within the site have been excluded from the development area to ensure that development and general use of these areas are excluded from any development or public use (Figure 10). Some revegetation will also be undertaken within the foothills outside the development area, where considered applicable, and where the soils are conducive to plantings. This will be detailed further in the POS Management Plan. Other specific management measures relative to potential water erosion and runoff will be detailed in the Local Water Management Strategy.

6.0 IMPLEMENTATION STRATEGY

The key environmental considerations for the site relate to vegetation and fauna and habitat. The findings and conclusions from this assessment are presented above.

Detailed management strategies will be determined through the POS Management Plan identified above, prepared through an appropriate schedule in the Local Structure Plan, to be approved by the Local Authority. This will provide statutory assurance that this plan will be completed in accordance with the objectives outlined above, as the CoGG Local Planning Scheme states that development must be in accordance with an approved Structure Plan. Therefore Proposed draft Local Structure Plan provisions are included in Appendix G.

6.1 Vegetation

Approximately 34% of the site is proposed for retention in Public Open Space, which includes almost all existing remnant vegetation located across the site.

Degraded land at the site which is identified as POS is proposed to be rehabilitated through the planting of locally endemic species.

To ensure the future viability of retained vegetated and revegetated areas, the management strategies which will be implemented will include delineation of retained vegetation, management of stormwater flow and preparation of a POS Management Plan.

6.2 Fauna and Habitat

Viability of fauna habitat is directly linked to the viability of the remnant vegetation across the site. Therefore the management measures pertaining to the retention and rehabilitation of the remnant vegetation across the site will ensure the long term sustainability of the existing fauna habitat.

Approximately 30% of the site is proposed for retention in POS, which includes almost all existing remnant vegetation located across the site, and also includes the formation of an ecological corridor between the vegetated larger semi-rural blocks to the west and the Moresby Ranges in the eastern portion of the site.

To ensure the future viability of retained habitat a POS Management Plan will detail specific management strategies to the satisfaction of the Local Authority in consultation with the DEC.

6.3 Additional Environmental Management Items

Please refer to the other accompanying reports appended to the LSP submission for the LWMS, prepared by AECOM (2012). A Preliminary Acid Sulfate Soil Investigation will be undertaken prior to subdivision.

7.0 REFERENCES

AECOM, (2012), *Moresby Heights Local Water Management Strategy*, prepared for Sutcliffe Road Joint Venture. AECOM, Geraldton.

Bureau of Meteorology, (2011) *Climate of Geraldton*, Overview [Online] <http://www.bom.gov.au/wa/geraldton/climate.shtml>

Coterra Environment (2011) *Level 1 Flora and Vegetation Survey of Moresby Heights*. Coterra, Perth

Department of Agriculture and Food, (2011) *Declared Plants Database* [Online] http://agspsrv95.agric.wa.gov.au/dps/version02/01_plantsearch.asp

Department of Agriculture, Dye R.A., Van Vreeswyk A.M.E., and Moore G.A, (1990) *Geraldton rural-residential land capability study - Land Resources Series No. 4*, Department of Agriculture, Perth, W.A.

Department of Environment and Conservation and the West Australian Herbarium (2006) *FloraBase*. [Online] <http://florabase.calm.wa.gov.au>

Department of Environment and Conservation. (2001-2010). *Contaminated Sites Management Series*. DEC, Perth.

Department of Environment and Conservation, Contaminated Sites Database [Online] <https://secure.dec.wa.gov.au/idelve/css/>

Department of Indigenous Affairs. (2001) [Online] <http://www.dia.wa.gov.au/>

Department of Sustainability, Environment, Water, Population and Communities (2010) *Environment Protection and Biodiversity Conservation Act 1999*, Overview [Online] <http://www.environment.gov.au/epbc/about/index.html> (Accessed 02/09/2010).

Department of Minerals and Energy (1986). *Serpentine sheet (Jordan JE 1986b Serpentine Sheet part of Sheets 2033 II and 2133 III. Environmental Geology Series. Geological Survey of Western Australia, Perth, Western Australia.)*

Desmond & Chant (2001) *Geraldton Sandplains 2 (GS2 Geraldton Hills Subregion)* DEC, Perth.

Environmental Protection Act 1986 Environmental Protection Authority (1998) *EPA Bulletin 891 - Geraldton Region Plan*, EPA, Perth

Environmental Protection Authority (2004) *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*. Environmental Protection Authority, Perth.

Environmental Protection Authority (2005) - *Guidance Statement No. 3 for the separation distances between industrial and sensitive land uses*. Final Guidance No. 3. Environmental Protection Authority, Perth.

Environmental Protection Authority (2008) - *Guidance Statement No. 33: Environmental Guidance for Planning and Development*. Environmental Protection Authority, Perth.

Geological Survey of Western Australia (1971) Geraldton - Houtman Abrolhos 1:250,000 Geological Series, Sheet SH 50-1 and Part of Sheet SH 49-4.

Geological Survey of Western Australia (2001) Howatharra 1:50000 Regolith - Landform Resource Series Sheet 1840 - IV First Edition

GHD (2006) *Humphrey Land Developments: 80 & 81 Hackett Road, Waggrakine, Environmental Assessment*. GHD, Perth

GHD (2007) *Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine*. GHD, Perth

Keighery, B.J. (1994). *Bushland Plant Survey: a Guide to Plant Community Surveys for the Community*. Wildflower Society of Western Australia (Inc.) Nedlands, Western Australia

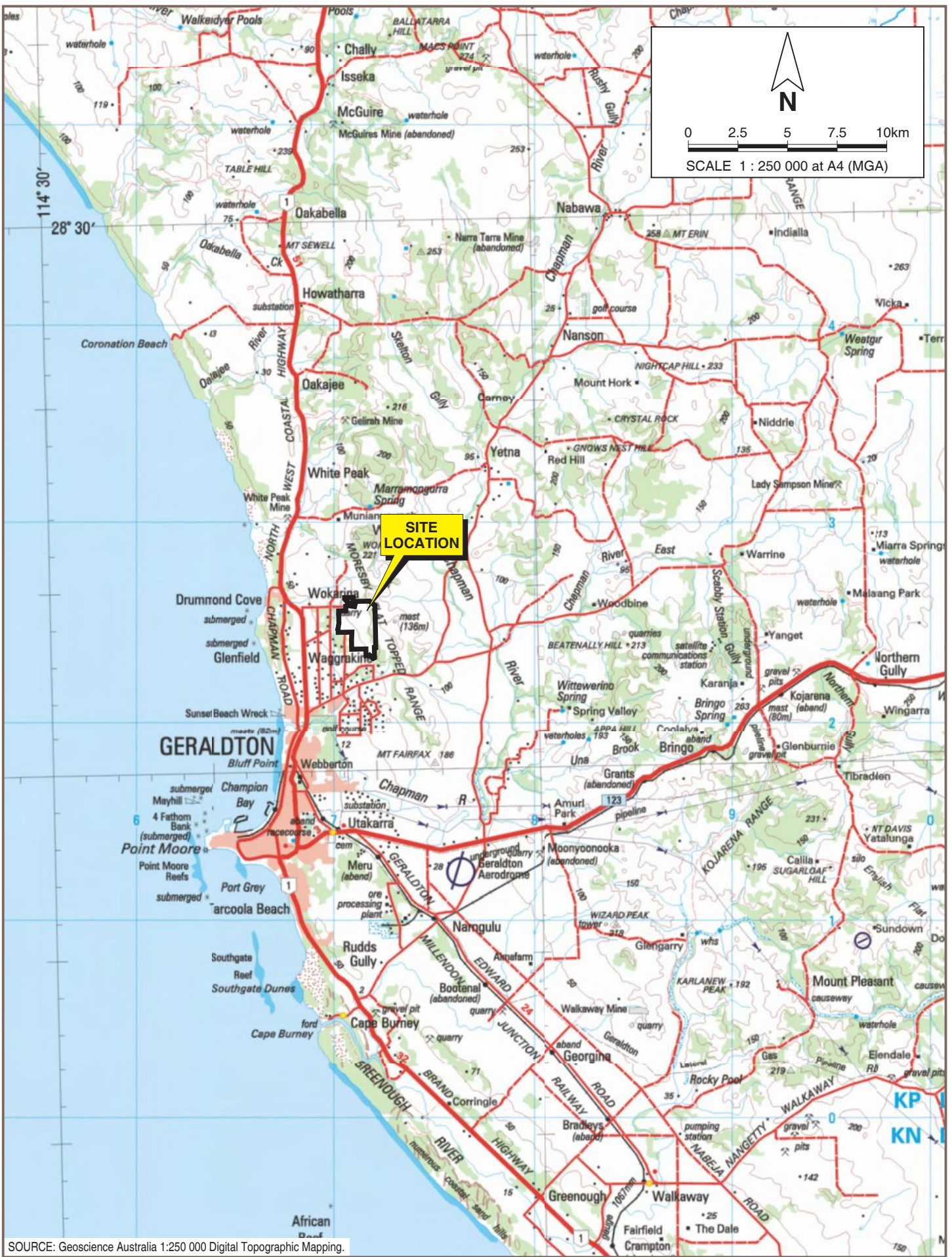
Landgate -Hydro (polygon) data feature (2011) - Accessed online at:
<https://www2.landgate.wa.gov.au/bmvf/app/waatlas/>

Thackway, R. & Cresswell I. D. 1995, *An Interim Biogeographical Regionalisation for Australia: a Framework for Setting Priorities in the National Reserves System Cooperative Program*, Australian Nature Conservation Agency, Canberra, ACT.

Western Australian Planning Commission (2010) *Geraldton Regional Flora and Vegetation Survey*. WAPC, Perth

Western Australian Planning Commission (2009) *Moresby Range Management Strategy*, WAPC, Perth

FIGURES



SOURCE: Geoscience Australia 1:250 000 Digital Topographic Mapping.

COTERRA
ENVIRONMENT

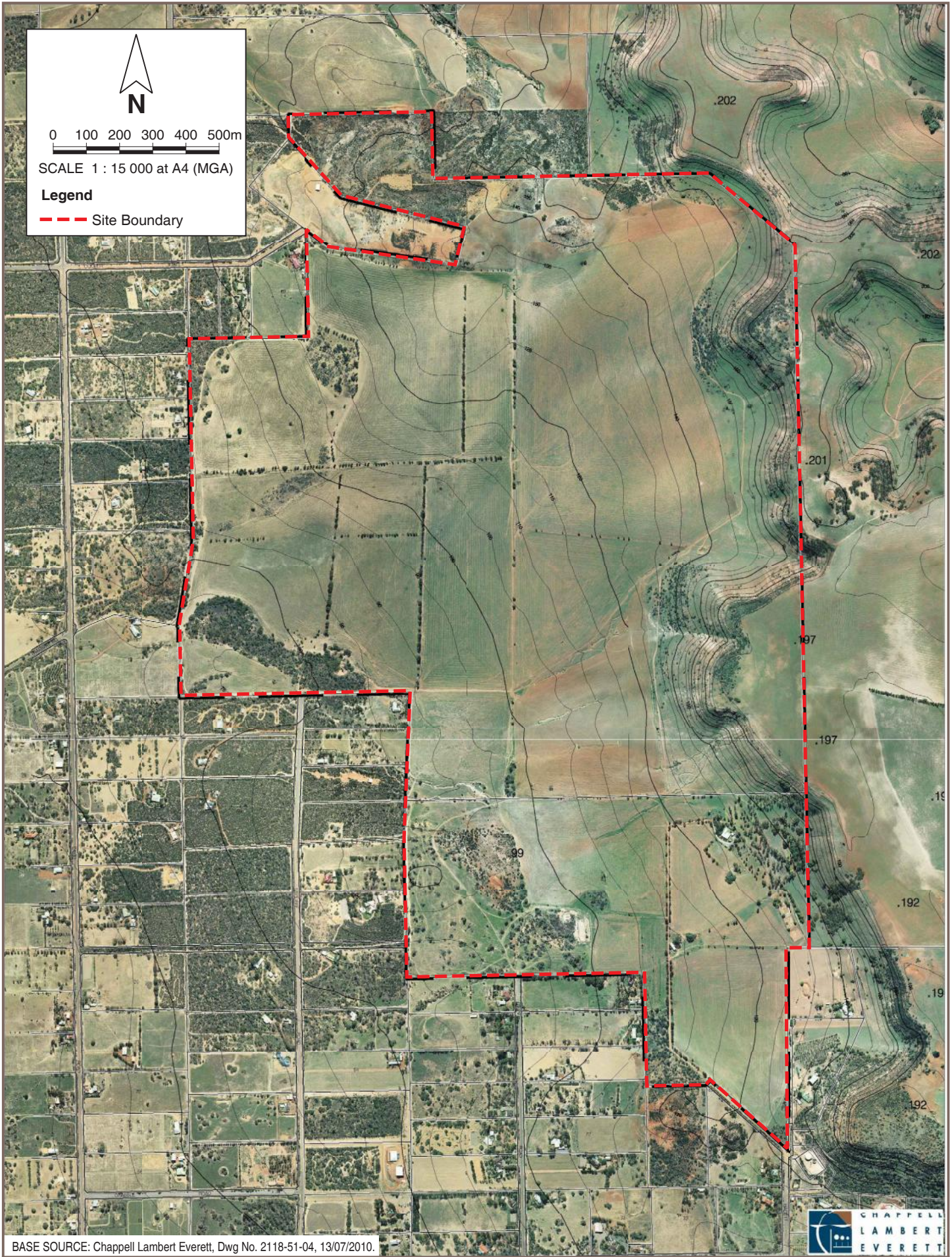
Humfry Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON


Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

SITE LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f01.dgn




N

0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend

- - - Site Boundary

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



COTERRA
ENVIRONMENT

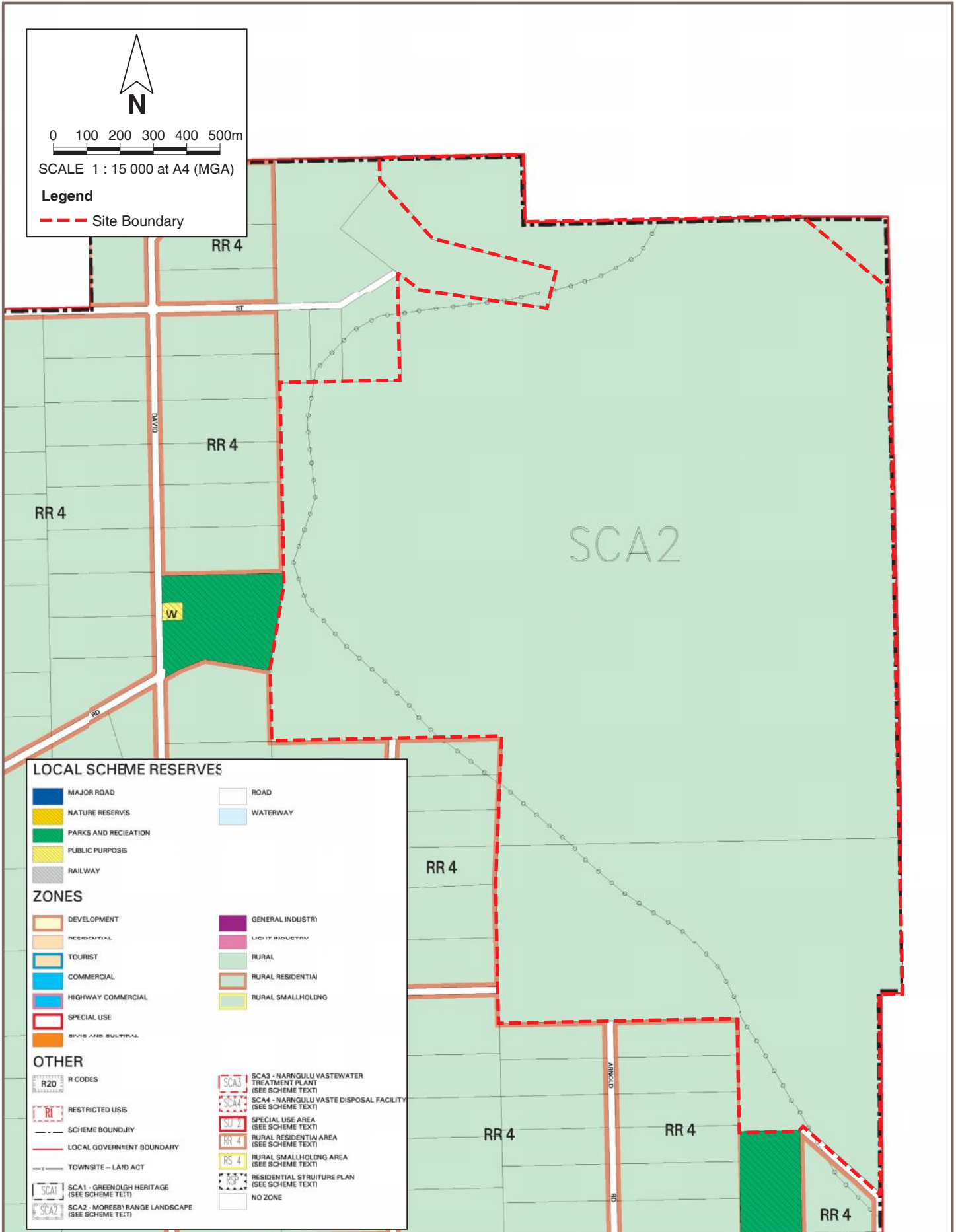
Humfrey Land Developments
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
 GERALDTON

Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

AERIAL PHOTOGRAPH

Figure 2

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f02.dgn



SOURCE: Department of Planning, February 2011.

COTERRA
ENVIRONMENT

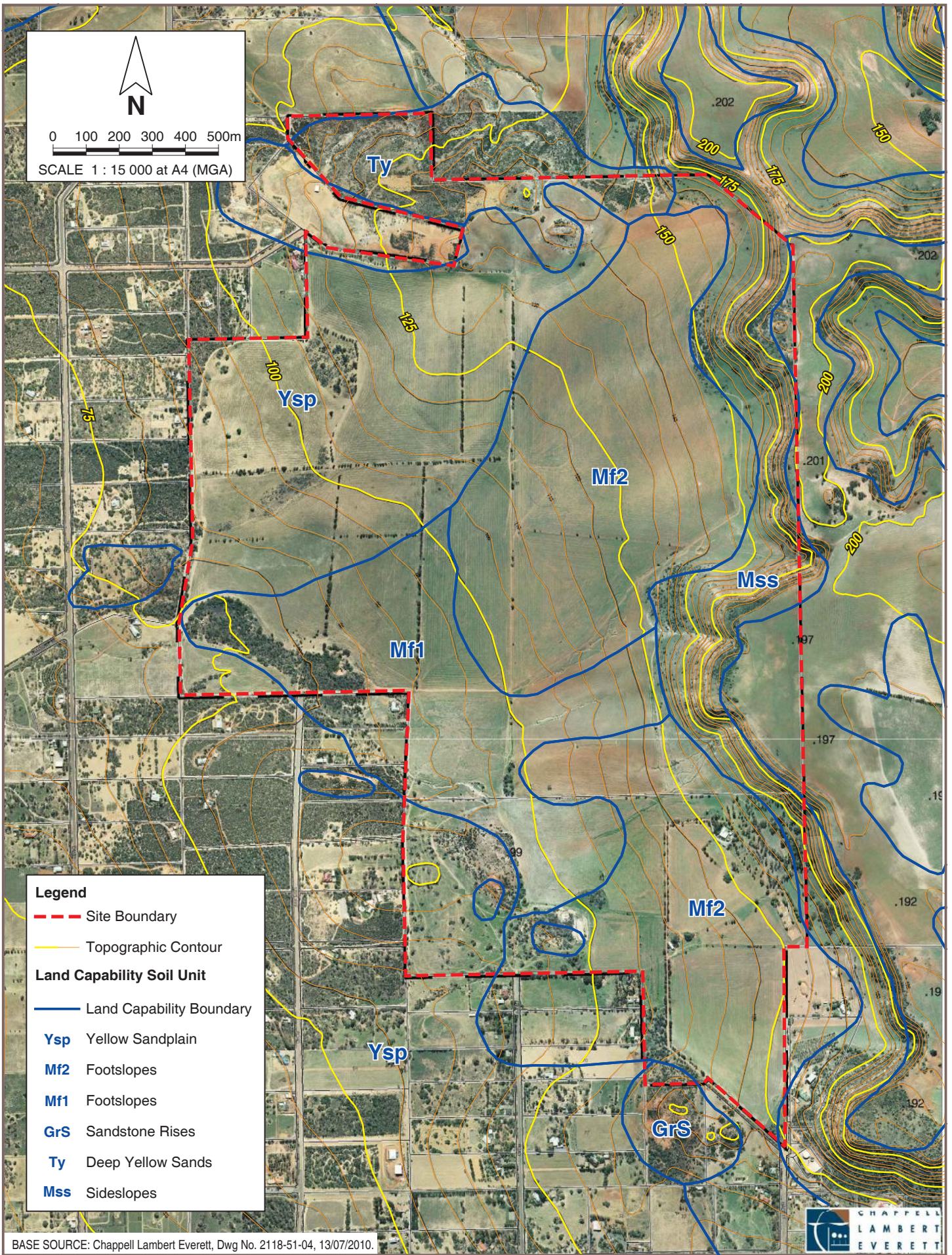
Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers
Date: 17 Jan 2013
Job: HUMMOR02
Revision: A

**CITY OF GERALDTON-GREENOUGH
LOCAL PLANNING SCHEME ZONING**

Figure 3

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f03.dgn



Legend

- - - Site Boundary
- Topographic Contour

Land Capability Soil Unit

- Land Capability Boundary
- Ysp** Yellow Sandplain
- Mf2** Footslopes
- Mf1** Footslopes
- GrS** Sandstone Rises
- Ty** Deep Yellow Sands
- Mss** Sideslopes

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f04.dgn

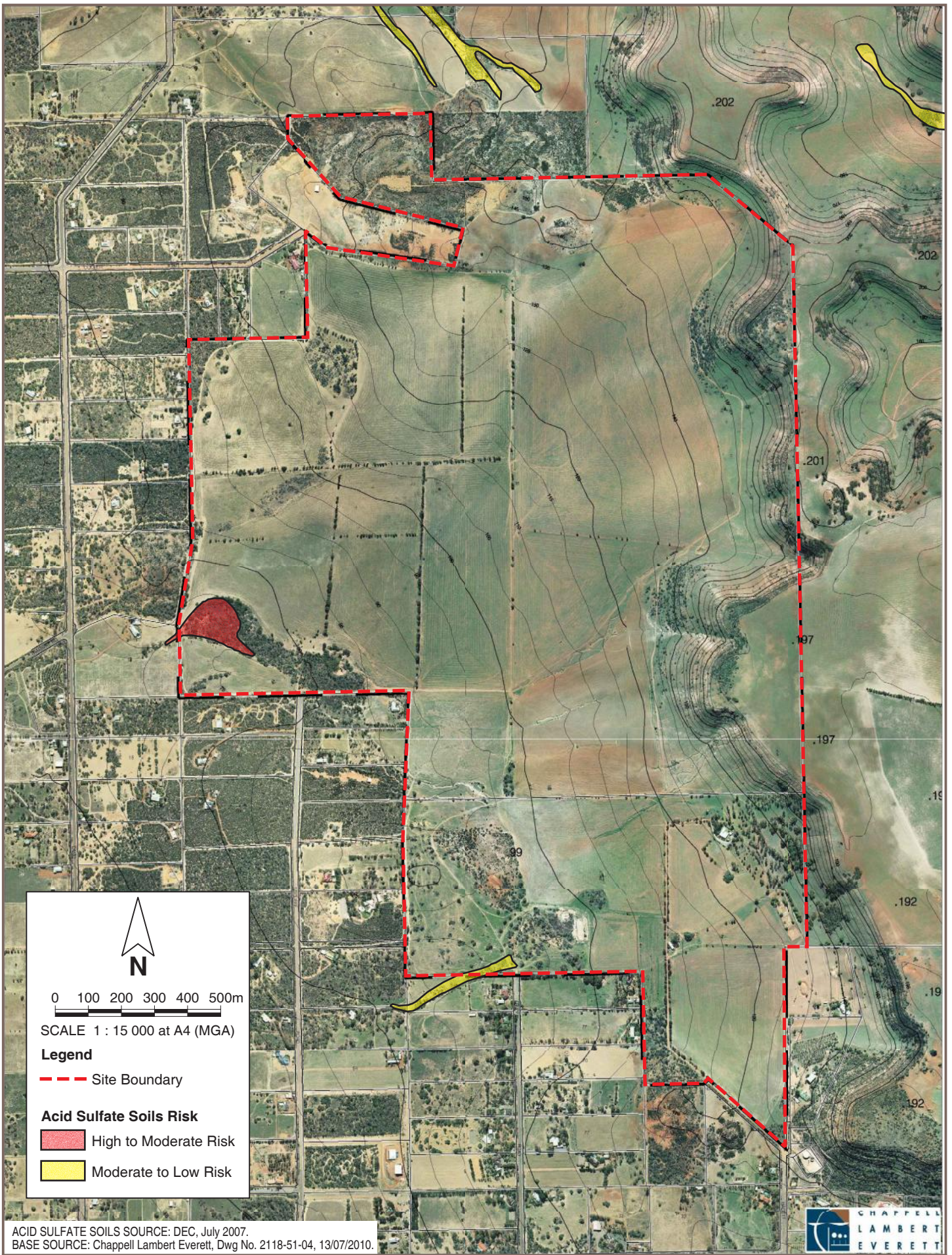
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON


Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A


**TOPOGRAPHY AND LAND CAPABILITY
SOIL UNITS**

Figure 4



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f05.dgn


N


 0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend


- - - Site Boundary

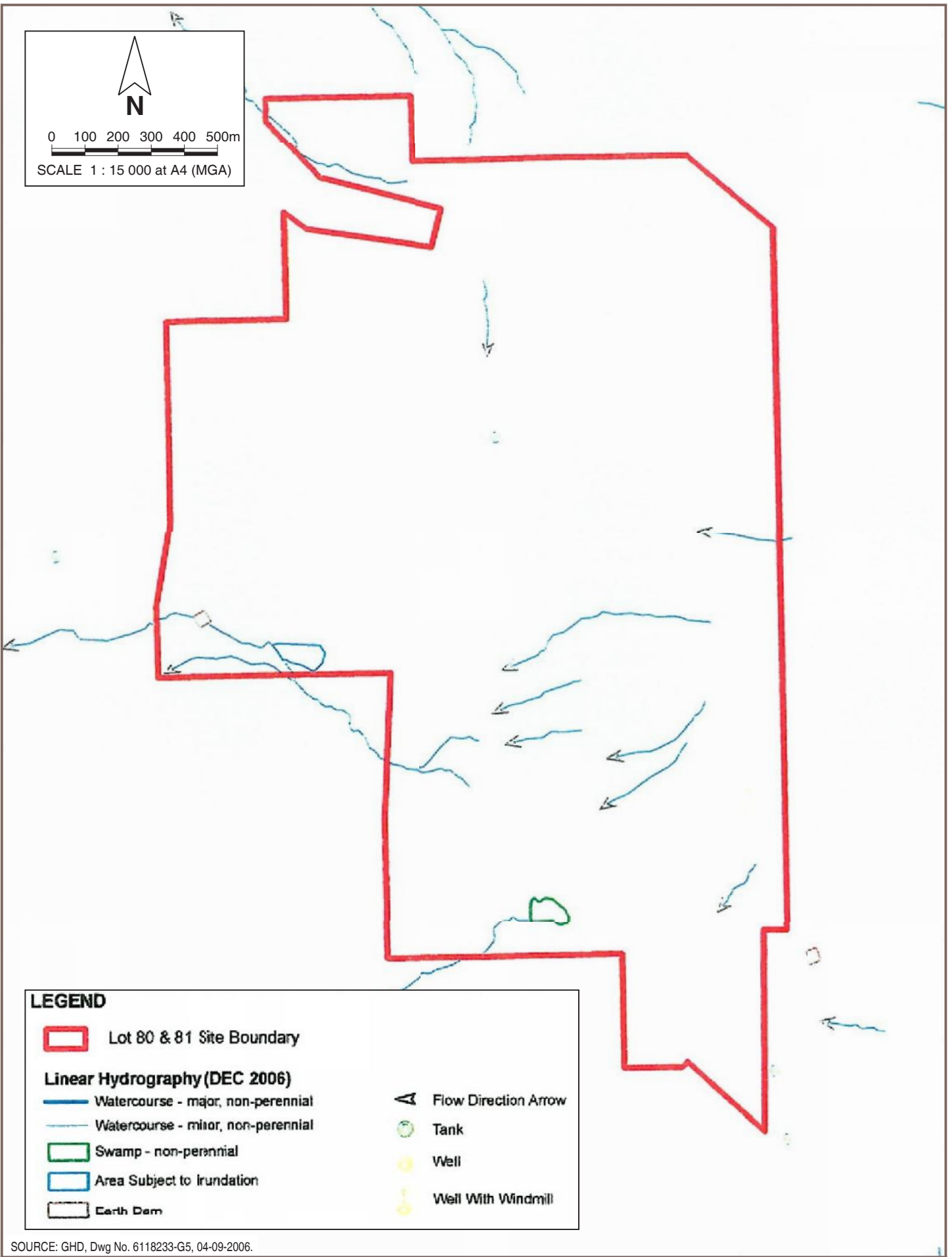
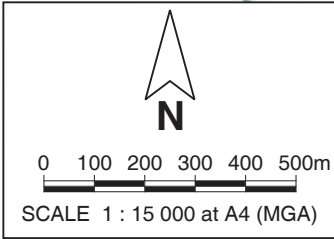
Acid Sulfate Soils Risk

- High to Moderate Risk
- Moderate to Low Risk

ACID SULFATE SOILS SOURCE: DEC, July 2007.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON	Figure 5
Drawn: L. Rogers	Date: 17 Jan 2013	ACID SULFATE SOILS	
Job: HUMMOR02	Revision: A		



LEGEND

- Lot 80 & 81 Site Boundary
- Linear Hydrography (DEC 2006)**
- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to Irrigation
- Earth Dam
- ↖ Flow Direction Arrow
- Tank
- Well
- Well With Windmill

SOURCE: GHD, Dwg No. 6118233-G5, 04-09-2006.

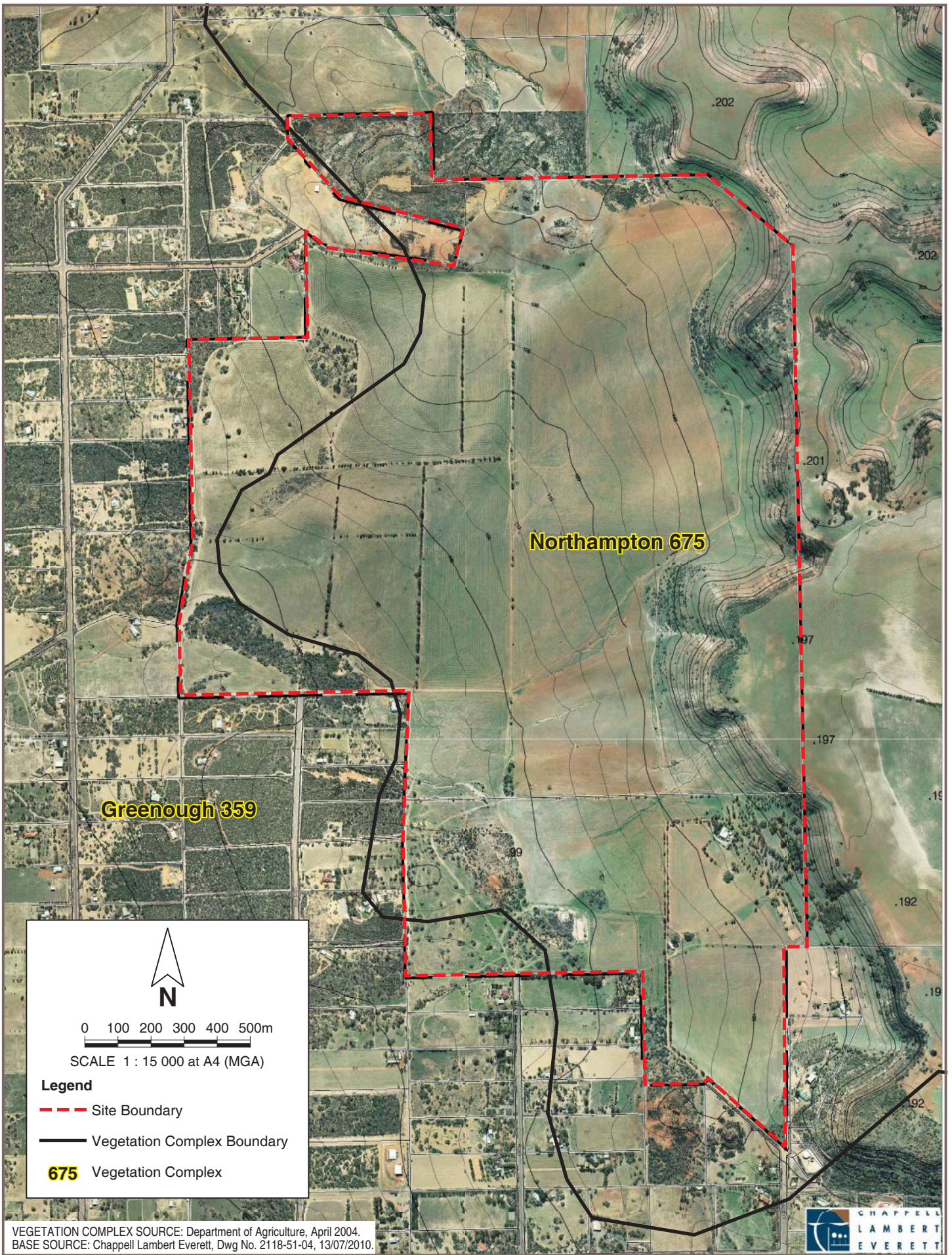
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

WETLANDS AND SURFACE WATER FLOW

Figure 6



N

0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend

- - - Site Boundary
- Vegetation Complex Boundary
- 675** Vegetation Complex

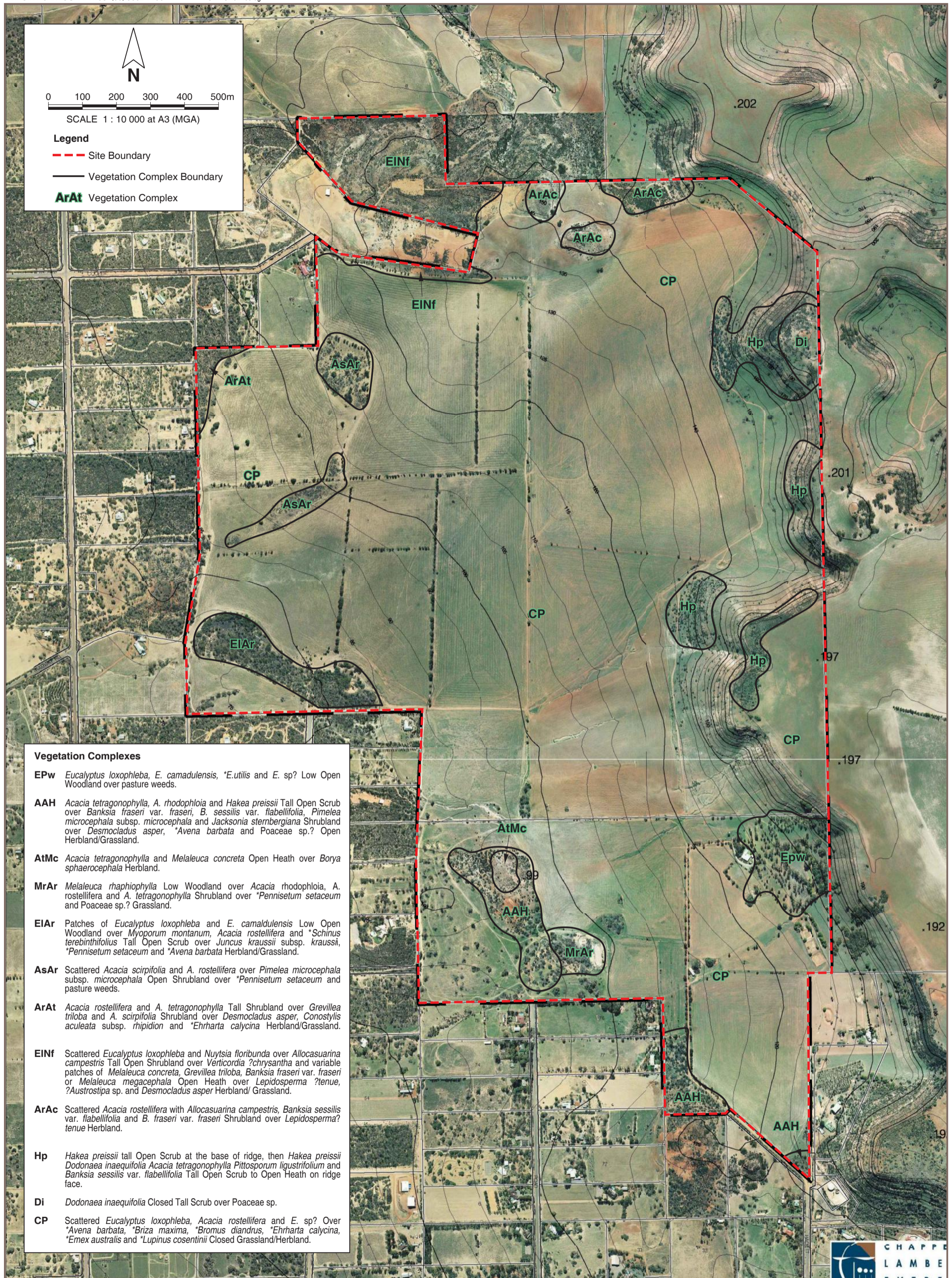
VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



HUMMOR02-607.dgn

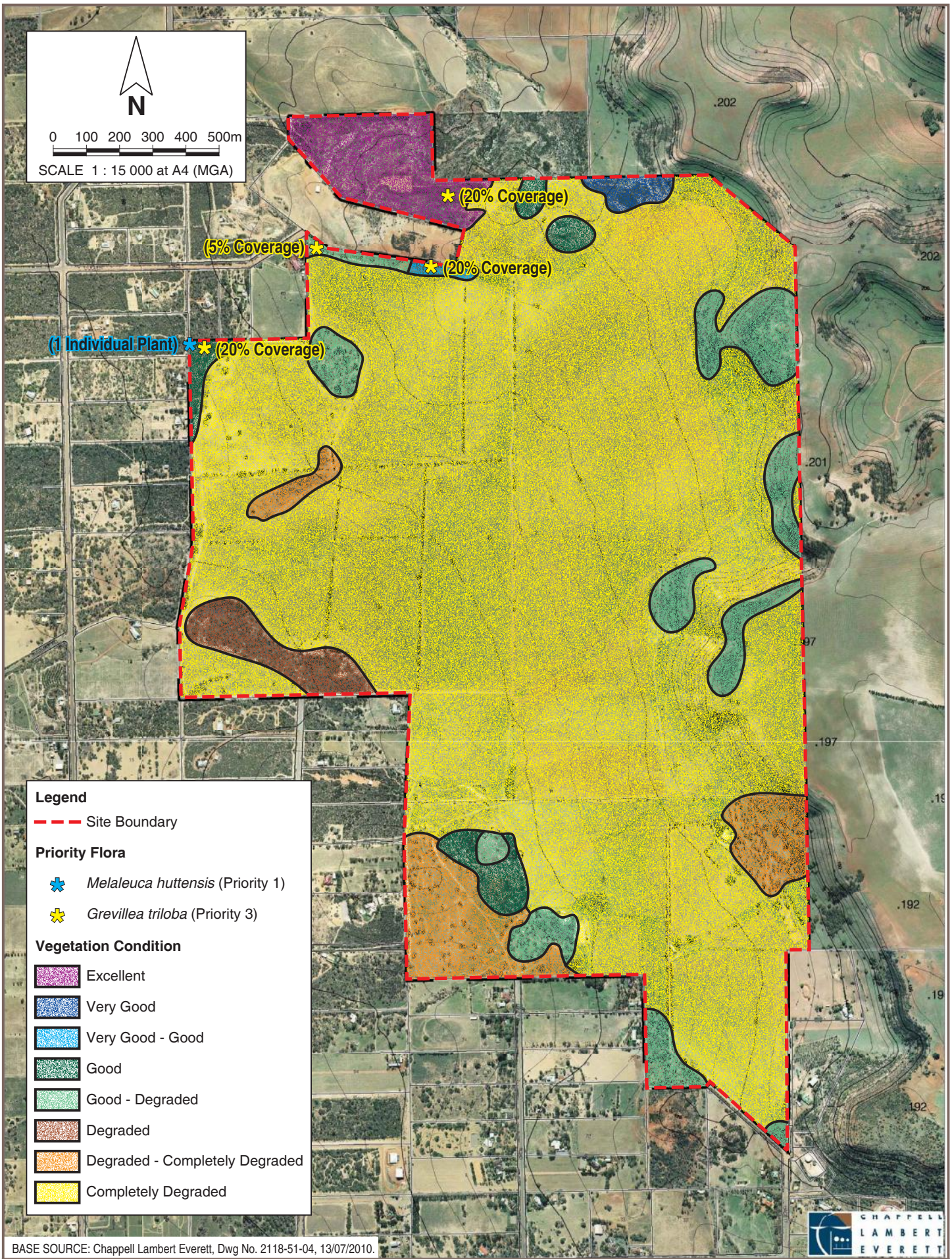
 PINPOINT CARTOGRAPHICS (08) 9562 7136

		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON	Figure 7
Drawn: L. Rogers	Date: 17 Jan 2013	REGIONAL VEGETATION COMPLEXES	
Job: HUMMOR02	Revision: A		



Vegetation Complexes

- EPw** *Eucalyptus loxophleba*, *E. camadulensis*, **E. utilis* and *E. sp?* Low Open Woodland over pasture weeds.
- AAH** *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia stembergiana* Shrubland over *Desmocladius asper*, **Avena barbata* and *Poaceae sp?* Open Herbland/Grassland.
- AtMc** *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland.
- MrAr** *Melaleuca rhapsiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostelifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and *Poaceae sp?* Grassland.
- EAIR** Patches of *Eucalyptus loxophleba* and *E. camadulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostelifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.
- AsAr** Scattered *Acacia scirpifolia* and *A. rostelifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds.
- ArAt** *Acacia rostelifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmocladius asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
- EINF** Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenua*, **Austrostipa sp.* and *Desmocladius asper* Herbland/Grassland.
- ArAc** Scattered *Acacia rostelifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland.
- Hp** *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
- Di** *Dodonaea inaequifolia* Closed Tall Scrub over *Poaceae sp.*
- CP** Scattered *Eucalyptus loxophleba*, *Acacia rostelifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland.



Legend

--- Site Boundary

Priority Flora

- ★ *Melaleuca huttensis* (Priority 1)
- ★ *Grevillea triloba* (Priority 3)

Vegetation Condition

- Excellent
- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f09.dgn

COTERRA
ENVIRONMENT

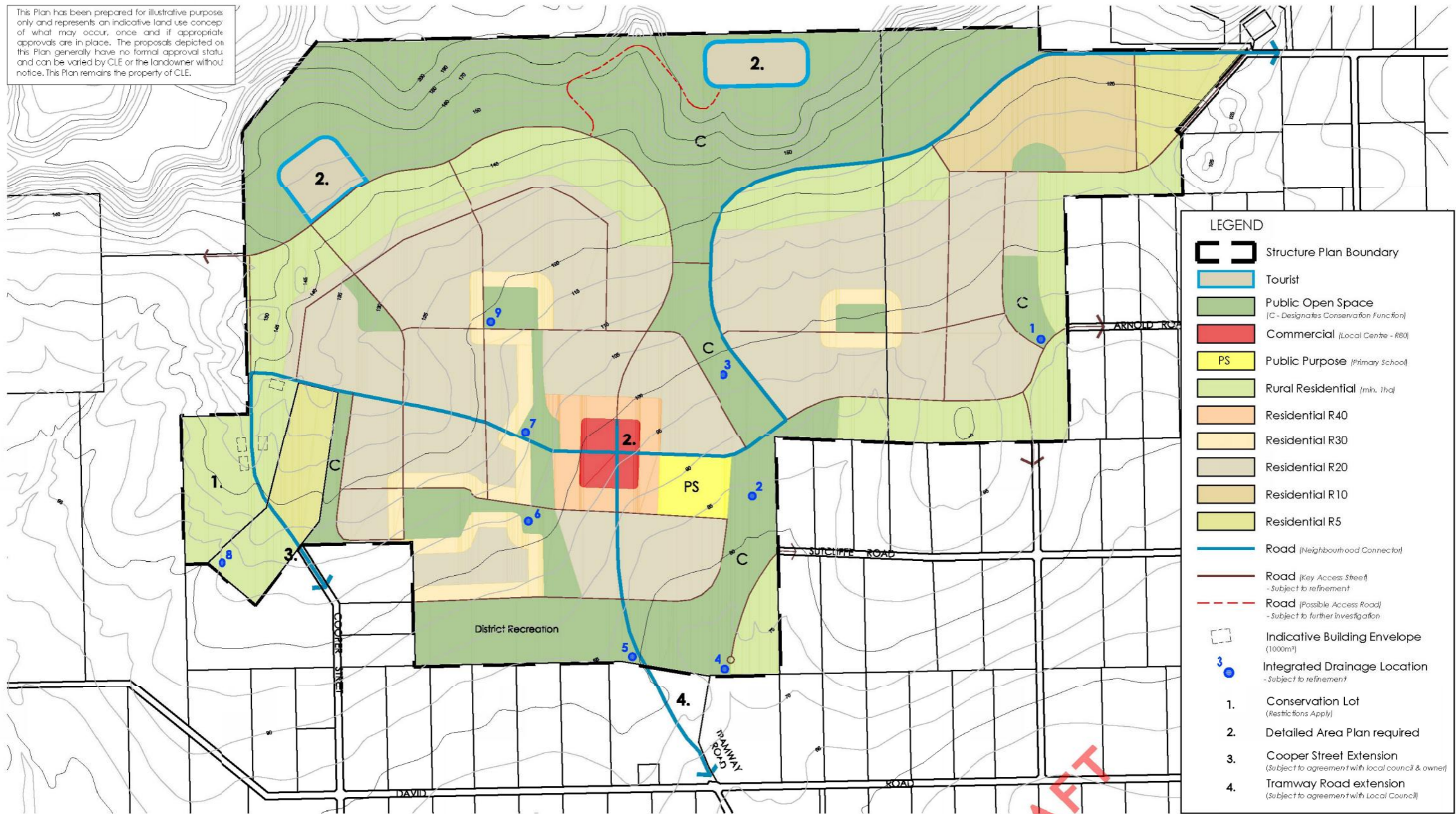
Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA

Figure 9

This Plan has been prepared for illustrative purposes only and represents an indicative land use concept of what may occur, once and if appropriate approvals are in place. The proposals depicted on this Plan generally have no formal approval status and can be varied by CLE or the landowner without notice. This Plan remains the property of CLE.



LEGEND

- Structure Plan Boundary
- Tourist
- Public Open Space
(C - Designates Conservation Function)
- Commercial *(Local Centre - R80)*
- PS Public Purpose *(Primary School)*
- Rural Residential *(min. 1ha)*
- Residential R40
- Residential R30
- Residential R20
- Residential R10
- Residential R5
- Road *(Neighbourhood Connector)*
- Road *(Key Access Street)*
- Subject to refinement
- Road *(Possible Access Road)*
- Subject to further investigation
- Indicative Building Envelope *(1000m²)*
- Integrated Drainage Location
- Subject to refinement
- 1. Conservation Lot
(Restrictions Apply)
- 2. Detailed Area Plan required
- 3. Cooper Street Extension
(Subject to agreement with local council & owner)
- 4. Tramway Road extension
(Subject to agreement with Local Council)



DRAFT

COTERRA ENVIRONMENT		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON
Drawn: L. Rogers	Date: 14 Jan 2013	DRAFT LOCAL STRUCTURE PLAN
Job: HUMMOR02	Revision: A	

Figure 10

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f10.dgn

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-90L-01, 05/12/2012.

**APPENDIX A - Priority Flora Survey for Lots 80 & 81 Hackett Road (GHD,
2007)**

**Humfrey Land
Developments**

**Report for Lots 80 & 81 Hackett
Road, Waggrakine Priority Flora
Survey**

**Addendum to September 2006
Environmental Assessment**

February 2007

Contents

1. Introduction	1
1.1 Background	1
1.2 Scope of Works	1
2. Desktop Review	2
2.1 Vegetation Composition	2
2.2 Priority Flora In the Vicinity	2
2.3 Threatened Ecological Communities In the Vicinity	4
3. Targeted Flora Survey	5
3.1 Methodology	5
3.2 Site Vegetation Condition	5
3.3 Site Flora	6
4. Conclusions	8
5. Limitations of this Report	9
5.1 Survey Limitations	9
5.2 Report Limitations	9
6. References	10

Table Index

Table 1	Regional Assessment of Vegetation Extent	2
Table 2	Threatened and Priority Flora	3
Table 3	Government of Western Australia (2000) Vegetation Condition Scale	6
Table 4	Priority Species Located on Site	6

Figure Index

Figure 1	Location Map
Figure 2	Site Aerial and Proposed Lot Layouts
Figure 3	Priority Flora
Figure 4	Vegetation Condition

Appendices

- A DEC Priority Flora Search Results**
- B Site Photos**
- C Flora Species Recorded on Site**

1. Introduction

1.1 Background

Humfrey Land Developments (HLD) are proposing to develop a rural residential subdivision on Lots 80 and 81 Hackett Road, Waggrakine (the Site). The Site comprises two separate parcels of land, totalling an area of approximately 380 hectares (refer to Figure 1).

HLD previously requested GHD Pty Ltd (GHD) to undertake an environmental appraisal of the site in relation to the proposed development. GHD issued a report to HLD in September 2006 entitled "Lots 80 and 81 Hackett Road: Environmental Assessment", with the following recommendation for further work:

The following additional issues will require further assessment prior to finalising a development concept, and managed where the assessment suggest management is required:

- ▶ *Effluent disposal;*
- ▶ *Rare flora;*
- ▶ *Acid sulfate soils – only if excavation near wetlands is required; and*
- ▶ *Unexploded Ordinance.*

1.2 Scope of Works

In response to the recommendations of the September 2006 Environmental Assessment, HLD requested GHD to undertake a Priority Flora survey on the Site.

The scope of works involved:

- ▶ A desktop review, in particular a search of the DEC Threatened (*Declared Rare*) Flora (TFD) and the *Western Australian Herbarium Specimen (WAHERB)*, as well as the *Declared Rare and Priority Flora (DR&PF)* list. This information is attached at **Appendix A**;
- ▶ Targeted Priority Flora Survey;
- ▶ Herbarium verification of actual and potential Priority Flora; and
- ▶ Reporting.

The September 2006 report provides some comments regarding the likelihood of priority flora existing on the Site, but this addendum provides a more full response. This addendum should now form part of the existing September 2006 Environmental Assessment Report.

2. Desktop Review

2.1 Vegetation Composition

The composition of remnant native vegetation in the project area was interpreted from mapping conducted by Beard (1976). According to this mapping, the project area was originally likely to contain two vegetation communities being: Shrublands; mixed thicket (*Melaleuca* and *Hakea*) and Shrublands on the higher ground; and *Acacia* and *Banksia* scrub on the western portion of the Site.

The relative importance of conserving remnant native vegetation in the project area at a regional scale was determined via the analysis of aerial photos by Shepherd (*pers comm*, 2006), the dataset has been archived as the 2005 vegetation extent. The results of the Vegetation Association assessment for the Geraldton Sandplains IBRA (Interim Biogeographic Regionalisation for Australia) area are summarised in Table 1.

Table 1 Regional Assessment of Vegetation Extent

Vegetation Association	Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining (2005)
675	Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51,854	10,989	21.2
359	Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub.	44,412	8,383	18.9

The Environmental Protection Authority (EPA), has established through Position Statement No. 2, (*Environmental Protection of Native Vegetation in Western Australia*), the "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level. This is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type (EPA, 2000).

In the case of those Vegetation System Associations detailed in Table 1 above, less than 30% of the original regional extent remained intact as at 2005. Clearing of such vegetation may be considered contradictory to the EPA's recommendations stated in Position Statement No. 2. However, much of the Site proposed to be developed has been historically cleared of native vegetation for agricultural purposes, also several areas of remnant bushland (also degraded by past agricultural activities) are proposed to be set aside in Public Open Space (POS), as identified in Figure 2.

2.2 Priority Flora in the Vicinity

A search was undertaken through the Department of Environment and Conservation (DEC) Threatened (*Declared Rare*) Flora Database (TFD) and the *Western Australian Herbarium Specimen* (WAHERB) database for species of rare and priority flora located within the vicinity of the Site. Species found have been listed and described in Table 2.

Table 2 Threatened and Priority Flora

Species	Conservation Category	Database	Description (FloraBase, 2006)
<i>Drummondia ericoides</i>	DRF	TFD	Divaricately branched shrub, 0.3–1 m high. Fl. yellow, white, violet, purple, Sep–Oct. Rocky places.
<i>Verticordia penicillaris</i>	P4	TFD WAHERB	Low spreading shrub, 0.15–0.3 m high, to 1 m wide. Fl. cream, yellow, Sep–Oct. Shallow gritty soils. Granite outcrops.
<i>Eucalyptus bleasdelii</i>	DRF	TFD WAHERB	Mallee, 1–4 m high, bark smooth. Fl. white, cream, Aug–Nov. Grey sand, clay. Rocky hillsides, creek flats.
<i>Acacia guiretli</i>	P4	WAHERB	Spreading to straggling or erect & spindly shrub, 0.3–2(–2.5) m high. Fl. yellow, Jun–Sep. Rocky loam, lateritic gravelly soils. Stony hills.
<i>Thryptomene stenophylla</i>	P2	WAHERB	Spreading shrub, 0.3–1.2 m high. Fl. pink, purple, Jun–Aug. Red or yellow sand, loam. Limestone hills, sandplains.
<i>Grevillea triloba</i>	P3	WAHERB	Diffuse or spreading shrub, (0.4–)0.9–1.5(–2.5) m high. Fl. white, pink, Jun–Oct. Sandy loam on sandstone or limestone, lateritic soils.
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3	WAHERB	Open shrub, 0.4–1.3 m high. Fl. pink, white, Sep–Dec. Sandy gravelly soils.
<i>Vittadinia cervicularis</i> var. <i>occidentali</i>	P1	WAHERB	Annual, herb, more than 0.3 m high. Fl. white, purple, blue, Aug–Sep.
<i>Melaleuca huttensis</i>	P1	WAHERB	Upright shrub, to 3 m high, bark gnarled, white to grey. Fl. cream, yellow, Jun–Sep. Light yellow or beige sand. Lower slopes of undulating plains, sandplains.
<i>Eucalyptus dimiruta</i>	P4	WAHERB	Mallee, 1.7–5 m high. Fl. white, cream, Jul–Nov. Sandy clay, white/grey sand, often over laterite. Sandplains, near swampy areas.
<i>Eucalyptus cupree</i>	DRF	WAHERB	Mallee, 2.5–5 m high, bark rough to 1.5 m, box-type. Fl. white, Aug–Nov. Shallow soils over granite.
<i>Thryptomene</i> sp. <i>Moresby Range</i>	P3	WAHERB	Spreading shrub, 0.3–1 m high. Fl. pink, Jul–Sep. Light brown loam, clay loam, sandy clay, sandstone. Hillsides & summits.

Conservation Category Key:

- DRF Declared Rare Flora, taxa which are deemed to be in the wild rare, in danger of extinction, or otherwise in need of special protection and have been declared under the Wildlife Conservation Act 1960 to be "rare flora".
- P1 Taxa known from only one, or a few populations which are under threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P2 Taxa known from only one, or a few populations, at least some of which are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P3 Taxa which are known from several populations, and the taxa are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.

P4 Taxa which are considered to have been adequately surveyed and which, whilst being rare, are not currently threatened by any identifiable factors.

DEC also provided results from a search of their *Declared Rare and Priority Flora (DR&PF)* list. The species in this list are those known to exist in the general Geraldton region and surrounds, and not to this project Site specifically.

The results of these searches are attached at **Appendix A**.

The previous report considered the possibility of these species being found on Site was low due to the degraded nature of the land and continued disturbance through grazing activities, however, the DEC search did indicate that priority species were previously located on Site, refer to Figure 2.

2.3 Threatened Ecological Communities in the Vicinity

A search of the CALM Threatened Ecological Community (TEC) database was undertaken. No known occurrences of threatened ecological communities have been recorded within the Site boundaries.

CALM further advised that there are known occurrences of the priority ecological community referred to as "*Melaleuca megacephala* and *Hakea pycnonera* thickets on the Moresby Range" within 10 kilometres of the Site.

3. Targeted Flora Survey

3.1 Methodology

A site visit was conducted by GHD on 11th August 2006 as part of the original environmental assessment work. A further site visit was conducted on the 21st September 2006 to survey the area for priority flora known to exist in the vicinity, as per the CALM search results. A final inspection was undertaken on the 21st December 2006 to review the Priority Flora populations.

The site was inspected on foot and by vehicle for the CALM listed Priority Flora species. Other common native species were recorded, but a full flora survey of the Site was not undertaken. The survey particularly focused on bushland areas to the west of the Site in or adjacent to proposed development areas. No detailed survey was undertaken of the escarpment, plateau or bushland area to the north, as these locations are proposed to be set aside in Public Open Space (POS).

No quadrat or transect recordings were undertaken.

Any potential Priority Flora species that couldn't be readily identified, were collected and identified at the Perth Herbarium at later date.

3.2 Site Vegetation Condition

The vegetation at the Site was given a condition rating based on the Bush Forever (Government of Western Australia, 2000) vegetation condition ratings scale. This scale recognises a level of intactness of vegetation, which is defined by the following:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping;
- The potential for natural or assisted regeneration.

The ratings in this scale are described in Table 3.

The majority of the Site supported Completely Degraded (Condition 6) agricultural grazing land, as shown in the aerial photograph in Figure 2 and photographs in Appendix B. Some individual, or copses of, remnant trees remain in these areas.

One area of Excellent (Condition 2) and several areas of Very Good (Condition 3) vegetation do exist to the north of Lot 81, in general these areas are proposed to be set aside in POS. Other areas of remnant bushland that are to be set aside in POS are considered to vary from Very Good to Degraded (Condition 3 to 5).

One isolated portion of bush on the western boundary (containing all of the Priority Flora) is also considered to be in Very Good to Good (Condition 3 to 4) condition, this area has been shown as being located within a proposed development lot.

The wetland area on Lot 80 had been recently burnt and so it was not possible to assess the condition of this section, it is assumed that this area was similar to the surrounding unburnt areas.

Vegetation conditions have been presented in Figure 4.



Table 3 Government of Western Australia (2000) Vegetation Condition Scale

Assigned Number	Classification	Description
1	<i>Pristine or nearly so</i>	No obvious signs of disturbance
2	<i>Excellent</i>	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species
3	<i>Very Good</i>	Vegetation structure altered, obvious signs of disturbance
4	<i>Good</i>	Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it
5	<i>Degraded</i>	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6	<i>Completely degraded</i>	The structure of the vegetation is no longer intact and the area is completely or almost without native species

3.3 Site Flora

3.3.1 General

Although a full flora survey was not conducted as part of this assessment a list of common weed and native species on site have been tabulated in Appendix C.

3.3.2 Priority Species

The site was inspected for the Priority Flora species identified by the DEC searches.

No Declared Rare Flora (DRF) was recorded on site.

Three Priority Flora species were identified, being; *Geleznowia verrucosa ssp formosa*, *Grevillea triloba* and *Melaleuca huttensis*. Refer to Table 4 for details.

Table 4 Priority Species Located on Site

Species	Conservation Code (see details at Table 2)	Number of plants seen
<i>Geleznowia verrucosa ssp formosa</i>	P3	1
<i>Grevillea triloba</i>	P3	> 100
<i>Melaleuca huttensis</i>	P1	1

The general location of these species has been shown in Figure 3.

Note, the *Geleznowia verrucosa* ssp *formosa* was not located again in the December 2006 review, therefore no GPS position was recorded, however, the one plant located during the September 2006 survey was known to have occurred in the small area of bush in which the *Melaleuca huttersis* was located (with the general location indicated on Figure 3).

3.3.3 Threatened Ecological Communities

The DEC referred to the possibility of a "*Melaleuca megarcephala* and *Hakea pycnanura* thickets on the Moresby Range" within 10 kilometres of the Site. Neither this TEC, nor these flora species, were identified on site.

3.3.4 Weed Species

The site was largely covered with pastoral weed species. Common weed species are included in the plant species list at Appendix C, identified by an asterix (*) notation.

One species, Paterson's Curse, identified on site is declared under the *Agriculture and Related Resources Protection Act (1976)*. Within the Shire of Greenough this is classified as a P1 declared plant species, which prohibits movement of plants or their seeds within the State and prohibits the movement of contaminated machinery and produce including livestock and fodder.

4. Conclusions

The Site largely supports completely cleared and degraded agricultural land, however, there are small isolated pockets of vegetation in Good to Very Good condition.

The survey undertaken found no Declared Rare Flora (DRF) on site, however, three species of Priority Flora were identified.

DRF is protected under the *Wildlife Conservation Act 1950* and any disturbance to these species requires permission to 'take'. To 'take' under the Act includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora. Additionally, the DEC keeps a list of Priority Flora species, that are not listed under legislation but for which the DEC feels there is cause for concern, or for which not enough information is known. The DEC would expect to be consulted with regards to potential loss of Priority Flora species.

Any clearing on site would require a clearing permit approval under the *Environmental Protection Act 1986*, unless the activity qualifies for an exemption under the Act or the *Environmental Protection (Clearing of Native Vegetation Regulations) 2004*. For example, exemptions are available for some approvals received under the *Town Planning & Development Act 1928*.

5. Limitations of this Report

5.1 Survey Limitations

This report presents the results of a desktop review and a single targeted Priority Flora site inspection carried out on the 21st September 2006.

This survey was carried out during only one season, and in one year. Complete surveys require multiple surveys, at different times of the year, and over a period of a number of years, to enable full survey of all species present.

Some flora species, such as annuals, are only available for collection at certain times of the year, and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to above factors. Therefore, while this flora survey was conducted at a time of year when the majority of the flora species would be able to be identified, there is the possibility that some species of Priority Flora on site have been overlooked.

The report provided does not meet the requirements of the Environmental Protection Authority (2004) *Guidance No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. However, due to the disturbed nature of the area, the opportunistic survey undertaken should be adequate for impact assessment purposes.

5.2 Report Limitations

This report presents the results of a targeted flora investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project described herein and must be reviewed by a competent scientist before being used for any other purpose. GHD Pty Ltd accepts no responsibility for other use of the data.

Where reports, searches, any third party information and similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

For these investigations GHD has conducted desktop data searches and field surveys. The conclusions of this report were based on the information gathered during these investigations and thus reflect the environment of the Site at the time of survey. GHD accepts no responsibility for any variation in the flora present at the Site due to natural and seasonal variability.

6. References

Agriculture and Related Resources Protection Act (1976).

Beard, J.S. (1976) *Vegetation Survey of Western Australia: The Vegetation of the Geraldton Area, Western Australia.* Vegmap Publications, Perth.

Environmental Protection Authority (2000) *Environmental Protection of Native Vegetation in Western Australia. clearing of native vegetation, with particular reference to the agricultural area.* Position Statement No. 2. Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Act 1986

Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

GHD Pty Ltd (2006) *80 & 81 Hackett Road, Waggrakine: Environmental Assessment.*

Government of Western Australia (2002) *Bush Forever Volume 2 – Directory of Bush Forever Sites.* Western Australian Planning Commission, Western Australia.

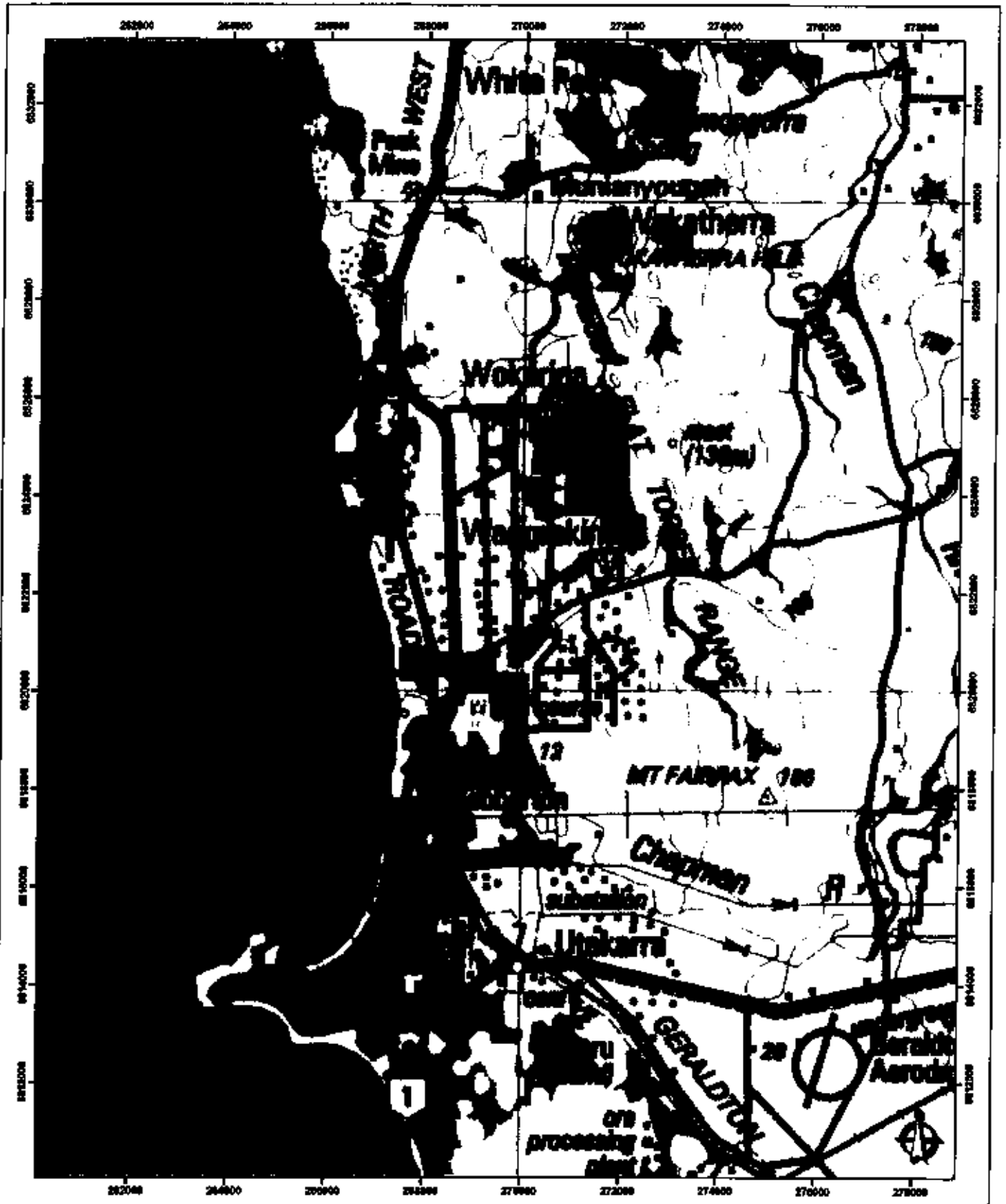
Shepherd, D.P, Beeston, G.R and Hopkins, A.J.M (2002) *Native Vegetation in Western Australia: Extent, Type and Status.* Natural Resource Management Technical Report No. 249: Department of Agriculture.

Shepherd, D.P. (2006) *Personal Communication.* Information updated from above reference, but not as yet developed into a final report.

Town Planning & Development Act 1928

Wildlife Conservation Act (1950).

Figures



LEGEND

 Lot 80 & 81 Hackett Rd Site Boundary

SCALE
 750 0 750 1,500 2,250m
 1:75,000 at A3

LOCALITY MAP



LHD-WEST W.A.

COPYRIGHT

THE INFORMATION ON THIS MAP IS THE PROPERTY OF GHD Pty Ltd. THE INFORMATION IS NOT TO BE USED FOR THE PURPOSES OF ANY OTHER PROJECT WITHOUT THE WRITTEN PERMISSION OF GHD Pty Ltd.

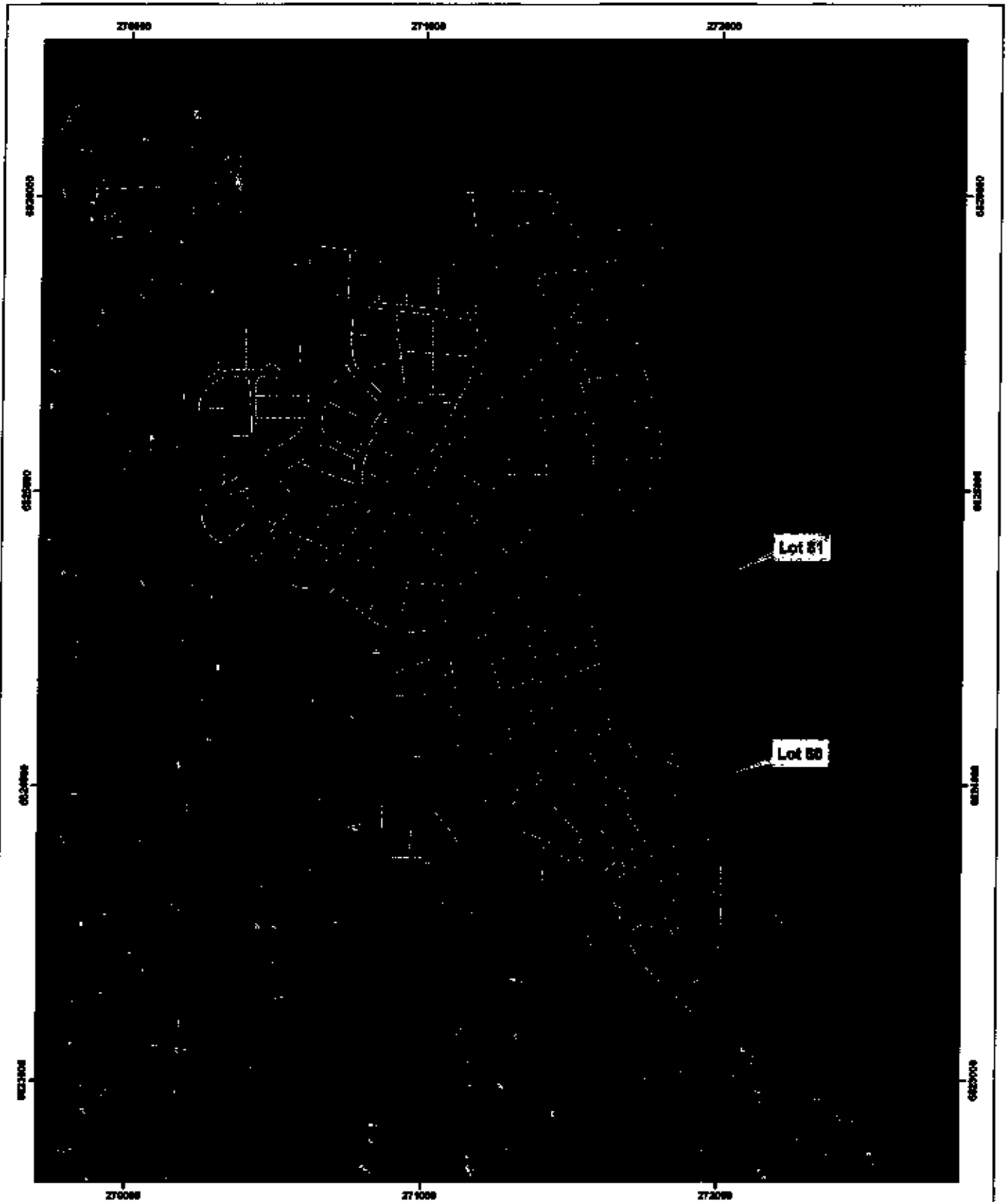
CREATED BY ML	CHECKED	APP'D BY
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
VERTICAL DATUM: NA		METADATA: ISO19115-2
DATE 04.08.2009	FILE LOCATION I:\011\0227\09\040809\0110227-09.mxd	
REVISION 0	CREATED BY ML	



Environmental Assessment
 Hackett Road, Wagga Wagga

Figure 1 - Site Locality




MAP UNITS PROMOTED IN MGA ZONE 50
 NOTE THAT POSITIONAL ERRORS CAN BE ± 5M IN SOME AREAS
 THIS BOUNDARY SHOULD BE CHECKED ON THE GROUND



Lot 81

Lot 80

LEGEND

-  Existing Cadastre
-  Proposed Subdivision Cadastre
-  Lot 80 & 81 Site Boundary

SCALE
 0 125 250 375m
 1:12,800 at A3



COPYRIGHT

UNCLASSIFIED DATA UNDER THE PROVISIONS OF THE
 INFORMATION ACCESS ACT 2009
 THIS DOCUMENT IS NOT TO BE REPRODUCED OR
 TRANSMITTED IN ANY FORM OR BY ANY MEANS
 WITHOUT THE WRITTEN PERMISSION OF THE
 COMMONWEALTH OF AUSTRALIA

CREATED BY WD	CHECKED	APPROVED
------------------	---------	----------

COORDINATE DATUM: GDA 94
 HEIGHT DATUM: HA
 PROJECTION: UTM ZONE 50
 METADATA RECORDED: 1998

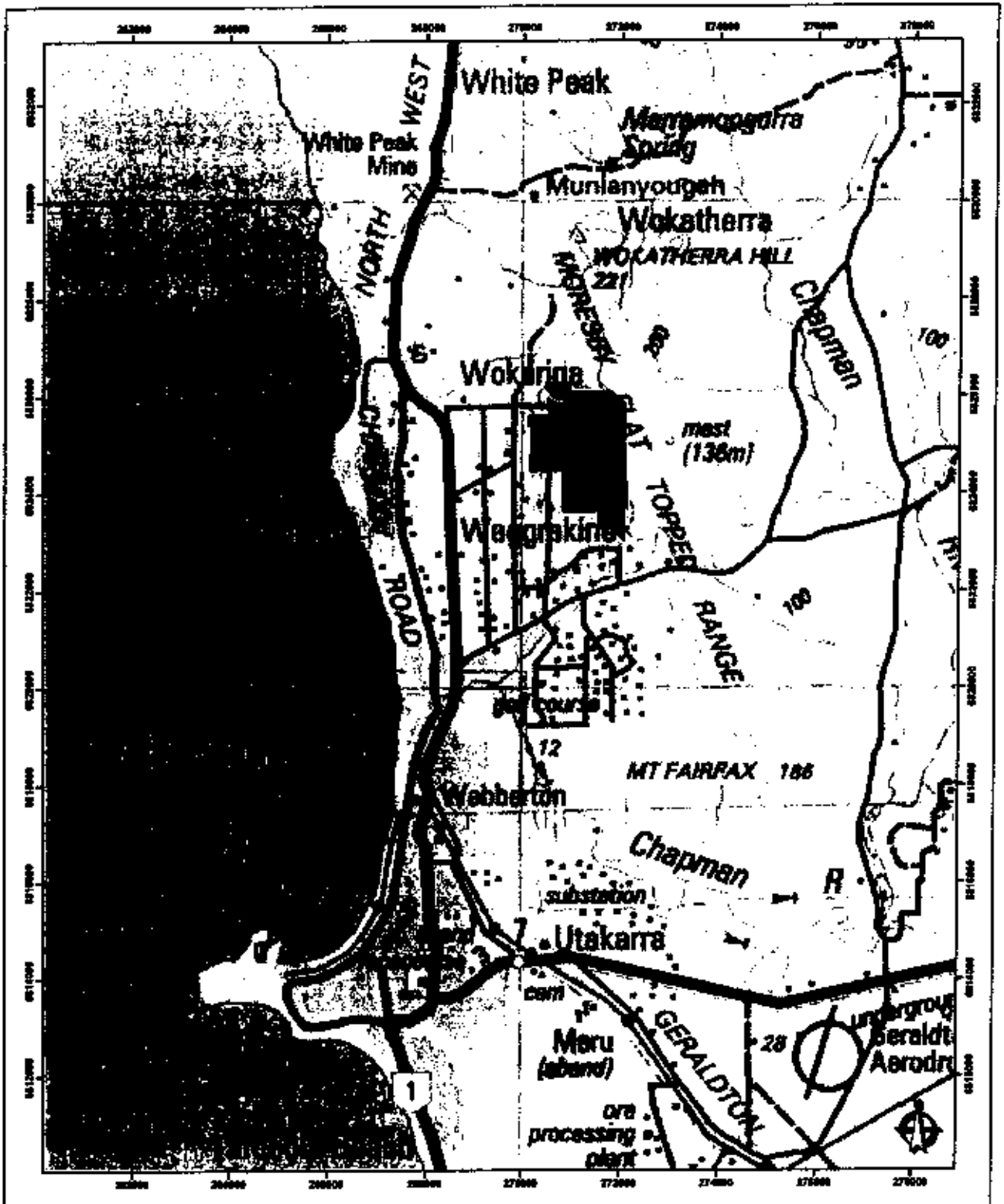
DATE 12.02.07	FILE LOCATION G:\11\1222\1222\1222\1222-02_Rev1.dwg
REVISION 1	DRAWING NO 041023-02



Environmental Assessment
 Heald Road, Wagga Wagga

Figure 2 - Proposed Development

NOTE THAT POSITIONAL ERRORS CAN BE ± 0.4 M AT 95% CL
 AIRPHOTO PHOTOGRAPHY ACQUIRED FROM DJL - 2005 ORIGINATOR: NOT REPRODUCED BY PERMISSION
 OF THE DEPT. OF LAND INFORMATION, PERTH, WESTERN AUSTRALIA, COPYRIGHT LICENSE 2006



LEGEND

Lot 80 & 81 Hackett Rd
 Site Boundary

MAP DATA PROVIDED BY BVA LTD/DC ©
 NOTE THAT PORTION MAPS CAN BE ± 5% IN SOME AREAS.
 SOURCE: BVA SOURCES GEOGRAPHIC AUSTRALIA

SCALE
 750 0 750 1,500 2,250m
 1:75,000 at A3

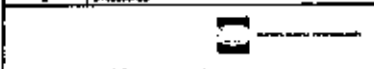


COPYRIGHT
 INFORMATION AND SERVICES DIVISION
 THE GOVERNMENT OF WESTERN AUSTRALIA
 2001/01/01 SOURCE: BVA SOURCES GEOGRAPHIC AUSTRALIA

DRAWN BY	DESIGNED	APPROVED
ML		

HORIZONTAL DATUM: GDA 94
 HORIZONTAL UNITS: M
 PROJECTION: UTM
 VELOCITY: 0.000000

FILE LOCATION: \\08102000\proj\00810204\001.mxd
 SHEET NO: 1
 DATE: 01/08/01



Environmental Assessment
 Hackett Road, Wokatherra

Figure 1 - Site Locality



LEGEND

- Existing Cadastra
- - - Proposed Subdivision Cadastra
- ▭ Lot 80 & 51 Site Boundary



MID-WEST W.A.

COPYRIGHT

Information is provided under the provisions of the Access to Information Act (R.S. 1985, c. 42) and the Access to Information Act (L.R. 1985, c. 42). Toute l'information est fournie en vertu de la Loi sur l'accès à l'information (L.R. 1985, c. 42) et de la Loi sur l'accès à l'information (L.R. 1985, c. 42).

NOTE THAT COORDINATE SYSTEMS CAN BE - OR IN SOME CASES ARE - PROBABLY SOURCED FROM ILLI - 2011 DEVELOPMENTAL INFORMATION PROVIDED BY PERMISSION OF THE DEPT. OF LAND INFORMATION SYSTEMS - AUSTRALIA. COPYRIGHT LEGALISE 2008.

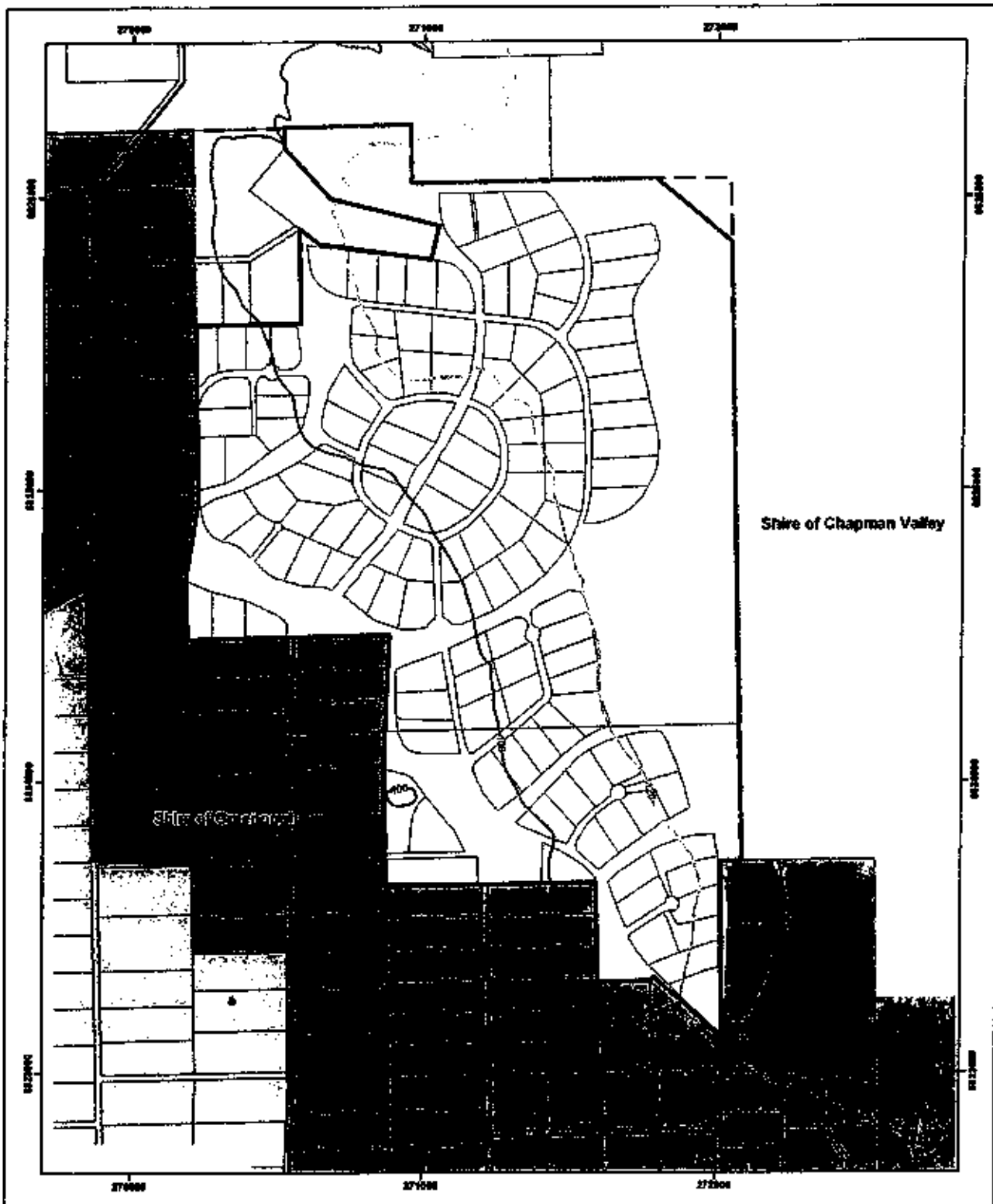
DESIGNED BY ML	APPROVED BY ML
-------------------	-------------------

PROPOSED DEVELOPMENT: O&A OF HIGHWAY 94A

DATE: 04/06/2008
REVISION: 2

PROJECT LOCATION: HIGHWAY 94A
PROJECT NO: 00
BY: 2008-08

Environmental Assessment
Hackett Road, Wagga Wagga
Figure 2 - Proposed Development



LEGEND

- Existing Cadastre
- Proposed Subdivision Cadastre
- 100m Contour
- 120m Contour
- ▭ Lot 80 & 81 Site Boundary
- ▭ Local Government Boundary

Northern Geraldton District Structure Plan Area

- ▭ R17
- ▭ R10 B
- ▭ R10 A

NOTE THAT INFORMATION CONTAINED HEREIN IS UNCLASSIFIED AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE DEPT. OF LAND INFORMATION/ARTS, HERBERT AUSTRALIA. COPYRIGHT LICENSE 30004

SCALE
0 125 250 375m

1:12,500 at A3

LOCALITY MAP



MID-WEST WA

COPYRIGHT

THIS DOCUMENT IS UNCLASSIFIED AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE DEPT. OF LAND INFORMATION/ARTS, HERBERT AUSTRALIA. COPYRIGHT LICENSE 30004

CREATED BY: ML CHECKED: APPROVED:

REVISIONS: 01 02 03

PROJECT NO: 100-2016-02

PROJECT NAME: 100-2016-02

PROJECT LOCATION: 100-2016-02

PROJECT DATE: 01/10/2016

PROJECT STATUS: 01/10/2016

PROJECT DESCRIPTION: 01/10/2016

PROJECT CONTACT: 01/10/2016

PROJECT ADDRESS: 01/10/2016

PROJECT PHONE: 01/10/2016

PROJECT FAX: 01/10/2016

PROJECT EMAIL: 01/10/2016

PROJECT WEBSITE: 01/10/2016

PROJECT SOCIAL MEDIA: 01/10/2016

PROJECT DOCUMENTS: 01/10/2016

PROJECT FILES: 01/10/2016

PROJECT IMAGES: 01/10/2016

PROJECT VIDEOS: 01/10/2016

PROJECT AUDIO: 01/10/2016

PROJECT PRESENTATIONS: 01/10/2016

PROJECT MEETINGS: 01/10/2016

PROJECT WORKSHOPS: 01/10/2016

PROJECT CONSULTATIONS: 01/10/2016

PROJECT FEEDBACK: 01/10/2016

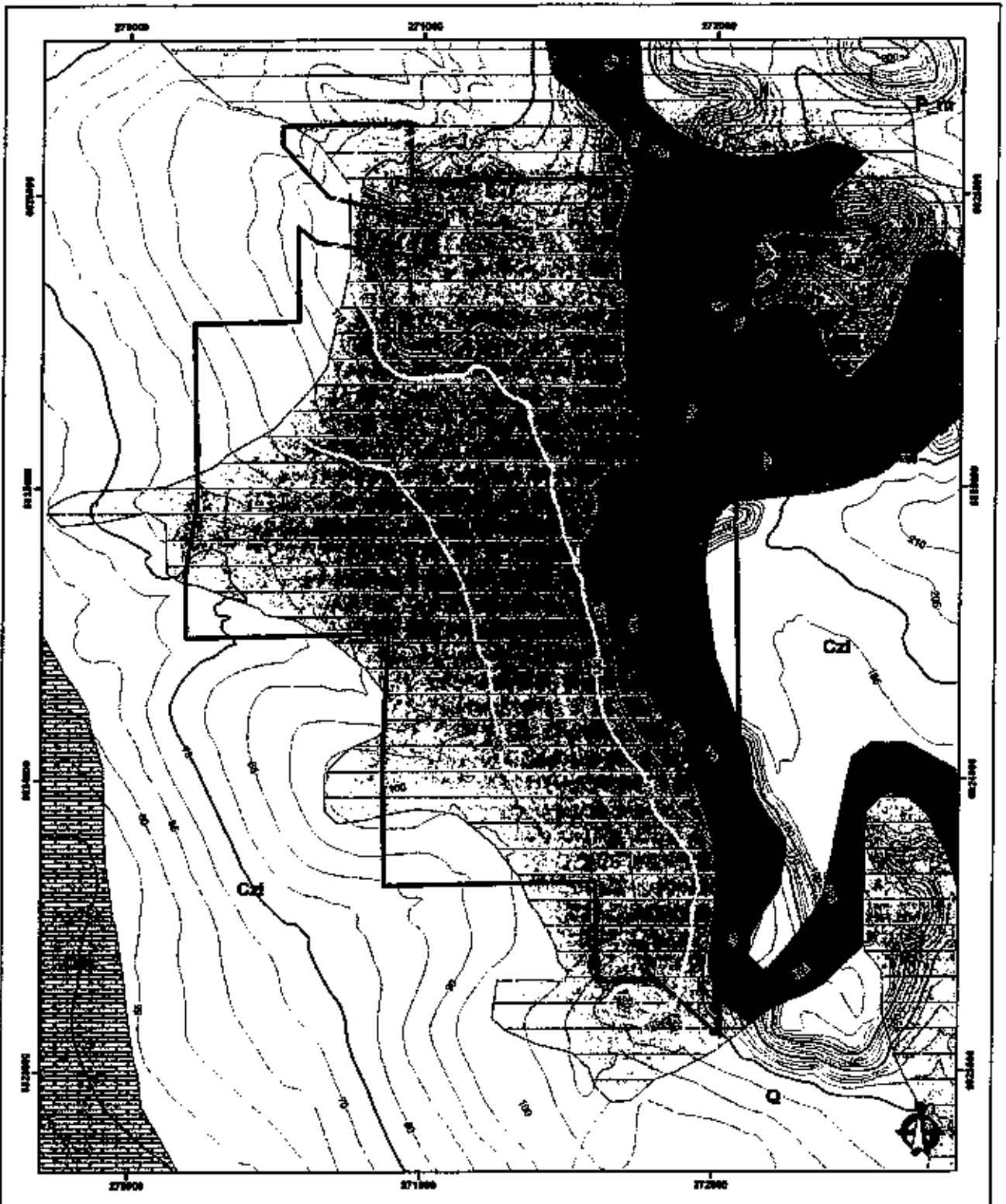
PROJECT COMMENTS: 01/10/2016

PROJECT NOTES: 01/10/2016

Environmental Assessment

Neakyl Road, Waggrakine

Figure 3 - Planning Scheme and Constraints



LEGEND

- Lot 80 & 81 Site Boundary
- 5m Contour Intervals
- 25m Index Contours
- 100m Contour
- 120m Contour

GEOLOGY

- Aqueous, calcareous and micaceous silts
- Coastal Limestone
- Lenticles with overlying quartz sand
- Yampelee Formation: Vailed sandstone
- Chepton Bay Group: Kojamaa Sandstone
- Chepton Bay Group: Mooryosooka Sandstone
- Granite - Includes cordierite gneiss

MAP UNITS PROJECTED IN NAD 83 ZONE 67
NOTE THAT PORTION OF UNITS CAN BE 1-2M IN SOME AREAS

SCALE

125 0 125 250 375m

1:12,500 @ A3

LOCALITY MAP

ARO-WEST W/A

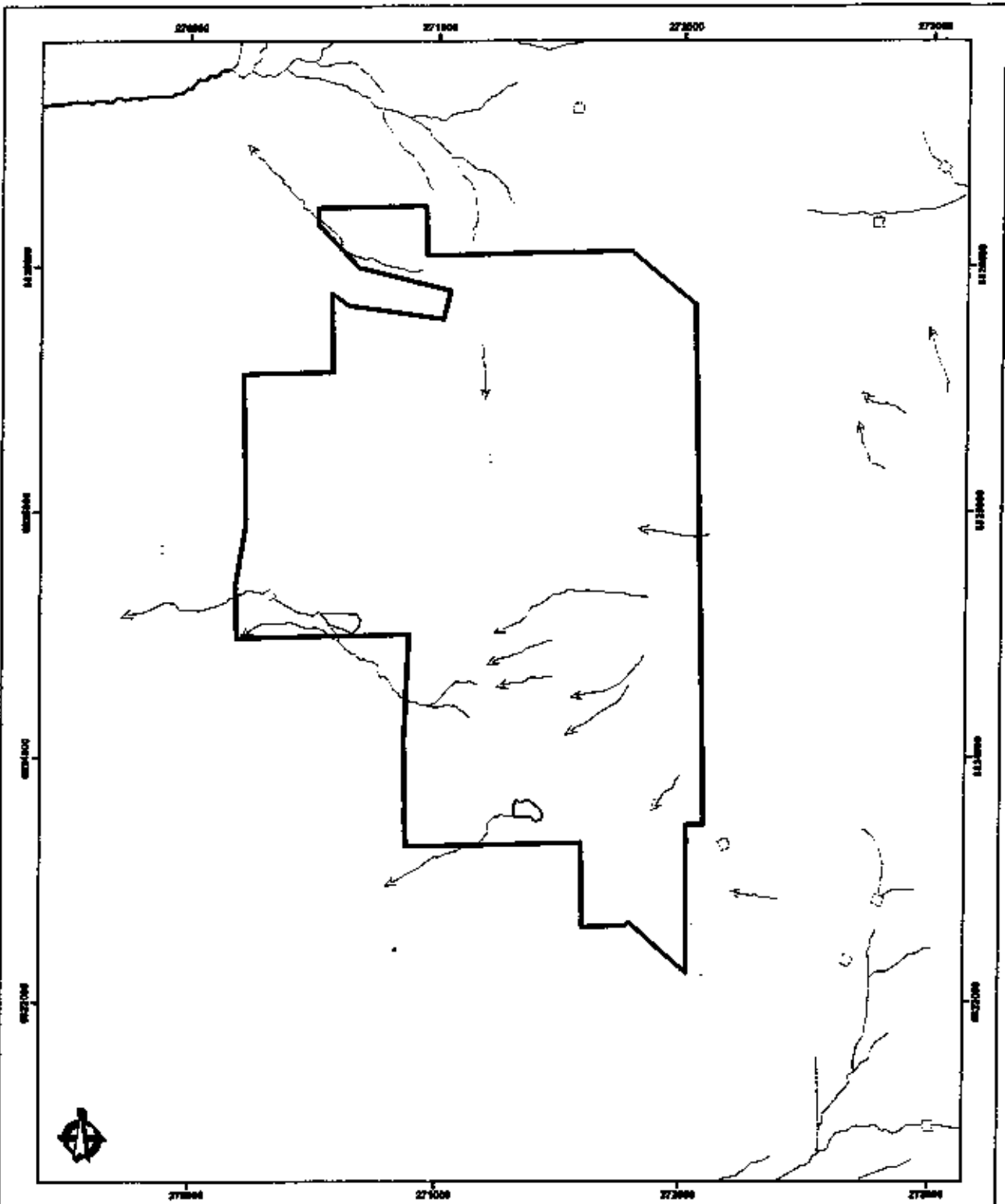
COPYRIGHT

TRADEMARK AND COPYRIGHT PROPERTY OF ARO PTT LTD
REPRODUCED BY ALL THE ABOVE MEMBERS
FOR SERVICE TO CLIENTS AND FOR INFORMATION
PURPOSES. REPRODUCED WITHOUT THE WRITTEN
CONSENT OF ARO-WEST W/A

CREATED BY BL	CHECKED	APPROVED
HORIZONTAL DATUM: GDA 84		VERTICAL DATUM: MGA 84
HEIGHT REFERENCE: M		PROJECTION: UTM
DATE 14/03/2008	FILE LOCATION C:\AROWEST\GIS\Projects\110205-04_gis_report.mxd	
PROJECT 0	SCALE 1:12,500	

Environmental Assessment
Nackak Road, Waggepink

Figure 4 - Geology and Topography



LEGEND

- Lot 80 & 81 Site Boundary
- Linear Hydrography (DEC 2006)**
- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to inundation
- Earth Dam
- Flow Direction Arrow
- Tank
- Well
- Well With Windmill

MAP DATA PROTECTED BY MAPS ACT 2000. NOTE THAT POSITIONAL ACCURACY CAN BE +/- 6m IN SOME AREAS

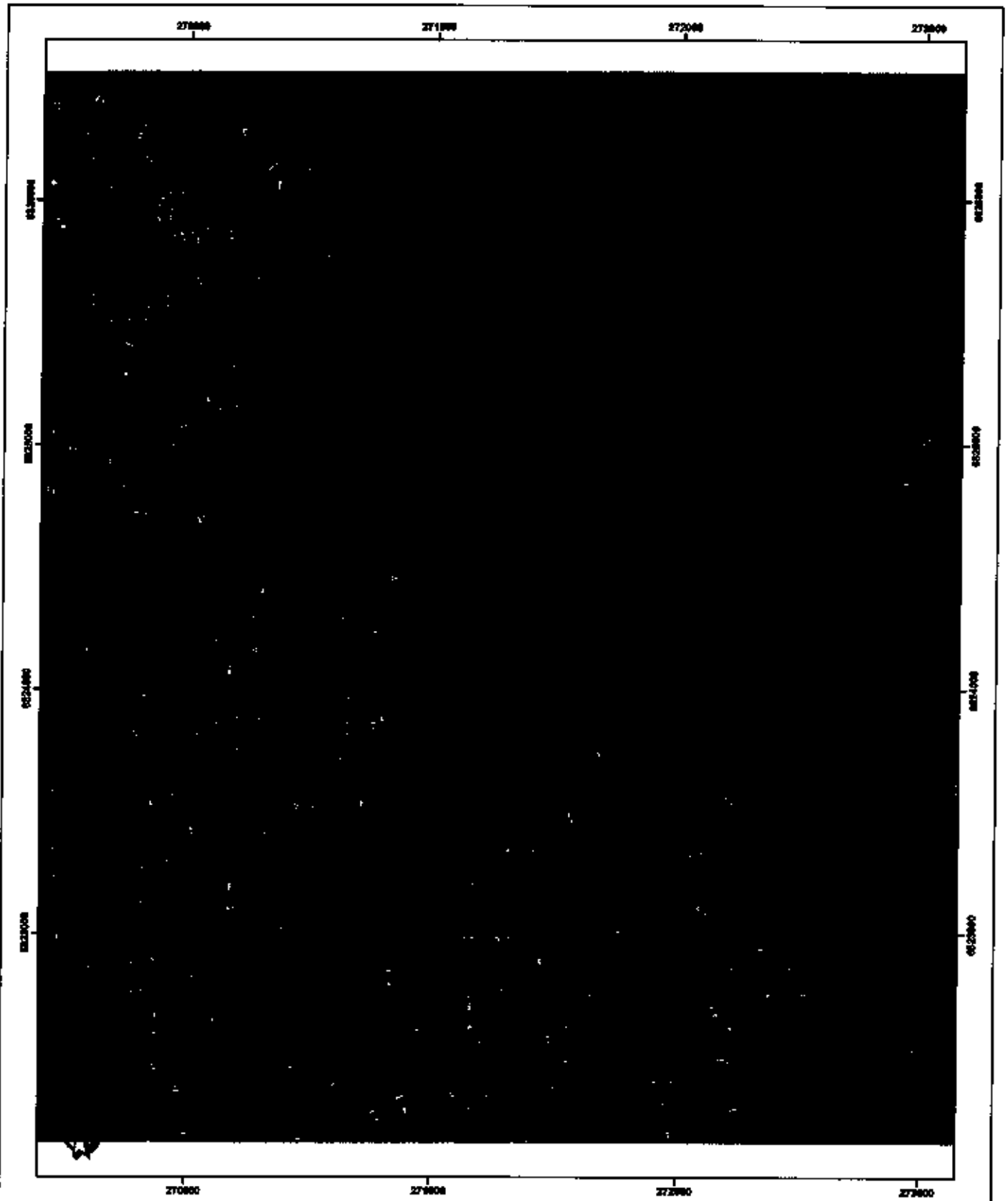


COPYRIGHT
 THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF THE GOVERNMENT OF WESTERN AUSTRALIA AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE GOVERNMENT OF WESTERN AUSTRALIA.

DATE 04.06.2008	FILE LOCATION G:\MAPPING\hydro\200811\8008-02_hydro.mxd
REVISION 0	DESCRIPTION 800808-02

Environmental Assessment
 Hockatt Road, Wagtailme

Figure 6 - Hydrography



LEGEND

Lot 80 & 81 Site Boundary
 Declared Rare and Priority Flora
 (R) Declared Rare Flora - Extant Taxa
 Priority 1 - Poorly Known Taxa
 Priority 2 - Poorly Known Taxa
 Priority 3 - Poorly Known Taxa
 Priority 4 - Rare Taxa

Priority Species
Eucalyptus adspira
Melaleuca holtzei
Galaxorhiza verticillata ssp. *formosa*

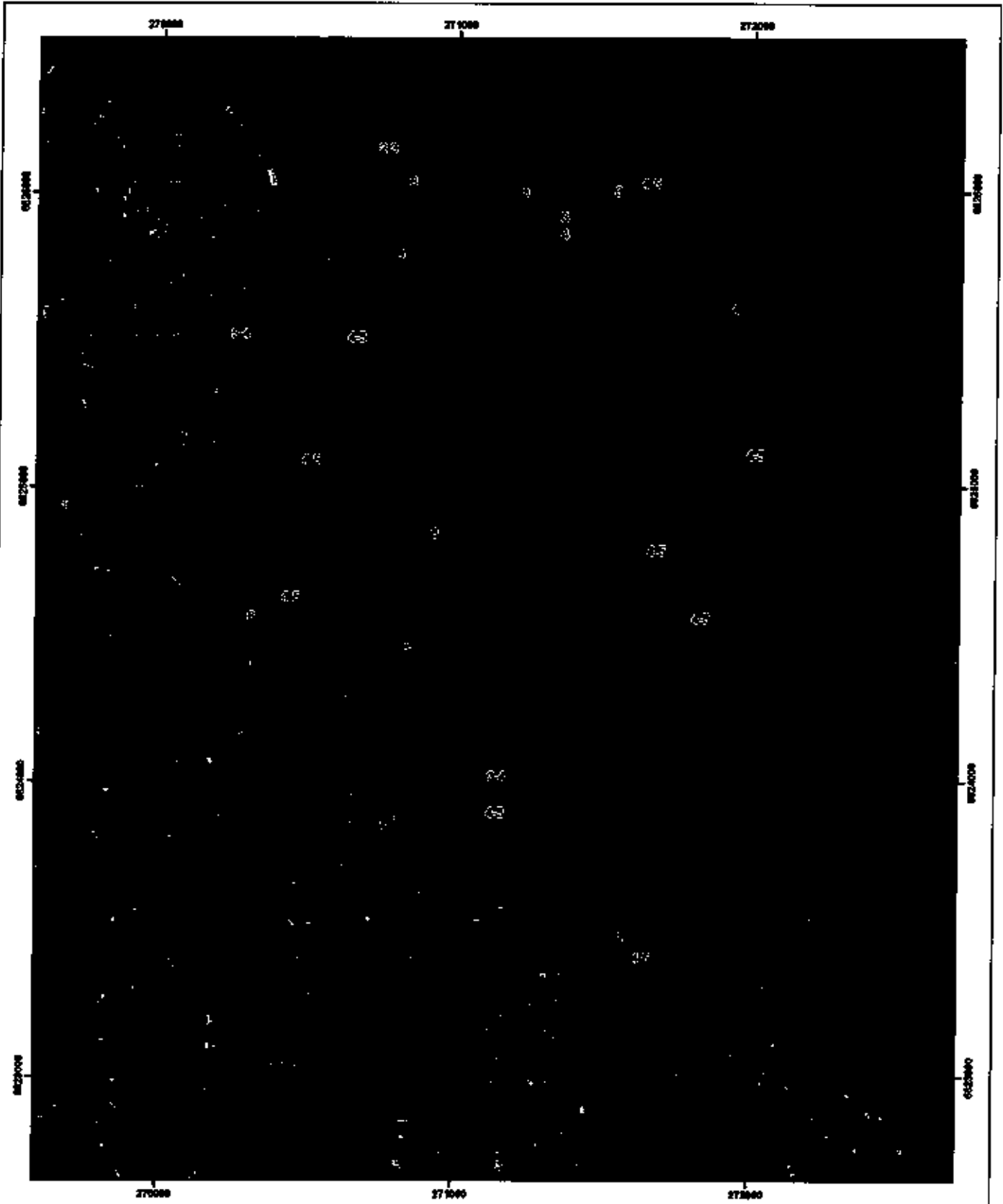
MAP UNITS PROJECTED IN MGA ZONE 80 NOTE THAT POSITIONAL ERRORS CAN BE ± 5M IN SOME AREAS

SCALE
 100 0 100 200 400m
 1:10,000 at A3
LOCALITY MAP



 MID-WEST W.A.
COPYRIGHT
THE GOVERNMENT OF WESTERN AUSTRALIA
 THE GOVERNMENT OF THE STATE OF WESTERN AUSTRALIA
 FOR ALL RIGHTS RESERVED AND TO BE ACCURATELY
 REPRODUCED BY ANY PERSON FOR THE GOVERNMENT

CREATED BY MT	CHECKED	APPROVED
HORIZONTAL DATUM: SDA 84		PROJECTION: MGA ZONE 80
HEIGHT DATUM: NA		DATA SOURCE: 1995
DATE 20/1/07	FILE LOCATION G:\1\1023\glaciated\1023-01.jpg Revised	
REVISION 0	DRAWING NO 011023-01	

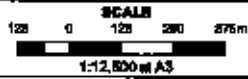
Environmental Assessment
 Hackett Road, Wagga Wagga
Figure 3 - Priority Flora



LEGEND

-  Lot 80 & 81 Site Boundary
-  Burnt Area

- Vegetation Condition**
1. Pristine or nearly so
 2. Excellent
 3. Very Good
 4. Good
 5. Degraded
 6. Completely degraded



COPYRIGHT

THIS DOCUMENT IS THE PROPERTY OF THE COMMONWEALTH OF AUSTRALIA AND IS LOANED TO YOUR OFFICE. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN PERMISSION OF THE COMMONWEALTH OF AUSTRALIA.

DEVELOPED BY KID	DESIGNED KID	APPROVED KID
---------------------	-----------------	-----------------

HORIZONTAL DATUM: GDA 84
VERTICAL DATUM: MSL
PROJECTION: UTM ZONE 52
METADATA RECORDS: YES

DATE 18.02.2007	FILE LOCATION D:\GIS\Projects\2007\20070218_Veg_Condition
VERSION 1	ISSUANCE NO. 001207-01



Environmental Assessment
Nackelt Road, Wagga Wagga
Figure 4 - Vegetation Condition

MAP UNITS PROJECTED IN MGA ZONE 52. NOTE THAT POSITIONAL ERRORS CAN BE > 1M IN SOME AREAS.

Appendix A

DEC Priority Flora Search Results



Department of Environment and Conservation

Your reference:
Our reference: 2006-003551
Enquiries: Ben Lullfitz

Phone: 9334 0123
Fax: 9334 0278
Email: Ben.Lullfitz@dec.wa.gov.au

GHD Pty Ltd
76 Forrest Street
GERALDTON WA 6530

Attention: Cathee Miller

Dear Ms Miller

REQUEST FOR RARE FLORA INFORMATION

I refer to your request of 3 August 2006 for information on rare flora in the Geraldton and Morawa areas. The search co-ordinates used were (Geraldton) 28° 39' - 28° 43' S and 114° 37' - 114° 41' E and (Morawa) 29° 07' - 29° 15' S and 115° 57' - 116° 05' E.

A search was undertaken for this area of (1) the Department's *Threatened (Declared Rare) Flora* database (for results, if any, see "Threatened Flora Data" - coordinates are GDA94), (2) the *Western Australian Herbarium Specimen* database for priority species opportunistically collected in the area of interest (for results, if any, see "WAHERB" - coordinates are GDA94 - see condition number 9 in the attached 'Conditions in Respect of Supply' and (3), the Department's *Declared Rare and Priority Flora List* [this list is searched using 'place names'. This list which may also be used as a species target list, contains species that are declared rare (Conservation Code R or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) - for results, if any, see "Declared Rare and Priority Flora List"]. The results are attached electronically to this email.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the seventh point, which refers to the requirement to undertake field investigations for the accurate determination of rare flora occurrence at a site. *The information supplied should be regarded as an indication only of the rare flora that may be present and may be used as a target list in any surveys undertaken.*

The information provided does not preclude you from obtaining and complying with, where necessary, land clearing approvals from other agencies.

An invoice for \$350 (plus GST) to supply this information will be forwarded.

It would be appreciated if any populations of rare flora encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss rare flora management, please contact my Principal Botanist, Dr Ken Atkins, on (08) 9334 0425.

Yours faithfully

B.R. Lullfitz

.....
for Keiran McNamara
DIRECTOR GENERAL
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

4 August, 2006

Please note: Co-ordinates supplied for all data search requests must be provided in latitude/longitude format, 'eastings and northings' are no longer suitable. Thank you.

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

RARE FLORA INFORMATION

CONDITIONS IN RESPECT OF SUPPLY OF INFORMATION

1. All requests for data to be made in writing to the Director General, Department of Environment and Conservation, Attention: Threatened Flora Database Officer, Species and Communities Branch.
2. The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided, without the prior written consent of the Director General, Department of Environment and Conservation.
3. Specific locality information for Declared Rare Flora is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for DRF may not be used in public reports without the written permission of the Executive Director, Department of Environment and Conservation. Publicly available reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Department is to be contacted for guidance on the presentation of rare flora information.
4. Note that the Department of Environment and Conservation respects the privacy of private landowners who may have rare flora on their property. Rare flora locations identified in the data as being on private property should be treated in confidence, and contact with property owners made through the Department of Environment and Conservation.
5. Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data provided, they may be present. The Department of Environment and Conservation accepts no responsibility for this.
6. Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.
7. It should be noted that the supplied data do not necessarily represent a comprehensive listing of the rare flora of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area. The receiving organisation should employ a botanist, if required, to undertake a survey of the area under consideration.
8. Acknowledgment of the Department of Environment and Conservation as source of the data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Environment and Conservation, Attention: The Manager, Species and Communities Branch.
9. The development of the PERTH Herbarium database was not originally intended for electronic mapping (eg. GIS ArcView). The latitude and longitude coordinates for each entry are not verified prior to being databased. It is only in recent times that collections have been submitted to PERTH with GPS recorded in latitude and longitude coordinates. Therefore, be aware when using this data in ArcView that some records may not plot to the locality description given with each collection.

THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DECLARED RARE AND PRIORITY FLORA LIST

for Western Australia

CONSERVATION CODES

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

ABBREVIATIONS USED IN THREATENED FLORA DATABASE PRINTOUTS

VESTING		EXL	Exploration Lease
AGR	Chief Exec Dept of Agriculture	EXP	Experimental Farm
ALT	Aboriginal Land Trust	FIR	Firing Range
BAP	Baptist Union of WA Inc	FOR	State Forest
BSA	Boy Scouts Association	GHA	Grain Handling
CC	Conservation Commission - NPNCA - LFC	GOL	Golf
CGT	Crown Grant in Trust	GRA	Gravel Pit
COM	Commonwealth of Australia	GRE	Green Belt
CRO	Crown Freehold-Govt Ownership	GVT	Government Requirements
DOL	Dept of Land Administration	HAR	Harbour Purposes
DFU	Ministry for Planning	HEP	Heritage Purposes
EXD	Exec Direc CALM	HER	Heritage trail
FRE	Freehold	HOS	Hospital
HOW	Homeswest	KEN	Kennels
ILD	Industrial Lands Develop. Auth	MIN	Mining lease
JOI	Joint Vesting-NPNCA & Shire	MUN	Municipal Purposes
LAC	LandCorp	NPK	National Park
LFC	Lands and Forests Commission	NRE	Nature Reserve
MAG	Minister for Agriculture	OTH	Other
MED	Ministry of Education	PAC	Public access
MHE	Minister for Health	PAR	Parkland (& Recreation)
MIN	Minister for Mines	PAS	Pastoral lease
MPL	Ministry for Planning	PFL	Protection of Flora
MPR	Minister for Prisons	PIC	Picnic ground
MRD	Main Roads WA	PLA	Plantation
MTR	Minister for Transport	POS	Public Open Space
MWA	Minister for Water Resources	FPA	Public parkland
MWO	Minister for Works	PRS	Prison site
NAT	Natural Trust of Australia WA	PUT	Public Utility
NON	Not Vested	QUA	Quarry
NPN	NPNCA	RAD	Radio Station
OTH	Other	RAC	Racecourse
FRI	Private	REC	Recreation
RAI	Westrail	REH	Rehabilitation
SEC	Western Power	RNP	Re-establish Native Plants
SHI	Shire	RRE	Railway Reserve
SPC	State Planning Commission	RUB	Rubbish
TEL	Telstra	SAN	Sand
TGR	Timber Govt Requirement	SCH	School-site
TOW	TOWN	SET	Settlers requirements
UNK	Unknown	SHI	Shire Requirements
WAT	Water Corporation	SHO	Showgrounds
WEL	Minister Community Welfare	SNN	Sanitary
WRC	Water & Rivers Commission	STO	Stopping place
XPL	Ex-Pastoral Lease	TIM	Timber
		TOU	Tourism
		TOW	Town-site
		TRA	Training Ground
		TRI	Trig station
		TVT	Television transmitting
		UNK	Unknown
		UTI	Utilities
		VCL	Vacant Crown Land
		VER	Road Verge
		VPF	Vermin Proof Fence
		WAT	Water
		WCO	Water & Conservation of F & F
		WOO	Firewood
PURPOSES			
ABR	Aboriginal Reserve		
AER	Aerodrome		
CAM	Camping		
CAR	Caravan park		
CEM	Cemetery		
CFA	Conservation of Fauna		
CFF	Conservation Of Flora & Fauna		
CFL	Conservation of Flora		
CHU	Church		
CPK	Car Park		
COM	Common		
CON	Conservation Park		
DEF	Defence		
DRA	Drain		
EDE	Educational Endowment		
EDU	Educational purposes UWA		
ENE	Enjoyment of Natural Environ.		
EXC	Excepted from sale		

* Please note that LFC now comes under the Conservation Commission.

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
DECLARED RARE AND PRIORITY FLORA LIST
30 June 2006

SPECIES / TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER PERIOD
<i>Acacia guinetii</i>	4	MW	Geraldton-Northampton	Jun-Aug
<i>Acacia latipes</i> subsp. <i>licina</i>	3	MW	Erangy Springs, Geraldton, Three Springs, Northampton, Hutt River, Eneabba	Jun-Jul
<i>Acacia leptospermoides</i> subsp. <i>psammophila</i>	3	MW	Geraldton, Yuna, Indarra, Eradu	
<i>Acacia megacephala</i>	2	MW	E of Geraldton, Kojarena, Burma Road	Jun-Sep
<i>Baeckea</i> sp. <i>Walkaway</i> (AS George 11249)	3	MW	Nanson, Ambania, Walkaway, Burma Road Reserve, Mt Fanny, Mt Homer	Jan-Apr
<i>Caladenia hoffmanii</i>	R	MW	Geraldton-Kalbarri	Aug-Oct
<i>Chorizema humile</i>	R	MW	Strawberry, Camamah, Geraldton, Kojarena, Coorow	Jul-Sep
<i>Cryptandra scoparia</i> var. <i>microcephala</i>	2	MW	Kalbarri N.P., Geraldton	May-Aug
<i>Dicrastylis incana</i>	2	MW	E of Geraldton, Yuna, Eradu	Sep, Nov
<i>Drummondita ericoides</i>	R	MW	N of Geraldton	Sep-Oct
<i>Enekbatus bounites</i> ms	2	MW	Howatharra Hill	July
<i>Eremophila brevifolia</i>	2	MW, WB	Geraldton, Mt Caroline, Northampton	Aug-Sep
<i>Eucalyptus blaxellii</i>	R	MW	NE of Geraldton	Aug-Nov
<i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>	4	MW	Nanson, Mt Michael, Eradu, Mt Homer, Morseby Range	-
<i>Gastrolobium propinquum</i>	1	MW	Northampton, Geraldton	Jun-Nov
<i>Geleznowia verrucosa</i> subsp. <i>formosa</i> ms	3	MW, WB	Kalbarri, Hill River, Geraldton, Eneabba	Jun-Sep
<i>Grevillea bracteosa</i>	R	MW, SW	Geraldton, Howatharra, Mullewa, Milling, Bindoon	Aug-Oct
<i>Grevillea candicans</i>	3	MW, WB	Dalwallinu, Mingenew, Geraldton, Galena, Yuna, Mullewa	Jul-Oct
<i>Grevillea hirtella</i>	3	MW	Walkaway, Burma Road, Geraldton, Greenough	-
<i>Grevillea triloba</i>	3	MW	Geraldton, Northampton	Jul-Aug
<i>Harperia ferruginipes</i>	1	MW	Geraldton/Mullewa	Apr-May
<i>Homalocalyx chapmanii</i>	1	MW	Arrowsmith River, Geraldton, One Tree Hill, Three Springs	
<i>Homalocalyx inerrabundus</i>	2	MW	Geraldton, Bindoo Hill, East Yuna, Mount Magnet	Sep, Oct
<i>Lepidobolus basiflorus</i>	1	MW	Geraldton-Mullewa	Apr-May
<i>Leucopogon oblongus</i> ms	2	MW	Northampton, Howatharra	Jul
<i>Malleostemon</i> sp. <i>Moonyoonooka</i> (R.J. Cranfield 2847)	2	MW	Kalbarri, Geraldton	Aug, Sep
<i>Schoenia filifolia</i> subsp. <i>subulifolia</i>	R	MW	Champion Bay, Geraldton	
<i>Scholtzia</i> sp. <i>Valentine Road</i> (S Patrick 2142)	1	MW	Geraldton-Mullewa	Nov
<i>Stenanthemum gracilipes</i>	1	MW	Geraldton, Nabawa	Aug-Sep
<i>Thryptomene</i> sp. <i>Moresby Range</i> (AS George 14873)	3	MW	Moresby Range, Chapman Valley, Howatharra	Jul-Sep
<i>Thryptomene</i> sp. <i>Yuna Reserve</i> (AC Burns 100)	2	MW	East Yuna Reserve, East Chapman, Bella Vista NR	Aug-Sep
<i>Thryptomene stenophylla</i>	2	MW	Kalbarri, Geraldton	-
<i>Verticordia chrysostachys</i> var. <i>pallida</i>	3	MW	Geraldton, Northampton	Dec
<i>Vittadinia cervicalis</i> var. <i>occidentalis</i>	1	MW	Geraldton, Northampton	-
<i>Wumbea tubulosa</i>	R	MW	Geraldton-Mingenew-Three Springs	Jun-Jul

WA HERBARIUM DATABASE - 4 August 2006

SHEET_NO.	GENUS	SPECIES	RANK	INFRASP	CONS.CODE
PERTH 196940	Acacia	guinetii			P4
PERTH 1135155	Verticordia	penicillaris			P4
PERTH 196428	Acacia	guinetii			P4
PERTH 196371	Acacia	guinetii			P4
PERTH 05395909	Grevillea	triloba			P3
PERTH 00755729	Acacia	guinetii			P4
PERTH 00759430	Acacia	guinetii			P4
PERTH 196396	Acacia	guinetii			P4
PERTH 1048945	Eucalyptus	blaxellii			R
PERTH 02032279	Verticordia	penicillaris			P4
PERTH 197335	Acacia	guinetii			P4
PERTH 197394	Acacia	guinetii			P4
PERTH 196363	Acacia	guinetii			P4
PERTH 196401	Acacia	guinetii			P4
PERTH 196436	Acacia	guinetii			P4
PERTH 196444	Acacia	guinetii			P4
PERTH 05396344	Grevillea	triloba			P3
PERTH 04159918	Grevillea	triloba			P3
PERTH 01648659	Grevillea	triloba			P3
PERTH 05392195	Thryptomene	stenophylla			P2
PERTH 1050508	Eucalyptus	blaxellii			R
PERTH 1048937	Eucalyptus	blaxellii			R
PERTH 196932	Acacia	guinetii			P4
PERTH 197408	Acacia	guinetii			P4
PERTH 01404539	Verticordia	densiflora	var.	roseostella	P3
PERTH 522309	Vitfadina	cervicularis	var.	occidentalis	P1
PERTH 00759449	Acacia	guinetii			P4
PERTH 05481074	Melaleuca	huttensis			P1
PERTH 04257413	Grevillea	triloba			P3
PERTH 05498228	Grevillea	triloba			P3
PERTH 05946433	Melaleuca	huttensis			P1
PERTH 06297161	Eucalyptus	blaxellii			R
PERTH 06297145	Eucalyptus	blaxellii			R

PERTH 1096846	Eucalyptus	diminuta	P4
PERTH 1039646	Eucalyptus	diminuta	P4
PERTH 1022814	Eucalyptus	cuprea	R
PERTH 05758408	Eucalyptus	blaxellii	R
PERTH 06095880	Eucalyptus	blaxellii	R
PERTH 06095879	Eucalyptus	blaxellii	R
PERTH 02191385	Thyptomene	sp. Moresby Range (A.S. George 1487	P3
PERTH 07901049	Melaleuca	huttensis	P1

THREATENED FLORA DATABASE - 4 August 2006

GENUS	SPECIES	CONS. CODE
Drummondia	ericoides	R
Verticordia	pericillaris	4
Eucalyptus	blaxellii	R

Appendix B
Site Photos

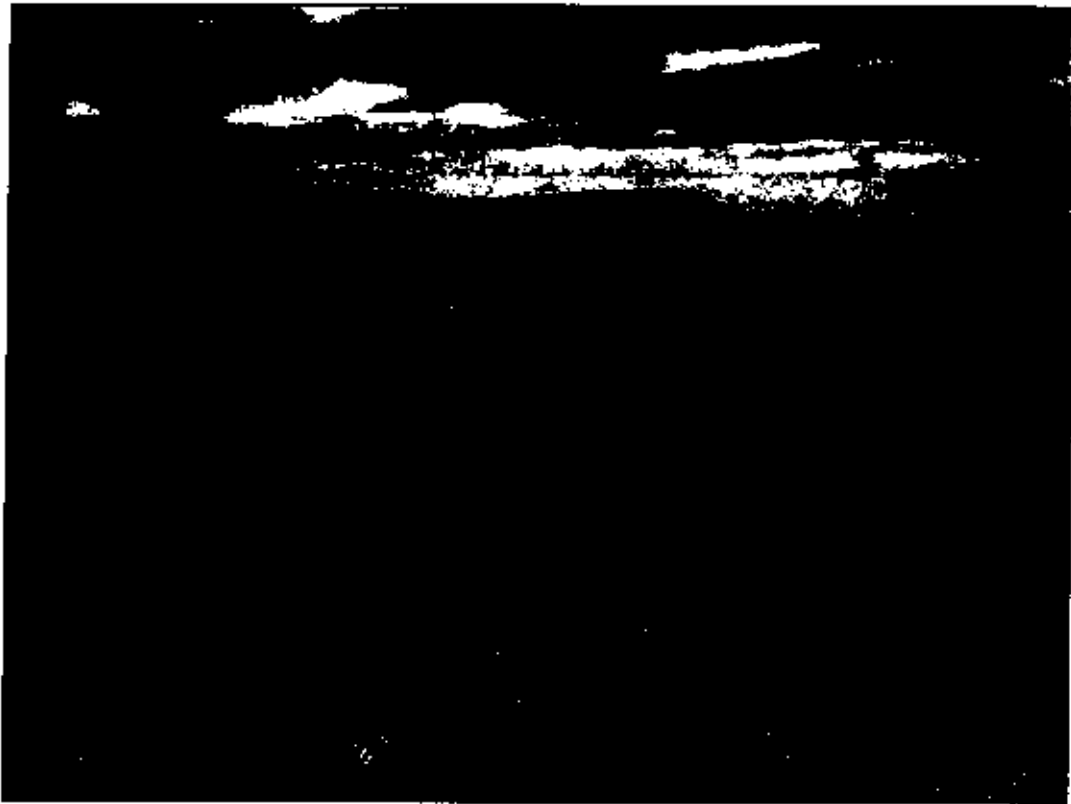


Plate 1 – Cleared Pasture Land



Plate 2 – View from escarpment onto Lot 81

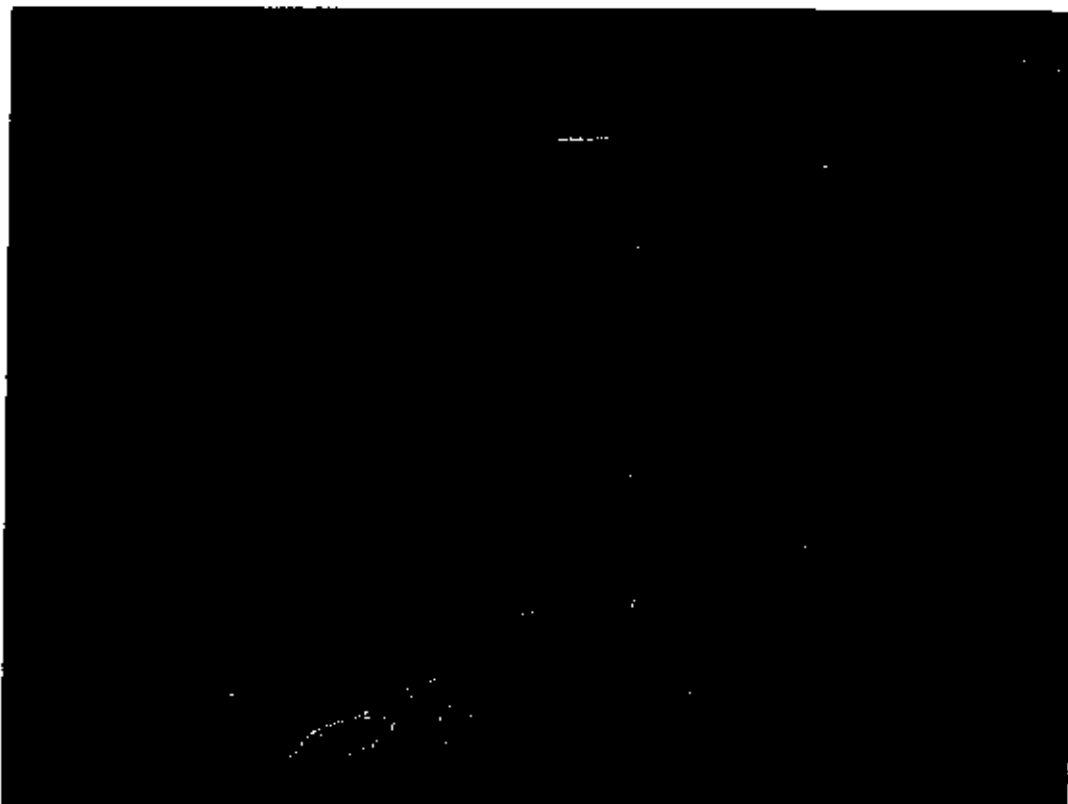


Plate 3 – vegetated areas to the north of Lot 81 in mid to background of photo

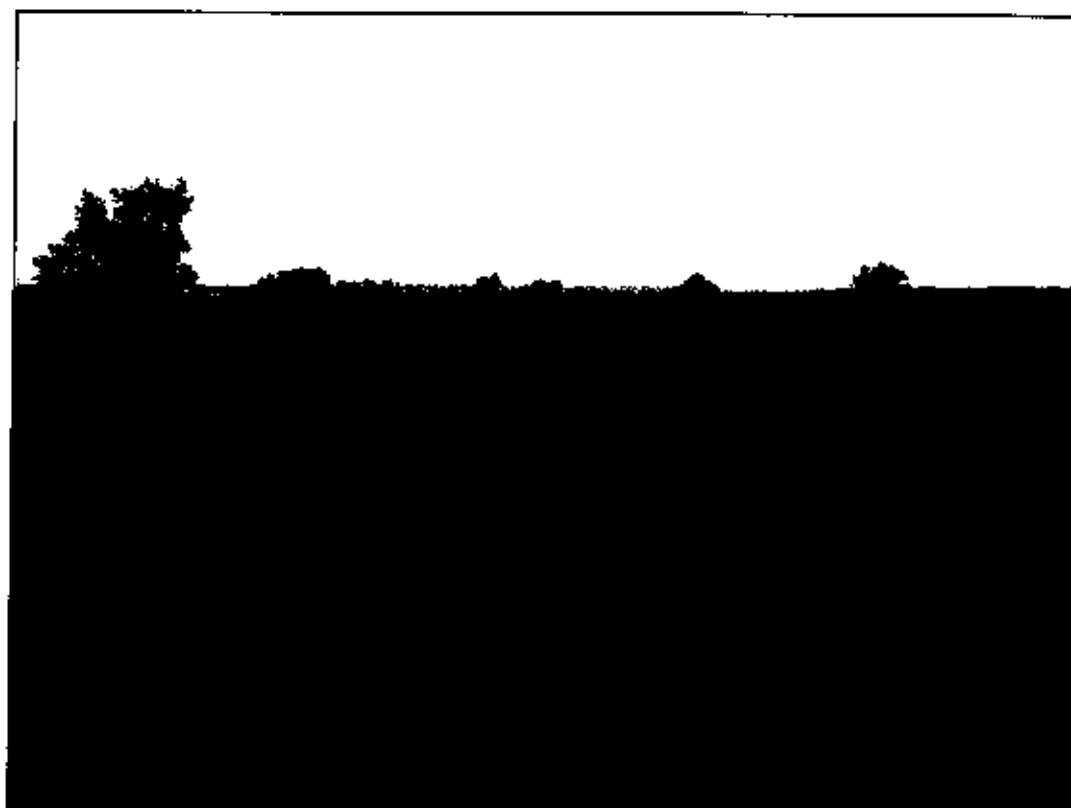


Plate 4 – northern fence line on Lot 81 hosting *Grevillea triloba* population



Plate 5 – Burnt Wetland Area on Lot 80

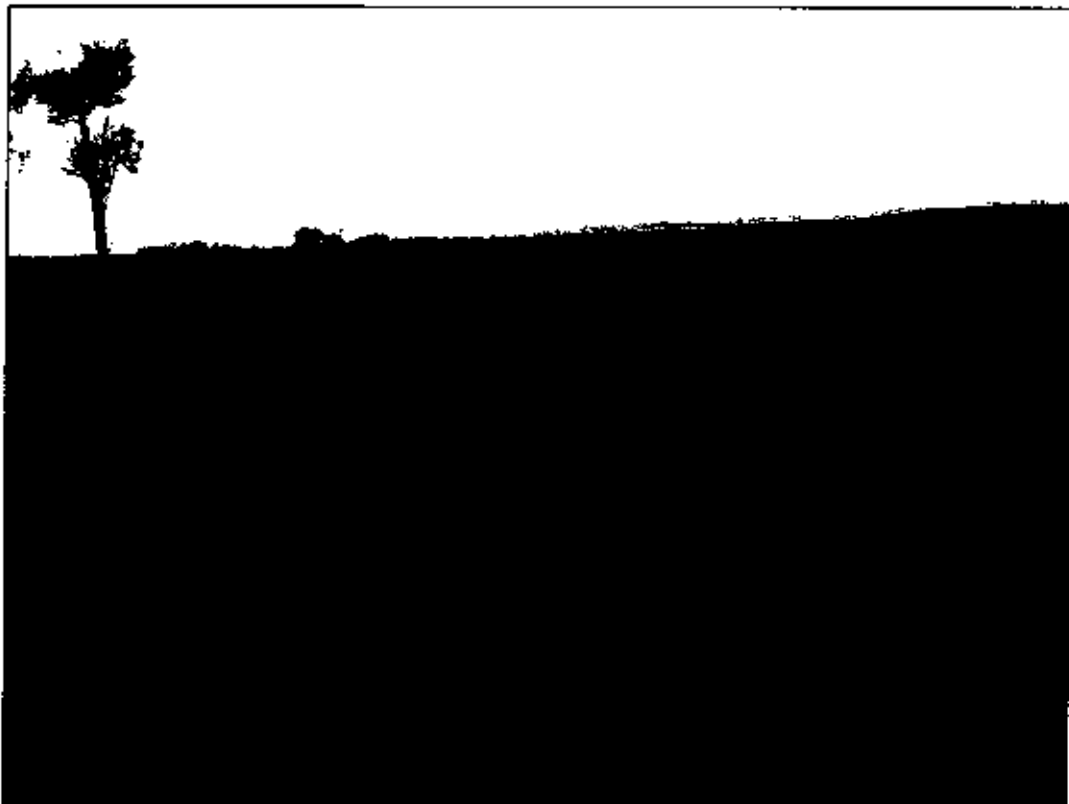


Plate 5 – Gravel Outcrop on Lot 80

Appendix C

Flora Species Recorded on Site

Family	Species	Common Name
	<i>Ptilotus polystachyus</i>	Prince of Wales Feather
AMARANTHACEAE	<i>Ptilotus obovatus</i> var <i>obovatus</i>	Cotton Bush
ANACARDIACEAE	* <i>Schinus terebinthifolia</i>	Japanese Pepper
	<i>Cassia micrantha</i>	Pale Grass Lily
	<i>Corynotheca micrantha</i>	Sand Lily
ANTHERICACEAE	<i>Tricoryne elatior</i>	Yellow Autumn Lily
APIACEAE	<i>Trachymene cyanopetala</i>	
	* <i>Arthrotheca calendula</i>	Cape Weed
	<i>Brachyscome ciliaris</i>	
	* <i>Hypochaeris</i> sp	Flat Weed
	<i>Lawrencella rosea</i>	
	* <i>Monoculus monstrosus</i>	
	<i>Podolepis lessonii</i>	
	<i>Rhodanthe manglesi</i>	
	<i>Rhodanthe spicata</i>	
	* <i>Sonchus oleraceus</i>	Sowthistle
	* <i>Urospermum picroides</i>	False Hawkbit
ASTERACEAE	* <i>Ursinia anthemoides</i>	Ursinia
BORAGINACEAE	* <i>Echium plantagineum</i> (DP)	Paterson's Curse
BRASSICACEAE	* <i>Brassica tournefortii</i>	Wild Turnip
	* <i>Raphanus raphanistrum</i>	Wild Radish
	* <i>Rapistrum rugosum</i>	Turnip Weed
BORYACEAE	<i>Borya sphaerocephala</i>	Pincushions
CARYOPHYLLACEAE	* <i>Petrohragia dubia</i>	
CASUARINACEAE	<i>Allocasuarina campestris</i>	
CHENOPODIACEAE	<i>Chenopodium gaudichaudianum</i>	Cottony Saltbush

	<i>Enchyleena tomentosa</i> var <i>tomentosa</i>	Ruby Saltbush
	<i>Rhagodia preissii</i> subsp <i>obovata</i>	
CONVOLVULACEAE	<i>Convolvulus remotus</i>	
CRASSULACEAE	<i>Crassula colorata</i>	
CUCURBITACEAE	* <i>Citrullus lanatus</i>	Paddy Melon
CUNONIACEAE	<i>Aphanopetalum dematideum</i>	
	<i>Lepidosperma leptostachyum</i>	
	<i>Lepidosperma tenue</i>	
CYPERACEAE	<i>Mesomelaena pseudostygia</i>	Semaphore Sedge
DASYPOGONACEAE	<i>Acanthocarpus preissii</i>	
	<i>Hibbertia hypericoides</i>	Yellow Buttercups
DILLENIACEAE	<i>Hibbertia potentilliflora</i>	
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>	
GOODENIACEAE	<i>Dampiera incana</i> var <i>incana</i>	
GYROSTEMONACEAE	? <i>Gyrostemon racemiger</i>	
	<i>Conostylis aculeata</i>	Prickly Conostylis
HAEMODORACEAE	<i>Conostylis candicans</i>	Grey Cottonhead
JUNCACEAE	<i>Juncus kraussii</i>	Sea Rush
LAURACEAE	<i>Cassytha</i> sp.	Dodder Laurel
LORANTHACEAE	<i>Nuytsia floribunda</i>	WA Christmas Bush
MALVACEAE	<i>Hibiscus ?sturtii</i>	
	<i>Acacia microbotrya</i>	Manna Wattle
	<i>Acacia oxyclada</i>	
	<i>Acacia rostellifera</i>	Summer-scented Wattle
	<i>Acacia saligna</i>	Orange Wattle
MIMOSACEAE	<i>Acacia tetragonophylla</i>	Kurara
MYOPORACEAE	<i>Myoporum montanum</i>	

	<i>Eucalyptus camaldulensis</i> var <i>obtusa</i>	Northern River Red Gum
	<i>Eucalyptus loxophleba</i>	
	<i>Eucalyptus subangulata</i> ssp <i>subangulata</i>	
	<i>Melaleuca huttensis</i> (P1)	
	<i>Melaleuca raphiophylla</i>	Swamp Paperbark
	<i>Melaleuca uncinata</i>	Broom Bush
MYRTACEAE	<i>Verticordia chrysantha</i>	
	<i>Daviesia divaricata</i>	
	<i>Daviesia divaricata</i> ssp <i>lanulosa</i>	
	<i>Gastrolobium trifangulare</i>	
	<i>Jacksonia calcicola</i>	
	<i>Leptosema aphyllum</i>	
	* <i>Lupinus cosentinii</i>	Blue Lupins
	* <i>Mellilotus indica</i>	Common Melilot
	* <i>Trifolium fragiferum</i>	Strawberry clover
PAPILIONACEAE	* <i>Trifolium hirtum</i>	Rose clover
PHORMIACEAE	<i>Dianella revoluta</i> var <i>divaricata</i>	Blueberry Lily
PITTOSPORACEAE	<i>Pittosporum ligustifolium</i>	
POACEAE	<i>Austrostipa elegantissima</i>	Elegant Spear Grass
	* <i>Avena barbata</i>	Bearded Oat Grass
	* <i>Avena fatua</i>	Wild Oats
	* <i>Briza maxima</i>	Blow Fly Grass
	* <i>Bromus diandrus</i>	Great Brome
	* <i>Ehrharta calycina</i>	Perennial Veldt Grass
	* <i>Hordeum leporinum</i>	Barley Grass
	<i>Neurachne alopecuroides</i>	Foxtail Mulga Grass
	* <i>Pennisetum clandestinum</i>	Kikuyu

	<i>* Pennisetum setaceum</i>	Fountain grass
POLYGONACEAE	<i>* Emex australis</i>	Doublegee
	<i>Muehlenbeckia adpressa</i>	Climbing Lignum
PORTULACACEAE	<i>Calandrinia liniflora</i>	
PRIMULACEAE	<i>* Anagallis arvensis</i>	Pimpernel
	<i>Banksia prionotes</i>	
	<i>Dryandra fraseri</i> var <i>fraseri</i>	
	<i>Dryandra sessilis</i> ssp <i>flabellifolium</i>	Parrot Bush
	<i>Grevillea candelabroides</i>	
	<i>Grevillea pinaster</i>	
	<i>Grevillea triloba</i> (P3)	
	<i>Hakea lissocarpa</i>	Honeybush
	<i>Hakea prostrata</i>	Needle Tree
	<i>Hakea recurva</i> ssp <i>recurva</i>	
PROTEACEAE	<i>Petrophile conferta</i>	
RUTACEAE	<i>Galeznovia verrucosa</i> ssp <i>formosa</i> (P3)	
SAPINDACEAE	<i>Dodonaea inaequalifolia</i>	
	<i>* Lycium ferocissimum</i>	African Boxthorn
	<i>* Solanum nigrum</i>	Blackberry Nightshade
SOLANACEAE	<i>Solanum oldfieldii</i>	
	<i>Gulchenotia micrantha</i>	
STERCULIACEAE	<i>Thomasia hermennifolia</i>	
STYLIDIACEAE	<i>Stylidium septentrionale</i>	
THYMELAEACEAE	<i>Pimelea microcephala</i> ssp <i>microcephala</i>	Shrubby Riceflower
VITACEAE	<i>Clematicissus angustissima</i>	

KEY:

* introduced plant species

DP = declared plant, see Section 3.3.4

P1, P3 = Priority Flora species, see Section 2.3 for further details

GHD Pty Ltd ABN 39 008 488 373

76 Forrest Street Geraldton WA 6530

PO BOX 164 Geraldton WA 6531

T: (08) 9964 3677 F: (08) 9921 7997 E: geraldtonmail@ghd.com.au

© GHD Pty Ltd 2007

This document is and shall remain the property of GHD Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
	C Miller	A Napier		M Coombes		

APPENDIX B - Level 1 Flora and Vegetation Survey (Coterra, 2011)

COTERRA
ENVIRONMENT

Level 1 Flora and Vegetation Survey

Lots 80 & 81 Hackett Road, Waggrakine

Rev 0, May 2011

This report was prepared by;

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): A. Benkovic
Report Version: Rev 0
Date: May, 2010

This report was prepared for;

Humfrey Land Developments
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Key Elements	
Flora	<p>A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants.</p> <p>No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian <i>Wildlife Conservation Act 1950</i> or governed by the <i>Environment Protection and Biodiversity Conservation Act 1999</i> were located within the study area.</p> <p>Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>.</p> <p>No other flora species of other conservation significance as stated in <i>Guidance Statement 51</i> (EPA, 2004) were recorded within the study area.</p>
Vegetation	<p>An expert botanist defined and mapped 12 vegetation units across the study area.</p> <p>The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition. The north western extent of the study area contains remnant heath vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition.</p>
Regional Representation Vegetation	<p>The study area is represented by two Beard vegetation associations: 359 - (Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub) and 675 - (Shrublands; <i>Melaleuca</i> and <i>Hakea</i> mixed thicket). Both of these vegetation associations are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010).</p> <p>Within the study area there are 3 plant communities, as mapped by the Geraldton Regional Flora and Vegetation Survey (WAPC, 2010). These plant communities are: 10 Near Coastal: <i>Acacia rostellifera</i> shrubland, 15 Thicket: <i>Melaleuca</i> spp. /mixed spp. and 13 Sandplain: <i>Banksia prionotes</i>/<i>Acacia rostellifera</i>.</p>
Regionally Significant Vegetation	<p>According to <i>Guidance Statement 33</i> (EPA, 2008) and <i>Position Statement 2</i> (EPA, 2000) the study area is considered Regionally Significant because:</p> <ol style="list-style-type: none"> 1. The vegetation associations within the study area have <30% of their present extents remaining within in WA. 2. The study area contains native vegetation remnants in good or better condition. 3. Two Priority Flora species were recorded; Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>. 4. Within the study area boundary lies, in part, the Moresby Range.

TABLE OF CONTENTS	Page
1.0 BACKGROUND.....	6
1.1 Objectives	6
1.2 Previous Investigations	6
2.0 EXISTING INFORMATION	8
2.1 Threatened Flora and Priority Flora	8
2.1.1 State Legislation.....	8
2.1.2 Federal Legislation	10
2.1.3 Other Species of Conservation Significance.....	10
2.2 Vegetation.....	10
2.2.1 Interim Biogeographical Regionalisation of Australia	10
2.2.2 Beard Vegetation Associations	11
2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).....	11
2.3 Conservation Significant Vegetation	12
2.3.1 Threatened Ecological Communities	12
2.3.2 Threshold Levels for Biodiversity Conservation.....	12
2.3.3 Areas of High Conservation Value.....	13
2.3.4 Significant Natural Areas.....	13
3.0 METHODS	14
3.1 Field Survey	14
3.1.1 Vegetation Sampling.....	14
3.2 Vegetation Condition	15
4.0 RESULTS AND DISCUSSION	16
4.1 Flora.....	16
4.1.1 Flora of Conservation Significance	16
4.1.2 Introduced Flora (Weeds).....	18
4.2 Vegetation.....	18
4.2.1 Vegetation Units	18
4.2.2 Vegetation Condition.....	19
4.3 Conservation Significant Vegetation	20

4.3.1	Biodiversity Threshold Levels.....	20
4.3.2	GRFVS Plant Community Representation.....	20
4.3.3	Regionally Significant Natural Areas and Areas of High Conservation Value.....	21
5.0	CONCLUSIONS & RECOMMENDATIONS	23
6.0	LIMITATIONS.....	24
7.0	REFERENCES	25

TABLES (Compiled within the report)

	Page
Table 1: Priority Flora Recorded in 2006 by GHD.....	7
Table 2: Significant Flora Species	9
Table 3: Regional Vegetation Association within Western Australia.....	11
Table 4: Regional Vegetation Association within the GRFVS Area	11
Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010).....	12
Table 6: Vegetation Structure Classes.....	15
Table 7: Vegetation Condition Scale.....	15
Table 8: Criteria for Environmental Weeds Strategy Rating.....	18
Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton	18

PLATES (Compiled within the report)

Plate 1: Mean Monthly Temperatures and Rainfall for Geraldton Airport (1941-2010) (BOM, 2011).....	Error! Bookmark not defined.
Plate 2: P1 <i>Melaleuca huttensis</i>	17
Plate 3: P3 <i>Grevillea triloba</i>	17

FIGURES (Compiled at the end of the report)

- Figure 1: Beard Vegetation Association
- Figure 2: Vegetation Units
- Figure 3: Vegetation Condition

APPENDICES

- Appendix A: Species List
- Appendix B: Vegetation Unit Photos

1.0 BACKGROUND

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the study area') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. In order to facilitate development of the site in accordance with this Concept Plan, the site is proposed be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5.

In accordance with Section 48A of the Environmental Protection (EP) Act (1986), any proposed change to a town planning scheme must be referred to the Environmental Protection Authority (EPA) for consideration.

In order to provide the EPA with the information necessary to properly assess this rezoning application, Coterra Environment have undertaken this Level 1 Flora and Vegetation survey to supplement the Environmental Assessment Report which will form part of the overall amendment application.

1.1 Objectives

This report presents the findings of the Level 1 Flora and Vegetation Survey for Lots 80 & 81 Hackett Road. The survey was carried out in accordance with the EPA's Guidance Statement 51 – *Terrestrial Flora and Vegetation Surveys for Environmental Impact assessment in Western Australia* requirements for a Level 1 Flora and Vegetation Survey (EPA, 2004) and involved the following components:

- Desktop review of the Department of Environment and Conservation (DEC) database search to identify any significant flora species that could potentially exist on site.
- A site visit to detail the vegetation and flora present on site. This involved undertaking selective low level sampling of native vegetation to produce maps of vegetation units and condition across the site.
- A targeted search for any Threatened Flora (TF) or Priority species known from the Geraldton area (as identified in the DEC database search).
- Analysis of the floristic composition of the vegetation for any species of conservation significance. This includes TF, Priority species and any species of other conservation value (EPA, 2004).
- Assessment of the condition and conservation significance of the vegetation using criteria outlined in *Position Statement 2* (EPA, 2000) and *Guidance Statement 33* (EPA, 2008).
- Preparation of a report and relevant maps.

1.2 Previous Investigations

A Priority Flora survey of the study area was conducted previously in 2006 by GHD (GHD, 2007). This survey only concentrated on locating DEC listed Priority Flora and therefore did not meet the requirements of a full flora survey. In addition the study did

not include the escarpment, plateau or bushland area in the north, as these portions of the site were proposed to be set aside as open spaces.

In this GHD survey, three Priority Flora species were recorded within the study area. These species and the number of plants recorded are listed in Table 1.

Table 1: Priority Flora Recorded in 2006 by GHD

Species	Conservation Code	Number of Plants Recorded
<i>Geleznovia verrucosa</i> subsp. <i>formosa</i> #	P3	1
<i>Grevillea triloba</i>	P3	>100
<i>Melaleuca huttensis</i>	P1	1

This taxon name is no longer current; it is a taxonomic synonym of *Geleznovia verrucosa*, which is not a Priority Flora species

The priority flora report completed by GHD (2007) is attached to the EAR, prepared as part of the overall scheme amendment submission.

2.0 EXISTING INFORMATION

2.1 Threatened Flora and Priority Flora

2.1.1 State Legislation

Threatened Flora (TF) are flora that have been adequately surveyed and are considered to be in danger of extinction, rare or otherwise in need of special protection within Western Australia. TF are protected under the *Wildlife Conservation Act 1950* (as amended).

Additionally in Western Australia there are five categories of Priority Flora, which are not specifically covered under current legislation, but their conservation status warrants some protection and/or further investigation. Three categories of Priority Flora are allocated to species that are poorly known (Priority 1 to 3). These require more information to be assessed for inclusion as TF. The categories are arranged to give an indication of the priority for undertaking further surveys based on the number of known sites, and the degree of threat to those populations. A fourth category of priority (Priority 4) is included for those species that have been adequately surveyed and are considered to be rare but not currently threatened. Priority 5 species are those that are also not threatened but are subject to a specific conservation program

The Department of Environment and Conservation's (DEC) databases for Threatened Flora, the Western Australian Herbarium (WAH) Specimen and Threatened Flora were searched for known records within the vicinity of the study area. There were twelve conservation significant species recorded, three of which are TF. The list of significant flora is provided in **Table 2** below.

Table 2: Significant Flora Species

Species	Conservation Code ¹
<i>Drummondita ericoides</i>	T - EN
<i>Eucalyptus cuprea</i>	T - EN
<i>Melaleuca huttensis</i>	P1
<i>Vittadinia cervicularis</i> var. <i>occidentalis</i>	P1
<i>Thryptomene</i> sp. Moresby Range	P3
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3
<i>Grevillea triloba</i>	P3
<i>Thryptomene stenophylla</i>	P2
<i>Acacia guinetii</i>	P4
<i>Eucalyptus blaxellii</i>	P4
<i>Verticordia penicillaris</i>	P4

¹ T: Threatened Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. Threatened Flora are further ranked by the Department according to their level of threat using IUCN Red List criteria:

CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
 EN: Endangered – considered to be facing a very high risk of extinction in the wild
 VU: Vulnerable – considered to be facing a high risk of extinction in the wild.

P1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

P4: Priority Four – Rare, Near Threatened and other species in need of monitoring

Rare Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection

Near Threatened Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent

Other Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

P5: Priority Five – Conservation Dependant Species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

2.1.2 Federal Legislation

Some flora species have additional protection under the *Environment Protection and Biodiversity Conservation Act (EPBC) 1999*. In Western Australia, this predominantly consists of Threatened Flora. Penalties apply for any damage to individuals, populations or habitats of species protected.

2.1.3 Other Species of Conservation Significance

Environmental Protection Authority (EPA) *Guidance Statement 51* (EPA, 2004) lists species other than Threatened Flora and Priority Flora as of conservation significance where a species has:

- A keystone role.
- Relictual status.
- Anomalous features indicating a potential new discovery.
- A representation of a species range (range extensions, extremes or an outlier population).
- Status as a restricted subspecies, variety, or naturally occurring hybrid.
- Poor reservation.
- Status as a local endemic or has a restricted distribution.

This document states that conservation significance includes these criteria, but is not limited to them. It may include flora that are poorly represented in WAH and short range endemic flora (those with a known range less than 200km).

2.2 Vegetation

2.2.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway & Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2, 242, 033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

2.2.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are;

- 675 -Shrublands; mixed thicket (*Melaleuca* and *Hakea*), and;
- 359 -Shrublands; *Acacia* and *Banksia* scrub.

The extent of these two vegetation associations within the study area is illustrated in **Figure 1**.

The vegetation extents within Western Australia of these two 'associations' are presented in **Table 3** (WAPC, 2010).

Table 3: Regional Vegetation Association within Western Australia

Vegetation Association	Pre-Europe Extent (WA)	Current Extent (WA)	% Remaining in WA
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51 850	10 992	21.2
359 Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub	44 493	8 366	18.8

The vegetation extents within the Geraldton Regional Flora and Vegetation Survey area (see section 2.4.3) of these two associations' are presented in **Table 4** (WAPC, 2010).

Table 4: Regional Vegetation Association within the GRFVS Area

Vegetation Association	Pre-Europe Extent (GRFVS)	Current Extent (GRFVS)	% Remaining in GRFVS area
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	3 148	240	7.62
359 Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub	17 805	3 077	17.28

2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010)

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed to describe and map the flora and vegetation within the Geraldton area. The report generated from the outcomes of this survey aims to provide information, from a regional context, to aid local scale studies in the assessment of proposals that may affect the native vegetation within the Geraldton region (WAPC, 2010). This survey

has been endorsed by the EPA (2010) as a key source to help minimise the environmental impact of future development in the Geraldton region.

Most of the remnants in the study area are within the GRFVS boundaries. However, no GRFVS quadrats were established within the study area for the GRFVS report. Therefore the plant communities within the study area that have been mapped by the GRFVS were done so at a 90% confidence level (WAPC, 2010).

The GRFVS mapped plant communities for the study area are listed in **Table 5**. The majority of the study area, which consists of cleared pastureland, and in part the Moresby Ranges, falls outside the GRFVS boundary.

Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010)

Beard Vegetation Association	Plant Community	Extent of GRFVS Plant Communities %
359	10 Near Coastal: <i>Acacia rostellifera</i> shrubland	36.63
675	15 Thicket: <i>Melaleuca</i> spp. /mixed spp.	7.61
359	13 Sandplain: <i>Banksia prionotes</i> / <i>Acacia rostellifera</i>	12.23

2.3 Conservation Significant Vegetation

2.3.1 Threatened Ecological Communities

DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database was searched for known occurrences within the vicinity of the study area.

This search relates to TECs listed under the *Wildlife Conservation Act 1950* (as amended). Some TECs have further protection under the *Environmental Protection Biodiversity Conservation (EPBC) Act 1999*. TEC and PEC listings are administered through the DEC Threatened Communities Branch.

No previously known TECs or PECs were identified as occurring within the search area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca megacephala* and *Hakea pycnoneura* thickets on the Moresby Range.

2.3.2 Threshold Levels for Biodiversity Conservation

To highlight the need for biodiversity protection within the agricultural areas of the Wheatbelt/ Geraldton region – due to high clearing practices - the EPA published *Position Statement 2* (EPA, 2000). According to *Position Statement 2*, for the EPA to support clearing within the Wheatbelt/ Geraldton region, alternative mechanisms need to be put in place that address biodiversity protection.

As a result EPA (2000 & 2008) has adopted two criteria that are to be taken into consideration when assessing a clearing application, these are:

- i. *The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type*
- ii. *A level of 10% of the original extent is regarded as being a level representing “endangered”*

Vegetation below the 30% “threshold level” is deemed to be significant (EPA, 2008).

2.3.3 Areas of High Conservation Value

In addition to the above criteria, *Guidance Statement 33* (EPA, 2008) lists areas of high conservation value that require protection in WA, these are:

- State and regional conservation areas
- Areas where clearing would conflict with the native vegetation clearing principles in schedule 5 of the *Environmental Protection Act 1986*
- Threatened Ecological Communities
- Significant flora and fauna
- Wetlands and buffers
- Rivers and foreshores
- Important landscapes and landforms
- Natural areas of heritage significance
- Other natural areas, such as ecological linkages

2.3.4 Significant Natural Areas

To assist proponents in the identification of significant natural areas, *Guidance Statement 33* (EPA, 2008) outlines methodology used by government agencies within the Perth Metropolitan Region (Del Marco *et al.* 2004). This methodology adopts the following criteria:

- Representation of ecological communities
- Diversity
- Rarity
- Maintaining ecological processes or natural systems
- Scientific or evolutionary importance
- Protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

3.0 METHODS

3.1 Field Survey

An expert botanist conducted a Level 1 Flora Survey of the Moresby Heights study area (Figure 1) in April 2011. The survey methodology was based on a Level 1 Flora Survey as outlined in *Guidance Statement 51* (EPA, 2004).

A Level 1 Survey comprises of:

Background Research or Desktop Study

- i. Gather together background information on the target area.

Reconnaissance Survey

- i. Verify accuracy of the Desktop Study.
- ii. Delineate and characterise the flora and range of vegetation units present in the target area.
- iii. Identify potential impacts

This involves selective, low intensity sampling of flora and vegetation to produce maps of vegetation units and vegetation condition at an appropriate scale. Searches for significant flora (**Table 2**) were also performed within the study area.

A species list was compiled using the latest nomenclature and taxonomic references (*Florabase*, 2011 and Smith, 2010).

3.1.1 Vegetation Sampling

Mapping of each vegetation unit was completed using aerial photographs and on site surveying. Each vegetation unit was defined by the dominant plant species (>2% cover) throughout its extent, using the vegetation structure classes of the WAPC (2000) (**Table 6**).

Table 6: Vegetation Structure Classes

Life Form/ Height Class	Canopy Cover (percentage)			
	100% - 70%	70% - 30%	30% - 10%	10% - 2%
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees <10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Scrub Mallee
Shrubs >2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs <1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

(WAPC, 2000)

3.2 Vegetation Condition

The site was traversed by foot and vehicle to assess the vegetation condition. The Vegetation Condition Scale (Keighery, 1994) recommended in *Bush Forever* (WAPC, 2000) (Table 7) was used classify the vegetation condition of the study area.

Table 7: Vegetation Condition Scale

Condition	Definition
Pristine	No obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species; weeds are non-aggressive species.
Very Good	Vegetation structure altered; obvious signs of disturbance.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance; basic vegetation structure or ability to regenerate is retained.
Degraded	Basic vegetation structure severely impacted by disturbance; scope for regeneration but not to a state approaching good (sic) condition without intensive management.
Completely Degraded	Vegetation structure not intact; the area completely or almost completely without native species ('parkland cleared').

(WAPC, 2000)

4.0 RESULTS AND DISCUSSION

4.1 Flora

A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants. A list of species recorded within the study area is presented in **Appendix A**.

There were a number of taxa that could not be positively identified due to inadequate fruiting or flowering material available at the time of the survey. These are labeled throughout this document with a '?'.

4.1.1 Flora of Conservation Significance

No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian *Wildlife Conservation Act 1950* or governed by the *Environment Protection and Biodiversity Conservation Act 1999* were located within the study area.

Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) *Melaleuca huttensis* (**Plate 1**) and Priority 3 (P3) *Grevillea triloba* (**Plate 2**). One individual *Melaleuca huttensis* was recorded within vegetation unit ArAt (**Section 4.2.1**) (**Figure 2**). *Grevillea triloba* was recorded in large numbers (>100) within vegetation units ArAt and EInF (**Section 4.2.1**) (**Figure 2**).

Both Priority Flora species located in this survey (current report) were also recorded in the previous survey of the study area by GHD (2007). GHD also recorded *Geleznovia verrucosa* subsp. *formosa*, which was a P3 species at the time of that survey. This species has since been identified as a taxonomic synonym of *Geleznovia verrucosa* and is no longer a Priority Flora species.



Plate 1: P1 *Melaleuca huttensis*



Plate 2: P3 *Grevillea triloba*

No other flora species of other conservation significance as stated in *Guidance Statement 51* (EPA, 2004) were recorded within the study area.

4.1.2 Introduced Flora (Weeds)

Thirteen introduced flora (weeds and landscaping plants) were recorded from the survey site, representing 16% of the total flora recorded.

The Environmental Weeds Strategy for WA (EWSWA) (CALM, 1999) rated all the weeds known for Western Australia at the time of publication, according to invasiveness, distribution and environmental impact (**Table 8**). Weeds were classified into four categories; High, Moderate, Mild and Low. High rated species are those that all three criteria apply to (**Table 8**) and Moderate to which two criteria apply. The High and Moderate category weeds recorded in the survey area that should be prioritised for control or eradication are listed in **Table 9**.

Table 8: Criteria for Environmental Weeds Strategy Rating

Criteria	Description
Invasiveness	Ability to invade bushland in good to excellent condition or ability to invade waterways.
Distribution	Wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world.
Environmental Impacts	Ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton

Weed	Rating	Weed	Rating
* <i>Brassica tournefortii</i>	High	* <i>Lycium ferocissimum</i>	High
* <i>Bromus diandrus</i>	High	* <i>Avena barbata</i>	Moderate
* <i>Ehrharta calycina</i>	High	* <i>Briza maxima</i>	Moderate
* <i>Lupinus cosentinii</i>	High	* <i>Ursinia anthemoides</i>	Moderate

4.2 Vegetation

4.2.1 Vegetation Units

An expert botanist defined and mapped 12 vegetation units across the study area, as shown in **Figure 3**. Photographs of some vegetation units and the general study area can be found in **Appendix B**. Descriptions of the vegetation units for the study area are as follows:

1. **EPw** - *Eucalyptus loxophleba*, *E. camaldulensis*, **E.utilis* and *E. sp?* Low Open Woodland over pasture weeds

2. **AAH** - *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladius asper*, **Avena barbata* and Poaceae sp.? Open Herbland/Grassland.
3. **AtMc** - *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland
4. **MrAr** - *Melaleuca raphiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostellifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and Poaceae sp.? Grassland.
5. **EIAr** - Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland
6. **AsAr** - Scattered *Acacia scirpifolia* and *A. rostellifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds
7. **ArAt** - *Acacia rostellifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmocladius asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
8. **EINf** - Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, *?Austrostipa* sp. and *Desmocladius asper* Herbland/ Grassland.
9. **ArAc** - Scattered *Acacia rostellifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland
10. **Hp** - *Hakea preissii* Tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face
11. **Di** - *Dodonaea inaequifolia* Closed Tall Scrub over Poaceae sp.
12. **CP** - Scattered *Eucalyptus loxophleba*, *Acacia rostellifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland

4.2.2 Vegetation Condition

The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition (Figure 3). The north western extent of the study area contains remnant heath

vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition. Within close proximity to this are small patches of 'Very Good' and 'Very Good' - 'Good' vegetation. The remainder of the study area has been affected - to varying degrees from grazing, clearing and weeds. Small patches of remnant vegetation exist within the cleared pasturelands, however weeds dominate most of these areas.

4.3 Conservation Significant Vegetation

4.3.1 Biodiversity Threshold Levels

Beard Vegetation Association Extent for WA and the GRFVS Area

Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010) (Table 3). In WA these two vegetation types have been cleared below the threshold at which species loss appears to accelerate exponentially at the ecosystem level (EPA, 2000 & 2008).

Within the GRFVS area Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have 17.28% and 7.62% respectively remaining (Table 4). Even though the 'threshold' extents apply to vegetation associations at state level, it is still important to consider the representation of these two vegetation associations within the GRFVS area in terms of local biodiversity.

It should be noted that these statistics do not take into account remnant size or vegetation condition of the areas represented by these vegetation associations. The majority of the study area has been historically cleared, and small remnants of vegetation within cleared pastureland are generally what is remaining. These remnants are continuing to degrade due to grazing and weed invasion, with the exception of the remnant vegetation represented by vegetation unit E1Nf in the north western corner of the site, rated as being in 'Excellent' condition (Figures 2 & 3).

4.3.2 GRFVS Plant Community Representation

To effectively assess the regional representation of vegetation within the study area and compare it to the dataset of the GRFVS, a 10m x 10m plot based survey followed by a quantitative statistical analysis would need to be done; this would involve a detailed Level 2 Flora and Vegetation survey in accordance with the EPA's Guidance Statement 51 (EPA, 2004). As outlined above in section 2.2.3, no GRFVS plots were established within the study area. The plant communities outlined below for the study area were mapped by the GRFVS at a confidence level of 90% (WAPC, 2010).

Plant Community 10 Near Coastal: *Acacia rostellifera* shrubland

This plant community is represented by vegetation units AAH, E1Ar and AtMc within the study area. The vegetation condition for these units ranged from 'Good' to 'Degraded' (Figure 3). Plant community 10 is thought to have previously included *Banksia prionotes*, but due to disturbance from clearing, grazing, fire and weed invasion it has been reduced to a community dominated by *Acacia rostellifera*.

This community occupies 36.63% of the native vegetation of the GRFVS area (Table 5), and is the most widespread of the plant communities

Plant Community 15 Thicket: *Melaleuca* spp / mixed spp.

This plant community is represented by vegetation units AAH, ElAr, MrAr, and EInF. The vegetation condition for these units ranged from 'Excellent' to 'Degraded' (Figure 3). This community is dominated by *Melaleuca* spp. and is most accurately portrayed in the study area by vegetation unit EInF.

Significant numbers of Threatened and Priority Flora species were recorded in this plant community by the GRFVS. Five out of eight plant community 15 quadrats surveyed by GRFVS contained flora species of conservation significance. This survey (current report) recorded Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 7.61% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area.

Plant Community 13 Sandplain: *Banksia prionotes/ Acacia rostellifera*

This plant community is only represented within the study area by vegetation unit ArAt; the condition of this unit was assessed as 'Good'. Species characteristic of this community include *Grevillea candelabroides*, *Melaleuca depressa*, *Hibbertia* spp., *Conostylis* spp., sedges and rushes. This survey (current report) recorded Priority Flora 1 (P1) *Melaleuca huttensis* and Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 12.23% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area. The GRFVS (WAPC, 2010) has stated that this community within Beard Association 359 has conservation significance because of the reduced numbers of *Banksia prionotes* due factors such as; fire, *Phytophthora* and grazing. As a result, large areas of this community no longer have this characteristic species present.

4.3.3 Regionally Significant Natural Areas and Areas of High Conservation Value

According to the EPA's *Position Statement 2* (2000) and *Guidance Statement 33* (2008) the study area is a Regionally and Locally Significant Natural Area for the following reasons:

Representation of ecological communities – Beard vegetation association 359 – (Shrublands; *Acacia* and *Banksia* scrub) and 675 – (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have < 30% of their pre-European extents remaining in WA

Diversity – The study area contains natural areas in good or better condition; namely vegetation unit EInF (Figures 2 & 3).

Significant Flora/ Rarity – Two Priority Flora species were recorded with the study area. These species were Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba*. One individual *Melaleuca huttensis* was recorded, whilst *Grevillea triloba* was recorded in densities of 5% and 20% (Figure 3).

Important landscapes and landforms/ Maintaining ecological processes or natural systems and Ecological Linkages - The Moresby Range follows the boundary of the eastern extent of the study area. The Moresby range is an important landscape that is part of a natural system and provides an ecological linkage throughout its extent.

The Moresby Range escarpment within the study area was not covered by the GRFVS (WAPC, 2010), so no plant community was assigned. However, plant assemblages of the Moresby Range system are considered to be synonymous with Beard vegetation association 675 (WAPC, 2010).

5.0 CONCLUSIONS & RECOMMENDATIONS

According to *Guidance Statement 33* (EPA, 2008) and *Position Statement 2* (EPA, 2000) the study area is considered Regionally Significant because:

5. The vegetation associations within the study area have <30% of their present extents remaining within in WA (**Table 3**)
6. The study area contains native vegetation remnants in good or better condition
7. Two Priority Flora species were recorded; Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba* (**Figure 3**)
8. Within the study area boundary lies, in part, the Moresby Range

To assess the proposed development of the study area, in reference to points 1 and 4, some details should be noted:

- The majority of the study area has been historically cleared and is in Completely Degraded condition (**Figure 3**)
- The Moresby Range escarpment of the study area will not be affected by the proposed development, as this area is to be set-aside as an open space.

With regards points 2 and 3 - vegetation in good or better condition, and Priority Flora – the following should be addressed:

- Within vegetation unit ArAt, P1 *Melaleuca huttensis* and P3 *Grevillea triloba* were recorded. This remnant was in Good condition but is small in size (<1ha). It is currently not fenced off from livestock, so without proper management the area will become further degraded. Due to the occurrence of P1 and P3 flora in this portion of remnant vegetation, it is recommended the area be conserved and fenced off from livestock.
- Vegetation unit EInF was in Excellent condition and is just over 10ha in size, with P3 *Grevillea triloba* recorded within this vegetation unit. Under *Guidance Statement 51* (EPA, 2004) the impact of clearing this vegetation would be considered high to moderate, as a result, a Level 2 Flora and Vegetation Survey of vegetation unit EInF would be required. Alternatively, in keeping with *Position Statement 2* (EPA, 2000) and its requirement for alternative mechanisms that address biodiversity protection, it is recommended that this remnant be retained and managed as a conservation area.

6.0 LIMITATIONS

As with any biological survey, additional flora species including potential threatened, priority or other conservation significant species may be detected in subsequent surveys. For example, ephemeral species such as orchids are not always present in each year/season or at the particular time a single botanical survey is conducted. This is a common limitation to all botanical surveys.

Approximately 10% of Western Australian flora species are undescribed, with new species found regularly. The flora identifications for this project were completed in line with the taxonomic resources and expertise available at the time.

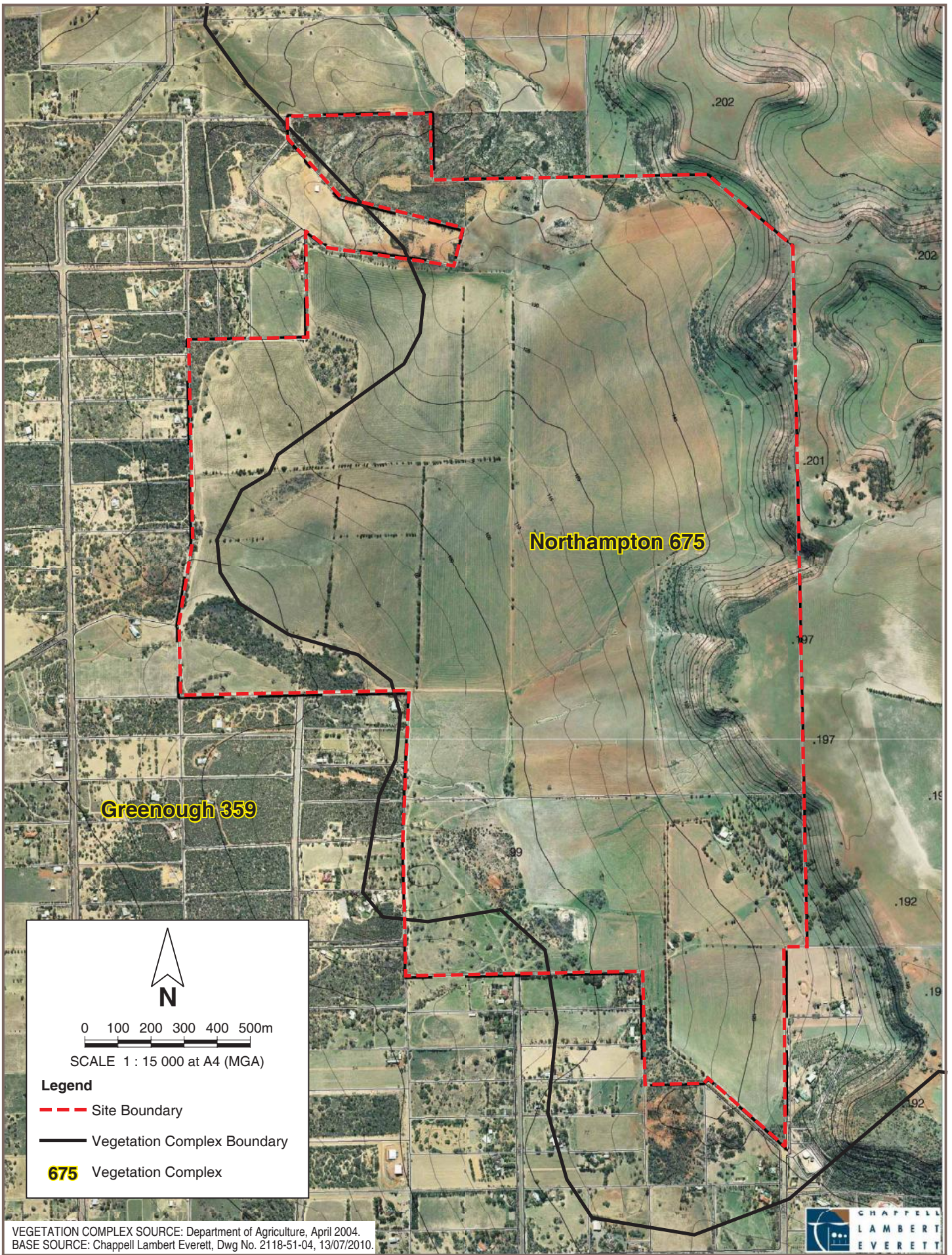
Conservation significant plant communities on site can not be positively confirmed without conducting a plot based survey.

7.0 REFERENCES

- Beard, J (1976), *Vegetation of the Geraldton Area*
- BOM (2011) *Climatic Statistics for Australian Locations*.
http://www.bom.gov.au/climate/averages/tables/cw_008051.shtml Accessed Online, May 2011
- CALM (1999), *Environmental Weed Strategy for Western Australia* Includes weedBase – a digital weed database, Department of Conservation and Land Management, Perth.
- Del Marco, A., Taylor, R., Clarke, K., Savage, K., Cullity, J. and Miles, C. (2004). *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*. Perth Biodiversity Project, Western Australian Local Government Association. West Perth.
- Desmond, A. & Chant, A. (2001) *Geraldton Sandplains 2 (GS2 - Geraldton Hills subregion)*. Department of Environment and Conservation
- Environment Australia. (2000). *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and development of Version 5.1 – Summary Report*. Environment Australia, Canberra
- EPA (2000), *Position Statement No. 2 - Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation with Particular Reference to the Agricultural Area*, Environmental Protection Authority, Perth.
- EPA (2004), *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) No 51 - Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, Environmental Protection Authority, Perth.
- EPA (2008), *Guidance Statement No. 33 - Environmental Guidance for Planning and Development*, Environmental Protection Authority, Western Australia.
- EPA (2010) *Environmental Protection Bulletin No. 10 Geraldton Regional Flora and Vegetation Survey*, Environmental Protection Authority, Western Australia
- Florabase® (2011). Department of Environment, Western Australian Herbarium <http://florabase.calm.wa.gov.au/>. Accessed Online, May 2011.
- GHD (2007) *Lots 80 & 81 Hackett Road, Waggrakine*. Unpublished report.
- Keighery, B (1994), *Bushland Plant Survey – A Guide to Plant Community Survey for the Community*, Wildflower Society of WA (Inc.), Nedlands, Western Australia.
- Noel Schoknecht, N, Tille, P and Purdie, B. (2004) *Soil-landscape mapping in south-western Australia: An overview of methodology and outputs*. Department of Agriculture.
- Smith, M.G. (2010). *Declared Rare and Priority Flora List for Western Australia, 16 September 2010*. Dept of Environment and Conservation. Como, W.A.

- Stuart-Street, A. & Clarke, M. (2005) *Greenough Region Catchment Appraisal*.
Department of Agriculture
- Thackway, R and Cresswell, I (eds.) (1995), *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0*, Australian Nature Conservation Agency, Canberra.
- WAPC (2010) *Geraldton Regional Flora and Vegetation Survey*. Western Australian Planning Commission, Perth.
- WAPC. (2000). *Bush Forever: Volume 2 Directory of Bush Forever Sites*, Perth.

FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-veg-f01.dgn

VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



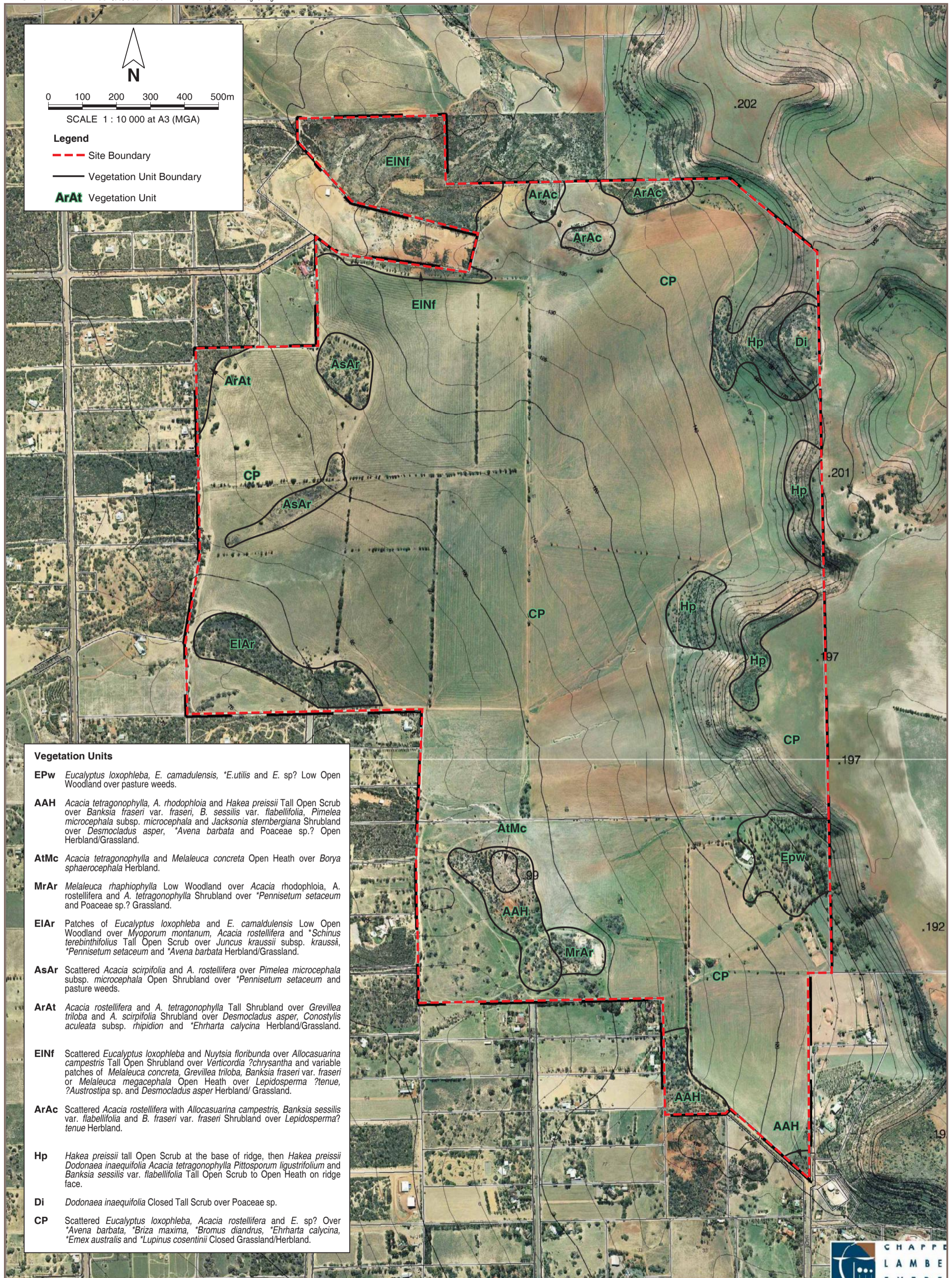
COTERRA
 ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers	Date: 19 May 2011
Job: HUMMOR01	Revision: A

BEARD VEGETATION ASSOCIATIONS

Figure 1



Vegetation Units

EPw	<i>Eucalyptus loxophleba</i> , <i>E. camadulensis</i> , * <i>E. utilis</i> and <i>E. sp?</i> Low Open Woodland over pasture weeds.
AAH	<i>Acacia tetragonophylla</i> , <i>A. rhodophloia</i> and <i>Hakea preissii</i> Tall Open Scrub over <i>Banksia fraseri</i> var. <i>fraseri</i> , <i>B. sessilis</i> var. <i>flabellifolia</i> , <i>Pimelea microcephala</i> subsp. <i>microcephala</i> and <i>Jacksonia sternbergiana</i> Shrubland over <i>Desmodcladus asper</i> , * <i>Avena barbata</i> and <i>Poaceae</i> sp.? Open Herbland/Grassland.
AtMc	<i>Acacia tetragonophylla</i> and <i>Melaleuca concreta</i> Open Heath over <i>Borya sphaerocephala</i> Herbland.
MrAr	<i>Melaleuca rhapsiophylla</i> Low Woodland over <i>Acacia rhodophloia</i> , <i>A. rostellifera</i> and <i>A. tetragonophylla</i> Shrubland over * <i>Pennisetum setaceum</i> and <i>Poaceae</i> sp.? Grassland.
EIAr	Patches of <i>Eucalyptus loxophleba</i> and <i>E. camadulensis</i> Low Open Woodland over <i>Myoporum montanum</i> , <i>Acacia rostellifera</i> and * <i>Schinus terebinthifolius</i> Tall Open Scrub over <i>Juncus kraussii</i> subsp. <i>kraussii</i> , * <i>Pennisetum setaceum</i> and * <i>Avena barbata</i> Herbland/Grassland.
AsAr	Scattered <i>Acacia scirpifolia</i> and <i>A. rostellifera</i> over <i>Pimelea microcephala</i> subsp. <i>microcephala</i> Open Shrubland over * <i>Pennisetum setaceum</i> and pasture weeds.
ArAt	<i>Acacia rostellifera</i> and <i>A. tetragonophylla</i> Tall Shrubland over <i>Grevillea triloba</i> and <i>A. scirpifolia</i> Shrubland over <i>Desmodcladus asper</i> , <i>Conostylis aculeata</i> subsp. <i>rhipidion</i> and * <i>Ehrharta calycina</i> Herbland/Grassland.
EINf	Scattered <i>Eucalyptus loxophleba</i> and <i>Nuytsia floribunda</i> over <i>Allocasuarina campestris</i> Tall Open Shrubland over <i>Verticordia ?chrysantha</i> and variable patches of <i>Melaleuca concreta</i> , <i>Grevillea triloba</i> , <i>Banksia fraseri</i> var. <i>fraseri</i> or <i>Melaleuca megacephala</i> Open Heath over <i>Lepidosperma ?tenua</i> , * <i>Austrostipa</i> sp. and <i>Desmodcladus asper</i> Herbland/ Grassland.
ArAc	Scattered <i>Acacia rostellifera</i> with <i>Allocasuarina campestris</i> , <i>Banksia sessilis</i> var. <i>flabellifolia</i> and <i>B. fraseri</i> var. <i>fraseri</i> Shrubland over <i>Lepidosperma? tenue</i> Herbland.
Hp	<i>Hakea preissii</i> tall Open Scrub at the base of ridge, then <i>Hakea preissii Dodonaea inaequifolia</i> <i>Acacia tetragonophylla</i> <i>Pittosporum ligustrifolium</i> and <i>Banksia sessilis</i> var. <i>flabellifolia</i> Tall Open Scrub to Open Heath on ridge face.
Di	<i>Dodonaea inaequifolia</i> Closed Tall Scrub over <i>Poaceae</i> sp.
CP	Scattered <i>Eucalyptus loxophleba</i> , <i>Acacia rostellifera</i> and <i>E. sp?</i> Over * <i>Avena barbata</i> , * <i>Briza maxima</i> , * <i>Bromus diandrus</i> , * <i>Ehrharta calycina</i> , * <i>Emex australis</i> and * <i>Lupinus cosentinii</i> Closed Grassland/Herbland.



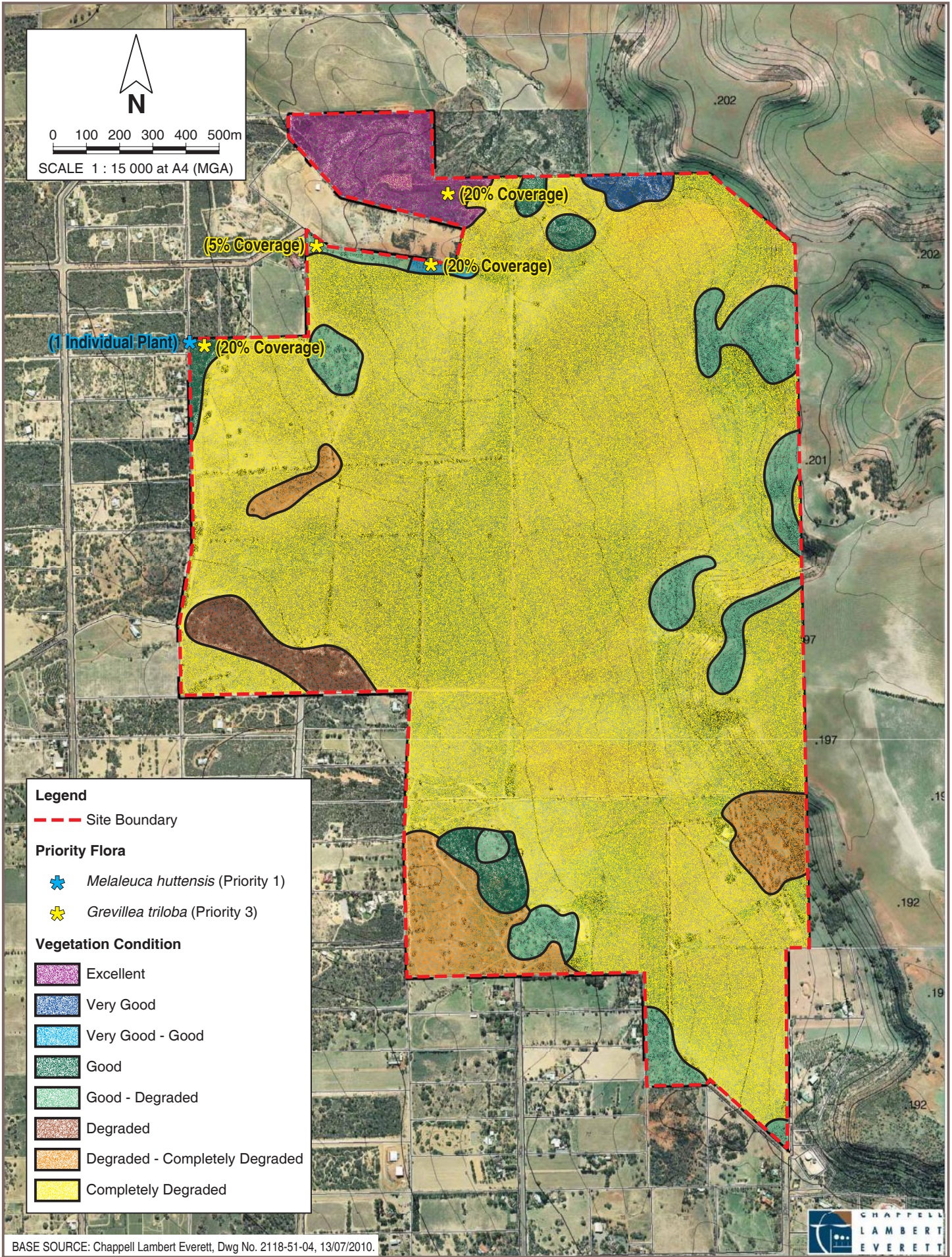
COTERRA ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers Date: 19 May 2011
 Job: HUMMOR01 Revision: A

VEGETATION UNITS

Figure 2



HUMMOR01-veg-f03.dgn
 PINPOINT CARTOGRAPHICS (08) 9562 7136

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



COTERRA
ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers	Date: 19 May 2011
Job: HUMMOR01	Revision: A

VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA

Figure 3

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Flora Species List

APPENDIX A: Species List

* denotes weed species

P1 or P3 denotes Priority Flora 1 or 3

*p denotes planted WA species

Family	Species
ANACARDIACEAE	* <i>Schinus terebinthifolius</i>
ASPARAGACEAE	<i>Acanthocarpus preissii</i>
ASTERACEAE	* <i>Ursinia anthemoides</i>
BORYACEAE	<i>Borya sphaerocephala</i>
BRASSICACEAE	* <i>Brassica tournefortii</i>
CASUARINACEAE	<i>Allocasuarina campestris</i>
CHENOPODIACEAE	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i> <i>Rhagodia preissii</i> subsp. <i>obovata</i>
COLCHICACEAE	<i>Burchardia congesta</i>
CUCURBITACEAE	* <i>Citrullus lanatus</i>
CYPERACEAE	<i>Lepidosperma ? tenue</i> <i>Lepidosperma</i> sp.? <i>Mesomelaena pseudostygia</i>
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>
ERICACEAE	<i>Astroloma serratifolium</i>
FABACEAE	<i>Acacia daphnifolia</i> <i>Acacia oxyclada</i> <i>Acacia rhodophloia</i> <i>Acacia rostelifera</i> <i>Acacia saligna</i> subsp. <i>lindleyi</i> <i>Acacia scirpifolia</i> <i>Acacia tetragonophylla</i> <i>Daviesia divaricata</i> subsp. <i>lanulosa</i> <i>Gastrolobium triangulare</i> <i>Jacksonia sternbergiana</i> * <i>Lupinus cosentinii</i>

Family	Species
GOODENIACEAE	<i>Lechenaultia linarioides</i>
HAEMODORACEAE	<i>Conostylis aculeata</i> subsp. <i>hipidion</i>
HEMEROCALLIDACEAE	<i>Corynotheca micrantha</i> var. <i>micrantha</i> <i>Dianella revoluta</i> var. <i>divaricata</i> <i>Tricoryne elatior</i>
JUNCACEAE	<i>Juncus kraussii</i>
LAURACEAE	<i>Cassytha aurea</i>
LORANTHACEAE	<i>Amyema preissii</i> <i>Nuytsia floribunda</i>
MYRTACEAE	<i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> <i>Eucalyptus camaldulensis</i> var. <i>obtusata</i> <i>Eucalyptus loxophleba</i> <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i> *p <i>Eucalyptus utilis</i> <i>Eucalyptus</i> sp.? <i>Melaleuca concreta</i> P1 <i>Melaleuca huttensis</i> <i>Melaleuca megacephala</i> <i>Melaleuca raphiophylla</i> <i>?Thryptomene</i> sp. <i>Verticordia ?chrysantha</i>
PITTOSPORACEAE	<i>Pittosporum ligustrifolium</i> Pittosporaceae sp.?
POACEAE	<i>Amphipogon caricinus</i> <i>Austrodanthonia</i> sp. <i>?Austrostipa</i> sp. * <i>Avena barbata</i> * <i>Briza maxima</i> * <i>Bromus diandrus</i> * <i>Ehrharta calycina</i> * <i>Pennisetum setaceum</i> Poaceae sp.
POLYGONACEAE	* <i>Emex australis</i>

Family	Species
PROTEACEAE	<i>Banksia fraseri</i> var. <i>fraseri</i> <i>Banksia prionotes</i> <i>Banksia sessilis</i> var. <i>flabellifolia</i> <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> <i>Grevillea candelabroides</i> P3 <i>Grevillea triloba</i> <i>Hakea preissii</i> <i>Petrophile conifera</i>
RESTIONACEAE	<i>Desmocladus asper</i> <i>Lepidobolus preissianus</i>
SANTALACEAE	<i>Santalum acuminatum</i>
SAPINDACEAE	<i>Dodonaea inaequifolia</i>
SCROPHULARIACEAE	<i>Myoporum montanum</i>
SOLANACEAE	* <i>Lycium ferocissimum</i>
THYMELAEACEAE	<i>Pimelea microcephala</i> subsp. <i>microcephala</i>
VITACEAE	<i>Clematicissus angustissima</i>

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Vegetation Unit Photos

APPENDIX B – Vegetation Unit Photographs



Plate 1: AAH – Good to Degraded Condition



Plate 2: EIAr – Degraded Condition



Plate 3: ArAt – Good Condition



Plate 4: ArAc – Very Good Condition



Plate 5: EINF - Excellent Condition



Plate 6: EINF - Excellent Condition



Plate 7: Epw - Degraded to Completely Degraded Condition



Plate 8: Hp - Good to Degraded Condition

**APPENDIX C - DEC Threatened Flora and Fauna Database Search
Results (Naturemaps, 2011)**

NatureMap Species Report

Created By Guest user on 06/05/2011

Method 'By Circle'

Centre 114°39' 20" E,28°41' 30" S

Buffer 40km

Group By Kingdom

Kingdom	Species	Records
Animalia	597	8627
Chromista	18	33
Fungi	77	114
Plantae	1482	7231
TOTAL	2174	16005

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Animalia				
1.	<i>Ablabesmyia notabilis</i>			
2.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
3.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill (Inland Thornbill))			
4.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
5.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
6.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
7.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
8.	24282 <i>Accipiter fasciatus</i> subsp. <i>fasciatus</i>			
9.	<i>Acercella falcipes</i>			
10.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
11.	-1576 <i>Actitis hypoleucos</i>			
12.	<i>Aedes</i> sp.			
13.	25544 <i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
14.	<i>Agraptocorixa eurynome</i>			
15.	<i>Agraptocorixa parvipunctata</i>			
16.	<i>Ainudrilus</i> sp.			Y
17.	<i>Allodessus bistrigatus</i>			
18.	<i>Alona rigidicaudis</i> s.l.			
19.	<i>Alona</i> sp. nov. d (<i>Wicherina</i>)			Y
20.	30833 <i>Amphibolurus longirostris</i>			
21.	24310 <i>Anas castanea</i> (Chestnut Teal)			
22.	24312 <i>Anas gracilis</i> (Grey Teal)			
23.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
24.	25550 <i>Anas rhynchotis</i> subsp. <i>rhynchotis</i>			
25.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
26.	24332 <i>Anhinga melanogaster</i> subsp. <i>novaehollandiae</i>			
27.	-1591 <i>Anhinga novaehollandiae</i>			
28.	<i>Anisops hyperion</i>			
29.	<i>Anisops thienemanni</i>			
30.	25634 <i>Anous stolidus</i> (Common Noddy)			
31.	25635 <i>Anous tenuirostris</i> (Lesser Noddy)			
32.	25241 <i>Antaresia stimsoni</i> subsp. <i>stimsoni</i>			
33.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
34.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
35.	25670 <i>Anthus australis</i> (Australian Pipit)			
36.	-1612 <i>Anthus novaeseelandiae</i>			
37.	<i>Antiporus</i> sp.			
38.	25528 <i>Aphelocephala leucopsis</i> (Southern Whiteface)			
39.	24266 <i>Aphelocephala leucopsis</i> subsp. <i>castaneiventris</i>			
40.	24991 <i>Aprasia repens</i>			
41.	25743 <i>Aptenodytes patagonicus</i> (King Penguin)			
42.	25554 <i>Apus pacificus</i> (Fork-tailed Swift)			
43.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
44.	25538 <i>Aquila morphnoides</i> (Little Eagle)			
45.	25558 <i>Ardea ibis</i> (Cattle Egret)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
46.	-1578 <i>Ardea modesta</i>			
47.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
48.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
49.	-1583 <i>Ardenna carneipes</i>			
50.	-1571 <i>Ardenna pacifica</i>			
51.	24610 <i>Ardeotis australis</i> (Australian Bustard)		P4	
52.	25736 <i>Arenaria interpres</i> (Ruddy Turnstone)			
53.	<i>Arrenurus balladoniensis</i>			
54.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
55.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
56.	<i>Arteria sp. 1</i>			
57.	25236 <i>Aspidites ramsayi</i> (Woma)		S	
58.	<i>Asteron-complex sp. 2</i>			
59.	<i>Atractocerus kreuslerae</i>			
60.	<i>Aulonogyrus strigosus</i>			
61.	<i>Australocyclops australis</i>			
62.	<i>Australutica quaerens</i>			
63.	<i>Austrochiltonia subtenuis</i>			
64.	<i>Austrolestes aridus</i>			
65.	<i>Austrotrombella sp. nov.</i>			
66.	24318 <i>Aythya australis</i> (Hardhead)			
67.	-1633 <i>Barnardius zonarius</i>			
68.	<i>Bennelongia australis</i>			
69.	<i>Berosus approximans</i>			
70.	<i>Berosus australiae</i>			
71.	<i>Bezzia sp. 1</i>			
72.	<i>Bezzia sp. 2</i>			
73.	24319 <i>Biziura lobata</i> (Musk Duck)			
74.	<i>Boeckella triarticulata</i>			
75.	24251 <i>Bos taurus</i> (European Cattle)	Y		
76.	<i>Bostrychopsis jesuita</i>			
77.	34059 <i>Bothriembryon whiteleyi</i>		X	Y
78.	25245 <i>Brachyurophis semifasciata</i>			
79.	24723 <i>Cacatua pastinator</i> subsp. <i>butleri</i> (Butler's Corella)			
80.	24725 <i>Cacatua roseicapilla</i> subsp. <i>assimilis</i>			
81.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
82.	-1686 <i>Cacatua sp.</i>			
83.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
84.	-1590 <i>Cacomantis pallidus</i>			
85.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)			
86.	24780 <i>Calidris alba</i> (Sanderling)			
87.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)			
88.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)			
89.	24790 <i>Calidris tenuirostris</i> (Great Knot)			
90.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
91.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)		T	
92.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)		T	
93.	<i>Candonocypris sp. 682</i> (? <i>novaezelandiae</i>)			
94.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
95.	24507 <i>Catharacta antarctica</i> subsp. <i>lonnbergi</i>			
96.	<i>Cavasteron sp. 1</i>			
97.	<i>Cephrenes augiades</i> subsp. <i>sperthias</i>			
98.	<i>Cercophonius sp.</i>			
99.	<i>Ceriodaphnia sp. nov. d</i> (Berner sp.#5)			
100.	24564 <i>Certhionyx variegatus</i> (Pied Honeyeater)			
101.	<i>Chaetogaster diastrophus</i>			
102.	-1624 <i>Chalcites basalis</i>			
103.	-1581 <i>Chalcites lucidus</i>			
104.	-1615 <i>Chalcites osculans</i>			
105.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
106.	-1634 <i>Charadrius australis</i>			
107.	25573 <i>Charadrius bicinctus</i> (Double-banded Plover)			
108.	25574 <i>Charadrius dubius</i> (Little Ringed Plover)			
109.	25575 <i>Charadrius leschenaultii</i> (Greater Sand Plover)			
110.	24373 <i>Charadrius melanops</i> (Black-fronted Dotterel)			
111.	25576 <i>Charadrius mongolus</i> (Lesser Sand Plover)			
112.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
113.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck (Wood Duck))			
114.	-1602 <i>Cheramoeca leucosterna</i>			
115.	24488 <i>Cheramoeca leucosternus</i> (White-backed Swallow)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
116.	<i>Chironomus aff. alternans</i> (V24)			
117.	<i>Chironomus tepperi</i>			
118.	-1579 <i>Chlidonias hybrida</i>			
119.	-1637 <i>Chroicocephalus novaehollandiae</i>			
120.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i>			
121.	24833 <i>Cincloramphus cruralis</i> (Brown Songlark)			
122.	24834 <i>Cincloramphus mathewsi</i> (Rufous Songlark)			
123.	-1620 <i>Cinclosoma castanotum</i>			
124.	24288 <i>Circus approximans</i> (Swamp Harrier)			
125.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
126.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
127.	24396 <i>Climacteris rufa</i> (Rufous Treecreeper)			
128.	<i>Cloeon</i> sp.			
129.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
130.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
131.	<i>Colurella coluris</i>			
132.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
133.	24416 <i>Corvus bennetti</i> (Little Crow)			
134.	25592 <i>Corvus coronoides</i> (Australian Raven)			
135.	24417 <i>Corvus coronoides</i> subsp. <i>perplexus</i>			
136.	25593 <i>Corvus orru</i> (Torresian Crow)			
137.	-1666 <i>Corvus</i> sp.			
138.	<i>Corynoneura</i> sp. (V49)			
139.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
140.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
141.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
142.	24422 <i>Cracticus tibicen</i> subsp. <i>dorsalis</i> (White-backed Magpie)			
143.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
144.	24918 <i>Crenadactylus ocellatus</i> subsp. <i>ocellatus</i>			
145.	25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet)			
146.	<i>Croitana croites</i>			
147.	30893 <i>Cryptoblepharus buchanani</i>			
148.	25020 <i>Cryptoblepharus plagioccephalus</i>			
149.	<i>Cryptochironomus griseidorsum</i>			
150.	24881 <i>Ctenophorus maculatus</i> subsp. <i>maculatus</i>			
151.	24886 <i>Ctenophorus reticulatus</i> (Western Nettle Dragon)			
152.	25027 <i>Ctenotus australis</i>			
153.	25039 <i>Ctenotus fallens</i>			
154.	25065 <i>Ctenotus pantherinus</i> subsp. <i>pantherinus</i>			
155.	<i>Culex (culex) australicus</i>			
156.	<i>Culicoides</i> sp.			
157.	25086 <i>Cyclodomorphus branchialis</i>		T	
158.	25087 <i>Cyclodomorphus celatus</i>			
159.	24322 <i>Cygnus atratus</i> (Black Swan)			
160.	<i>Cypretta baylyi</i>			
161.	<i>Cypretta</i> sp. 527			
162.	<i>Cypricercus</i> sp. 442			
163.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
164.	<i>Daphnia cf. cephalata</i>			
165.	24995 <i>Delma australis</i>			
166.	24997 <i>Delma butleri</i>			
167.	25766 <i>Delma fraseri</i>			
168.	24999 <i>Delma grayii</i>			
169.	<i>Delma</i> sp ? nov SAP			Y
170.	25004 <i>Delma tincta</i>			
171.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i>			
172.	25346 <i>Dermodochelys coriacea</i> (Leatherback Turtle)		T	
173.	<i>Dero furcata</i>			
174.	<i>Dero nivea</i>			
175.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
176.	<i>Diplacodes bipunctata</i>			
177.	25469 <i>Diplodactylus granariensis</i>			
178.	24929 <i>Diplodactylus granariensis</i> subsp. <i>granariensis</i>			
179.	24938 <i>Diplodactylus ornatus</i>			
180.	24940 <i>Diplodactylus pulcher</i>			
181.	25359 <i>Disteira major</i>			
182.	<i>Doratifera</i> sp.			
183.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
184.	<i>Ecnomus pansus/turgidus</i>			
185.	-1623 <i>Egretta garzetta</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
186.	-1577 <i>Egretta novaehollandiae</i>			
187.	-1647 <i>Egretta sacra</i>			
188.	-1600 <i>Elanus axillaris</i>			
189.	25250 <i>Elapognathus coronatus</i> (Crowned Snake)			
190.	-1573 <i>Eiseyornis melanops</i>			
191.	<i>Enoplognatha</i> sp.			
192.	-1569 <i>Eolophus roseicapillus</i>			
193.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
194.	-1629 <i>Eopsaltria griseogularis</i>			
195.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
196.	24568 <i>Epthianura aurifrons</i> (Orange Chat)			
197.	24570 <i>Epthianura tricolor</i> (Crimson Chat)			
198.	25109 <i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)			
199.	24379 <i>Erythrogonys cinctus</i> (Red-kneed Dotterel)			
200.	<i>Eucyclops australiensis</i>			
201.	<i>Eucypris virens</i>			
202.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
203.	<i>Euryopsis</i> sp. 7			
204.	<i>Euryopsis</i> sp. 9			
205.	24415 <i>Eurystomus orientalis</i> subsp. <i>pacificus</i>			
206.	<i>Eylais</i> sp.			
207.	25621 <i>Falco berigora</i> (Brown Falcon)			
208.	25622 <i>Falco cenchroides</i> (Australian Kestrel)			
209.	24472 <i>Falco cenchroides</i> subsp. <i>cenchrroides</i>			
210.	25623 <i>Falco longipennis</i> (Australian Hobby)			
211.	24474 <i>Falco longipennis</i> subsp. <i>longipennis</i>			
212.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
213.	24475 <i>Falco peregrinus</i> subsp. <i>macropus</i>		S	
214.	24041 <i>Felis catus</i> (Cat)	Y		
215.	25727 <i>Fulica atra</i> (Eurasian Coot)			
216.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
217.	24765 <i>Gallirallus philippensis</i> subsp. <i>mellori</i>			
218.	<i>Gamasomorpha</i> sp. 7			
219.	<i>Gamasomorpha</i> sp. 8			
220.	24959 <i>Gehyra variegata</i>			
221.	-1614 <i>Gelochelidon nilotica</i>			
222.	Gen. 1 sp. 1			
223.	Gen. 1 sp. 1			
224.	Gen. 1 sp. 1			
225.	Gen. 1 sp. 1			
226.	Gen. 1 sp. 1			
227.	Gen. 1 sp. 1			
228.	Gen. 1 sp. 1			
229.	Gen. 1 sp. 1			
230.	Gen. 1 sp. 1			
231.	Gen. 1 sp. 1			
232.	Gen. 1 sp. 1			
233.	Gen. 1 sp. 1			
234.	Gen. 1 sp. 2			
235.	Gen. 1 sp. 2			
236.	Gen. 1 sp. 2			
237.	Gen. 1 sp. 2			
238.	Gen. 1 sp. 2			
239.	Gen. 1 sp. 2			
240.	Gen. 1 sp. 2			
241.	Gen. 1 sp. 2			
242.	Gen. 1 sp. 2			
243.	Gen. 12 sp. 2			
244.	Gen. 12 sp. 4			
245.	Gen. 2 sp. 1			
246.	Gen. 2 sp. 1			
247.	Gen. 2 sp. 1			
248.	Gen. 2 sp. 1			
249.	Gen. 2 sp. 1			
250.	Gen. 2 sp. 1			
251.	Gen. 2 sp. 1			
252.	Gen. 2 sp. 1			
253.	Gen. 3 sp. 1			
254.	Gen. 3 sp. 1			
255.	Gen. 3 sp. 1			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
256.	Gen. 3 sp. 1			
257.	Gen. 3 sp. 1			
258.	Gen. 3 sp. 1			
259.	Gen. 3 sp. 1			
260.	Gen. 3 sp. 10			
261.	Gen. 3 sp. 11			
262.	Gen. 3 sp. 12			
263.	Gen. 3 sp. 3			
264.	Gen. 3 sp. 3			
265.	Gen. 5 sp. 1			
266.	Gen. 5 sp. 1			
267.	Gen. 5 sp. 1			
268.	Gen. 6 sp. 1			
269.	Gen. 6 sp. 1			
270.	Gen. ?? sp. 12			
271.	Gen. ?? sp. 12			
272.	Gen. A sp.			
273.	-1684 Genus sp.			
274.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
275.	25585 <i>Geopelia striata</i> (Peaceful Dove)			
276.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
277.	-1596 <i>Glyciphila melanops</i>			
278.	<i>Gmogola</i> sp. B			
279.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
280.	<i>Grayenulla australensis</i>			
281.	<i>Grymeus</i> sp. 10			
282.	<i>Grymeus</i> sp. 4			
283.	<i>Grymeus</i> sp. 9			
284.	<i>Gymnometriocnemus</i> sp. A			
285.	<i>Habronestes</i> sp. 15			
286.	<i>Habronestes</i> sp. 27			Y
287.	<i>Habronestes</i> sp. 5			
288.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
289.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
290.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
291.	<i>Haliplus gibbus</i>			
292.	24689 <i>Halobaena caerulea</i> (Blue Petrel)			
293.	24297 <i>Hamirostra melanosternon</i> (Black-breasted Buzzard)			
294.	<i>Harrisius</i> sp. A			
295.	25408 <i>Heleioporus albopunctatus</i> (Western Spotted Frog)			
296.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
297.	25412 <i>Heleioporus psammophilus</i> (Sand Frog)			
298.	<i>Helobdella papillornata</i>			
299.	<i>Hemianax papuensis</i>			
300.	<i>Hemicordulia tau</i>			
301.	<i>Heterocypris tatei</i>			
302.	24961 <i>Heteronotia binoei</i> (Bynoe's Gecko)			
303.	-1601 <i>Hieraaetus morphnoides</i>			
304.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
305.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
306.	25629 <i>Hirundo nigricans</i> (Tree Martin)			
307.	<i>Hyderodes crassus</i>			
308.	25366 <i>Hydrophis elegans</i>			
309.	-1642 <i>Hydroprogne caspia</i>			
310.	24075 <i>Hyperoodon planifrons</i> (Southern Bottlenose Whale)			Y
311.	<i>Hyphydrus elegans</i>			
312.	<i>Hypochrysops halyaetus</i>			
313.	33917 <i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)		T	
314.	<i>Ilyodromus</i> sp. 566 (aff. <i>amplicolis</i>)			
315.	<i>Ischnura aurora aurora</i>			
316.	<i>Isidorella</i> sp.			
317.	<i>Kerasteron</i> sp. 1			
318.	<i>Keratella procurva</i>			
319.	<i>Kiefferulus intertinctus</i>			
320.	-1641 <i>Lalage sueurii</i>			
321.	<i>Lampona cylindrata</i>			
322.	<i>Larsia ? albiceps</i>			
323.	25638 <i>Larus pacificus</i> (Pacific Gull)			
324.	<i>Latrodectus hasseltii</i>			
325.	<i>Lecane aculeata</i>			Y

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
326.	<i>Lecane bulla</i>			
327.	<i>Lecane closterocerca</i>			
328.	<i>Lecane hamata</i>			
329.	<i>Lecane ludwigii</i>			
330.	<i>Lecane luna</i>			
331.	<i>Lecane papuana</i>			
332.	24218 <i>Leporillus apicalis</i> (Lesser Stick-nest Rat)		X	
333.	25131 <i>Lerista distinguenda</i>			
334.	25133 <i>Lerista elegans</i>			
335.	25137 <i>Lerista gerrardii</i>			
336.	25147 <i>Lerista lineata</i>		P3	
337.	25148 <i>Lerista lineopunctulata</i>			
338.	25160 <i>Lerista planiventralis</i> subsp. <i>decora</i>			
339.	25165 <i>Lerista praepedita</i>			
340.	25005 <i>Lialis burtonis</i>			
341.	24575 <i>Lichenostomus keartlandi</i> (Grey-headed Honeyeater)			
342.	25659 <i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
343.	24577 <i>Lichenostomus ornatus</i> (Yellow-plumed Honeyeater)			
344.	24578 <i>Lichenostomus penicillatus</i> (White-plumed Honeyeater)			
345.	24579 <i>Lichenostomus plumulus</i> (Grey-fronted Honeyeater)			
346.	24581 <i>Lichenostomus virescens</i> (Singing Honeyeater)			
347.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
348.	<i>Limnocythere porphyretica</i>			
349.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
350.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)			
351.	25741 <i>Limosa limosa</i> (Black-tailed Godwit)			
352.	<i>Liodessus inornatus</i>			
353.	<i>Liparetrus</i> sp.			
354.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
355.	<i>Lophocharis salpina</i>			
356.	-1635 <i>Lophochroa leadbeateri</i>			
357.	<i>Lychas</i> sp. 3			
358.	<i>Lycidas chrysomelas</i>			
359.	<i>Lycidas</i> sp. 21			Y
360.	<i>Lycidas</i> sp. 3			
361.	<i>Lycidas</i> sp. 4			
362.	<i>Lycosa forresti</i>			
363.	<i>Lycosa</i> sp. 1			
364.	<i>Lycosa</i> sp. 10			
365.	<i>Lycosa</i> sp. 14			
366.	<i>Lycosa</i> sp. 17			
367.	<i>Lycosa</i> sp. 6			
368.	<i>Lycosa</i> sp. 8			
369.	<i>Lynceus</i> sp.			
370.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		T	
371.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
372.	24133 <i>Macropus irma</i> (Western Brush Wallaby)		P4	
373.	25489 <i>Macropus robustus</i>			
374.	24135 <i>Macropus robustus</i> subsp. <i>erubescens</i> (Euro, Biggada)			
375.	<i>Macrothrix breviseta</i>			
376.	<i>Macrothrix schauinslandi</i>			
377.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
378.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
379.	24544 <i>Malurus lamberti</i> subsp. <i>assimilis</i>			
380.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
381.	24551 <i>Malurus pulcherrimus</i> (Blue-breasted Fairy-wren)			
382.	-1674 <i>Malurus</i> sp.			
383.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
384.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
385.	<i>Maratus pavonis</i>			
386.	<i>Matilda</i> sp. 1			
387.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
388.	<i>Megaporus</i> sp.			
389.	24051 <i>Megaptera novaeangliae</i> (Humpback Whale)		T	
390.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
391.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
392.	25184 <i>Menetia greyii</i>			
393.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
394.	<i>Mesocyclops brooksi</i>			
395.	-1636 <i>Microcarbo melanoleucos</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
396.	25693 <i>Microeca fascinans</i> (Jacky Winter)			
397.	<i>Micronecta gracilis</i>			
398.	<i>Micronecta robusta</i>			
399.	25542 <i>Milvus migrans</i> (Black Kite)			
400.	<i>Missulena</i> sp. 5			
401.	<i>Missulena</i> sp. 6			
402.	24904 <i>Moloch horridus</i> (Thorny Devil)			
403.	<i>Monohelea</i> sp. 3			
404.	25240 <i>Morelia spilota</i> subsp. <i>imbricata</i> (Carpet Python)		S	
405.	25191 <i>Morethia lineocellata</i>			
406.	25192 <i>Morethia obscura</i>			
407.	-1595 <i>Morus serrator</i>			
408.	24601 <i>Motacilla alba</i> subsp. <i>ocularis</i>			Y
409.	24223 <i>Mus musculus</i> (House Mouse)	Y		
410.	25610 <i>Myiagra inquieta</i> (Restless Flycatcher)			
411.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
412.	<i>Myrmopopaea</i> sp.			
413.	<i>Necterosoma</i> sp.			
414.	<i>Necterosoma wollastoni</i>			
415.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
416.	25425 <i>Neobatrachus kunapalari</i> (Kunapalari Frog)			
417.	25426 <i>Neobatrachus pelobatoides</i> (Humming Frog)			
418.	25428 <i>Neobatrachus wilmorei</i> (Plonking Frog)			
419.	24210 <i>Neophoca cinerea</i> (Australian Sea Lion)		S	
420.	<i>Neostorena</i> sp. 12			
421.	<i>Neostorena</i> sp. 4			
422.	24968 <i>Nephurus levis</i> subsp. <i>occidentalis</i>			
423.	30941 <i>Nephurus millii</i> (Barking Gecko)			
424.	<i>Nilobezzia</i> sp. 1			
425.	25748 <i>Ninox novaeseelandiae</i> (Boobook Owl)			
426.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
427.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
428.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
429.	24495 <i>Oceanites marinus</i> subsp. <i>dulciae</i>			
430.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
431.	<i>Oecetis</i> sp.			
432.	-1606 <i>Onychoprion anaethetus</i>			
433.	-1656 <i>Onychoprion fuscata</i>			
434.	<i>Opopaea</i> sp. 1			
435.	<i>Opopaea</i> sp. 10			
436.	<i>Opopaea</i> sp. 11			
437.	<i>Opopaea</i> sp. 12			
438.	<i>Opopaea</i> sp. 2			
439.	<i>Opopaea</i> sp. 3			
440.	<i>Opopaea</i> sp. 4			
441.	<i>Opopaea</i> sp. 7			
442.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
443.	<i>Orthetrum caledonicum</i>			
444.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
445.	34016 <i>Ovis aries</i> (Sheep)			
446.	24328 <i>Oxyura australis</i> (Blue-billed Duck)			
447.	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
448.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
449.	-1611 <i>Pandion cristatus</i>			
450.	<i>Parachironomus</i> sp. 1 (VSCL35)			
451.	<i>Paracyclops chiltoni</i>			
452.	<i>Parakiefferiella</i> sp. A			
453.	<i>Paramerina levidensis</i>			
454.	<i>Paramerina</i> sp.a			
455.	<i>Pararchaea</i> sp. 2			
456.	25254 <i>Parasuta monachus</i>			
457.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
458.	25687 <i>Passer domesticus</i> (House Sparrow)	Y		
459.	24642 <i>Passer montanus</i> (Eurasian Tree Sparrow)	Y		
460.	-1631 <i>Pelagodroma marina</i>			
461.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
462.	-1638 <i>Petrochelidon ariel</i>			
463.	-1640 <i>Petrochelidon nigricans</i>			
464.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
465.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
466.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
467.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
468.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
469.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
470.	<i>Phenasteron longiconductor</i>			
471.	<i>Philodina</i> sp.			Y
472.	<i>Phoracantha lata</i>			
473.	<i>Phoracantha rugithoracica</i>			
474.	-1643 <i>Phylidonyris niger</i>			
475.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
476.	24073 <i>Physeter macrocephalus</i> (Sperm Whale)		P4	
477.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
478.	25721 <i>Platycercus zonarius</i> (Australian Ringneck (Ring-necked Parrot))			
479.	<i>Platynectes decempunctatus</i> var. <i>polygrammus</i>			
480.	<i>Platynectes</i> sp.			
481.	<i>Platyomopsis</i> sp.			
482.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)			
483.	25509 <i>Pletholax gracilis</i> (Keeled Legless Lizard)			
484.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i>			
485.	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)			
486.	24383 <i>Pluvialis squatarola</i> (Grey Plover)			
487.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
488.	25510 <i>Pogona minor</i>			
489.	24907 <i>Pogona minor</i> subsp. <i>minor</i>			
490.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
491.	<i>Polypedilum nubifer</i>			
492.	<i>Polypedilum watsoni</i>			
493.	30854 <i>Polytelis anthopeplus</i> subsp. <i>westralis</i>			
494.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
495.	34013 <i>Pomatostomus superciliosus</i> subsp. <i>ashbyi</i> (White-browed Babbler (western wheatbelt))		P4	
496.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
497.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
498.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
499.	<i>Pristina jenkiniae</i>			
500.	<i>Procladius paludicola</i>			
501.	33991 <i>Psacodonotus seriatus</i> ((cricket))		P1	Y
502.	-1655 <i>Psephotus varius</i>			
503.	25261 <i>Pseudechis australis</i> (Mulga Snake)			
504.	24230 <i>Pseudomys albocinereus</i> (Ash-grey Mouse)			
505.	25263 <i>Pseudonaja modesta</i> (Ringed Brown Snake)			
506.	25264 <i>Pseudonaja nuchalis</i> (Gwardar)			
507.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
508.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill (Chiming Wedgebill))			
509.	24173 <i>Pteropus scapulatus</i> (Little Red Flying-fox)			
510.	-1625 <i>Purnella albifrons</i>			
511.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
512.	25009 <i>Pygopus nigriceps</i>			
513.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
514.	25271 <i>Ramphotyphlops australis</i>			
515.	25279 <i>Ramphotyphlops hamatus</i>			
516.	25281 <i>Ramphotyphlops leptosoma</i>			
517.	25285 <i>Ramphotyphlops pinguis</i>			
518.	25288 <i>Ramphotyphlops waitii</i>			
519.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
520.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
521.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
522.	<i>Rhantus</i> sp.			
523.	-1654 <i>Rhipidura albiscapa</i>			
524.	25613 <i>Rhipidura fuliginosa</i> (Grey Fantail)			
525.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
526.	<i>Sarscyridopsis aculeata</i>			
527.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
528.	24279 <i>Sericornis frontalis</i> subsp. <i>maculatus</i>			
529.	<i>Simocephalus elizabethae</i>			
530.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
531.	25267 <i>Simoselaps littoralis</i> (West Coast Banded Snake)			
532.	<i>Simulium ornatipes</i>			
533.	30948 <i>Smicromis brevirostris</i> (Weebill)			
534.	24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
535.	24109 <i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			
536.	24112 <i>Sminthopsis granulipes</i> (White-tailed Dunnart)			
537.	<i>Sondra</i> sp. 1			
538.	<i>Steatoda</i> sp. 1			
539.	-1574 <i>Stercorarius antarcticus</i>			
540.	-1619 <i>Stercorarius maccormicki</i>			Y
541.	24517 <i>Stercorarius parasiticus</i> (Arctic Skua)			
542.	25640 <i>Sterna dougallii</i> (Roseate Tern)			
543.	24530 <i>Sterna nereis</i> subsp. <i>nereis</i>			
544.	-1599 <i>Sternula nereis</i>			
545.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
546.	24426 <i>Strepera versicolor</i> subsp. <i>plumbea</i>			
547.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
548.	30950 <i>Streptopelia senegalensis</i> subsp. <i>senegalensis</i>	Y		
549.	25518 <i>Strophurus spinigerus</i>			
550.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
551.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe (Black-throated Grebe))			
552.	24207 <i>Tachyglossus aculeatus</i> (Echidna)			
553.	24185 <i>Tadarida australis</i> (White-striped Freetail-bat)			
554.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck (Mountain Duck))			
555.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
556.	30871 <i>Taeniopygia guttata</i> subsp. <i>castanotis</i>			
557.	<i>Tanytarsus fuscithorax/semibarbitarsus</i>			
558.	<i>Tanytarsus</i> sp. F			Y
559.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
560.	<i>Tasmanocoenis tillyardi</i>			
561.	<i>Textracella</i> sp. 1			
562.	34135 <i>Thalassarche cauta</i> (Shy Albatross)		T	
563.	34007 <i>Thalassarche chlororhynchos</i> (Atlantic Yellow-nosed Albatross)		T	
564.	-1582 <i>Thalassarche melanophris</i>			
565.	-1622 <i>Thalasseus bergii</i>			
566.	<i>Thienemanniella</i> sp. (V19)			
567.	24844 <i>Threskiornis molucca</i> (Australian White Ibis)			
568.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
569.	25203 <i>Tiliqua occipitalis</i> (Western Bluetongue)			
570.	25519 <i>Tiliqua rugosa</i>			
571.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
572.	24308 <i>Todiramphus pyrrhopygia</i> (Red-backed Kingfisher)			
573.	-1613 <i>Todiramphus pyrrhopygius</i>			
574.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
575.	-1617 <i>Tribonyx ventralis</i>			
576.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
577.	24803 <i>Tringa brevipes</i> (Grey-tailed Tattler)			
578.	24806 <i>Tringa glareola</i> (Wood Sandpaper)			
579.	24808 <i>Tringa nebularia</i> (Common Greenshank)			
580.	<i>Triplectides australis</i>			
581.	24851 <i>Turnix velox</i> (Little Button-quail)			
582.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
583.	24852 <i>Tyto alba</i> subsp. <i>delicatula</i>			
584.	-1626 <i>Tyto javanica</i>			
585.	24855 <i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i>		P3	
586.	24983 <i>Underwoodisaurus millii</i> (Barking Gecko)			
587.	<i>Urodacus</i> sp. 1			
588.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
589.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
590.	25227 <i>Varanus tristis</i> subsp. <i>tristis</i> (Racehorse Monitor)			
591.	<i>Venatrix pullastra</i>			
592.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
593.	<i>Xanthagrion erythroneurum</i>			
594.	-1639 <i>Xenus cinereus</i>			
595.	<i>Zillimata scintillans</i>			
596.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye (Silvereye))			
597.	24856 <i>Zosterops lateralis</i> subsp. <i>gouldi</i>			
Chromista				
598.	26586 <i>Caulocystis uvifera</i>			
599.	26731 <i>Cystoseira trinodis</i>			
600.	26766 <i>Dictyopteris muelleri</i>			
601.	26767 <i>Dictyopteris plagiogramma</i>			
602.	29537 <i>Dictyota fastigiata</i>			
603.	29939 <i>Dictyota moniliformis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
604.	35216 <i>Dictyota paniculata</i>			
605.	26946 <i>Hormophysa cuneiformis</i>			
606.	27043 <i>Lobophora variegata</i>			
607.	27090 <i>Myriodesma quercifolium</i>			
608.	27118 <i>Padina sanctae-crucis</i>			
609.	27123 <i>Perithalia caudata</i>			
610.	-9620 <i>Sargassum cinctum</i>			Y
611.	27236 <i>Sargassum decurrens</i>			
612.	27245 <i>Sargassum ilicifolium</i>			
613.	27264 <i>Scaberia agardhii</i>			
614.	27273 <i>Scytothalia dorycarpa</i>			
615.	27373 <i>Zonaria turneriana</i>			

Fungi

616.	27574 <i>Acarospora citrina</i>			
617.	-10227 <i>Alternaria brassicae</i>			Y
618.	-11461 <i>Alternaria japonica</i>			Y
619.	-4469 <i>Alternaria solani</i>			
620.	-13185 <i>Ascochyta rabiei</i>			
621.	27587 <i>Aspicilia calcarea</i>			
622.	27593 <i>Buellia alboatra</i>			
623.	-5725 <i>Buellia sp.</i>			
624.	-5296 <i>Caloplaca burneimensis</i>			
625.	27625 <i>Caloplaca cinnabarina</i>			
626.	27628 <i>Caloplaca erythrostricta</i>			
627.	-12556 <i>Caloplaca kaernefeltii</i>			
628.	31099 <i>Caloplaca kantvilasii</i>			
629.	27638 <i>Caloplaca marina</i>			
630.	-3957 <i>Caloplaca mereschkowskiana</i>			
631.	-11616 <i>Caloplaca michelagoensis</i>			
632.	31095 <i>Caloplaca montisfracti</i>			
633.	-12902 <i>Caloplaca sp.</i>			
634.	-6058 <i>Caloplaca yorkensis</i>			Y
635.	27645 <i>Candelariella xanthostigmoides</i>			
636.	27649 <i>Canoparmelia pruinata</i>			
637.	-8172 <i>Cercospora echii</i>			Y
638.	-13018 <i>Cladosporium herbarum</i>			Y
639.	-4180 <i>Cochliobolus victoriae</i>			
640.	-8329 <i>Colletotrichum gloeosporioides</i>			
641.	-7183 <i>Colletotrichum orbiculare</i>			Y
642.	27718 <i>Diploschistes euganeus</i>			
643.	-3855 <i>Drechslera teres</i>			
644.	27741 <i>Endocarpon simplicatum</i>			
645.	-9728 <i>Endocarpon sp.</i>			
646.	27748 <i>Flavoparmelia rutidota</i>			
647.	-9847 <i>Flavoparmelia sp.</i>			
648.	-4702 <i>Fusarium equiseti</i>			
649.	-12094 <i>Fusarium oxysporum</i>			Y
650.	-6320 <i>Gaeumannomyces graminis var. tritici</i>			
651.	-11951 <i>Graphis sp.</i>			
652.	-11257 <i>Hyperphyscia sp.</i>			
653.	-11223 <i>Leptosphaeria nodorum</i>			
654.	-5611 <i>Mycosphaerella capsellae</i>			Y
655.	27956 <i>Pertusaria thiospoda</i>			
656.	20167 <i>Pertusaria trachyspora</i>		P2	
657.	-9407 <i>Phaeogyroporus portentosus</i>			
658.	27972 <i>Physcia jackii</i>			
659.	-9592 <i>Physoderma trifolii</i>			
660.	-10822 <i>Placidium lacinulatum</i>			
661.	-3905 <i>Placidium sp.</i>			
662.	27998 <i>Psora crenata</i>			
663.	-7216 <i>Puccinia coronata</i>			
664.	-5068 <i>Puccinia graminis</i>			
665.	-6842 <i>Puccinia graminis forma avenae</i>			
666.	-12538 <i>Puccinia graminis forma tritici</i>			
667.	-12188 <i>Puccinia haemodori</i>			
668.	28007 <i>Punctelia subalbicans</i>			
669.	28017 <i>Pyxine cocoes</i>			
670.	28052 <i>Rinodina thiomela</i>			
671.	-12715 <i>Septoria lycopersici</i>			Y
672.	28060 <i>Siphula coriacea</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
673.	28065 <i>Teloschistes chrysophthalmus</i>			
674.	28075 <i>Toninia glaucocarpa</i>			
675.	-9750 <i>Toninia</i> sp.			
676.	28080 <i>Trapeliopsis psammophila</i>			
677.	-6370 <i>Uromyces polygoni-aviculariae</i>			
678.	-8367 <i>Uromycladium tepperianum</i>			
679.	28102 <i>Xanthoparmelia alternata</i>			
680.	28104 <i>Xanthoparmelia amplexula</i>			
681.	28145 <i>Xanthoparmelia isidiosa</i>			
682.	29019 <i>Xanthoparmelia kondininensis</i>		P2	
683.	28156 <i>Xanthoparmelia nana</i>			
684.	29964 <i>Xanthoparmelia sargentii</i>		P1	
685.	28180 <i>Xanthoparmelia succedans</i>			
686.	28181 <i>Xanthoparmelia taractica</i>			
687.	28192 <i>Xanthoparmelia yowaensis</i>			
688.	-10456 <i>Xanthoria ectanea</i>			
689.	30455 <i>Xanthoria elixii</i>			
690.	28193 <i>Xanthoria ligulata</i>			
691.	28194 <i>Xanthoria parietina</i>			
692.	-3959 <i>Xanthoria parietinoides</i>			Y

Plantae

693.	4889 <i>Abutilon cryptopetalum</i>			
694.	-4675 <i>Acacia Plurinerves-Microneurae Phyllodes >8-nerved, terete(Misc.- SW)</i>			
695.	3197 <i>Acacia aciphylla</i>			
696.	3199 <i>Acacia acuarria</i>			
697.	3200 <i>Acacia acuminata (Jam)</i>			
698.	3207 <i>Acacia alata (Winged Wattle)</i>			
699.	16111 <i>Acacia alata var. biglandulosa</i>			
700.	3225 <i>Acacia ashbyae</i>			
701.	3238 <i>Acacia bidentata</i>			
702.	3242 <i>Acacia blakelyi</i>			
703.	15471 <i>Acacia brumalis</i>			
704.	3265 <i>Acacia comans</i>			
705.	-10495 <i>Acacia comans Variant No. 1</i>			
706.	15473 <i>Acacia congesta subsp. congesta</i>			
707.	3269 <i>Acacia coolgardiensis (Spinifex Wattle)</i>			
708.	3282 <i>Acacia cyclops (Coastal Wattle)</i>			
709.	20435 <i>Acacia daphnifolia</i>			
710.	3301 <i>Acacia dielsii</i>			
711.	3323 <i>Acacia ericifolia</i>			
712.	3358 <i>Acacia guinetii (Guinet's Wattle)</i>		P4	Y
713.	3376 <i>Acacia idiomorpha</i>			
714.	3391 <i>Acacia jacksonioides</i>			
715.	-8604 <i>Acacia lasiocarpa var. *</i>			
716.	-4811 <i>Acacia lasiocarpa var. ?</i>			
717.	11611 <i>Acacia lasiocarpa var. lasiocarpa</i>			
718.	-4667 <i>Acacia lasiocarpa var. lasiocarpa (flat pinnule variant)</i>			
719.	15721 <i>Acacia lasiocarpa var. sedifolia</i>			
720.	3412 <i>Acacia latipes</i>			
721.	-10506 <i>Acacia latipes Variant No. 2</i>			
722.	15476 <i>Acacia latipes subsp. latipes</i>			
723.	11448 <i>Acacia leptospermoides subsp. leptospermoides</i>			
724.	-5526 <i>Acacia leptospermoides subsp. leptospermoides/psammophila</i>			
725.	11330 <i>Acacia leptospermoides subsp. psammophila</i>		P3	
726.	3419 <i>Acacia ligulata (Umbrella Bush)</i>			
727.	3437 <i>Acacia megacephala</i>		P2	
728.	15290 <i>Acacia neurophylla subsp. erugata</i>			
729.	15291 <i>Acacia neurophylla subsp. neurophylla</i>			
730.	3466 <i>Acacia oldfieldii</i>			
731.	3470 <i>Acacia orbifolia</i>			
732.	3474 <i>Acacia oxyclada</i>			
733.	14134 <i>Acacia pelophila</i>		P1	
734.	3515 <i>Acacia restiacea</i>			
735.	3525 <i>Acacia rostellifera (Summer-scented Wattle)</i>			
736.	-12473 <i>Acacia rostellifera x xanthina</i>			
737.	3527 <i>Acacia saligna (Orange Wattle)</i>			
738.	30033 <i>Acacia saligna subsp. lindleyi</i>			
739.	-8016 <i>Acacia saligna x xanthina</i>			Y
740.	3532 <i>Acacia scirpifolia</i>			
741.	3534 <i>Acacia sclerosperma (Limestone Wattle)</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
742.	3541 <i>Acacia sessilis</i>			
743.	3546 <i>Acacia signata</i>			
744.	-6755 <i>Acacia</i> sp.			
745.	20344 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798)			
746.	29118 <i>Acacia</i> sp. small seed (B.R. Maslin 7830)			
747.	-11839 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798) subsp.			
748.	8951 <i>Acacia spathulata</i>			
749.	3549 <i>Acacia spathulifolia</i>			
750.	15484 <i>Acacia sphacelata</i> subsp. <i>sphacelata</i>			
751.	12268 <i>Acacia sphenophylla</i>			
752.	15294 <i>Acacia stereophylla</i> var. <i>stereophylla</i>			
753.	3577 <i>Acacia tetragonophylla</i> (Kurara)			
754.	3581 <i>Acacia trigonophylla</i>			
755.	3587 <i>Acacia ulicina</i>			
756.	3604 <i>Acacia xanthina</i> (White-stemmed Wattle)			
757.	1205 <i>Acanthocarpus canaliculatus</i>			
758.	1207 <i>Acanthocarpus parviflorus</i>		P3	
759.	1208 <i>Acanthocarpus preissii</i>			
760.	1209 <i>Acanthocarpus robustus</i>			
761.	-9369 <i>Acanthocarpus</i> sp.			
762.	20797 <i>Acanthocarpus</i> sp. <i>Ajana</i> (C.A. Gardner 8596)			
763.	26441 <i>Acanthopora spicifera</i>			
764.	32310 <i>Acaulon triquetrum</i>			Y
765.	26447 <i>Acrothamnion preissii</i>			
766.	19901 <i>Actinobole oldfieldianum</i>			
767.	7817 <i>Actinobole uliginosum</i> (Flannel Cudweed)			
768.	7818 <i>Actites megalocarpus</i> (Dune Thistle)			
769.	11837 <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (Common Woollybush)			
770.	4582 <i>Adriana quadripartita</i> (Bitter Bush)			
771.	20331 <i>Aeonium arboreum</i>	Y		
772.	176 <i>Agrostis avenacea</i> (Blowgrass)			
773.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
774.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
775.	1376 <i>Allium orientale</i>	Y		
776.	-7430 <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> / <i>prinsepiana</i>			
777.	1721 <i>Allocasuarina campestris</i>			
778.	1725 <i>Allocasuarina dielsiana</i> (Northern Sheoak)			
779.	1731 <i>Allocasuarina huegeliana</i> (Rock Sheoak)			
780.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
781.	-6080 <i>Allocasuarina</i> sp.			
782.	1739 <i>Allocasuarina thuyoides</i> (Horned Sheoak)			
783.	2652 <i>Alternanthera nodiflora</i> (Common Joyweed)			
784.	19465 <i>Aluta aspera</i> subsp. <i>hesperia</i>			
785.	20173 <i>Alyogyne coronopifolia</i>			
786.	-7864 <i>Alyogyne coronopifolia</i> x <i>purpurea</i>			Y
787.	4905 <i>Alyogyne hakeifolia</i>			
788.	4906 <i>Alyogyne huegelii</i> (Lilac Hibiscus)			
789.	17975 <i>Alyogyne huegelii</i> var. <i>grossulariifolia</i>			
790.	15458 <i>Alyogyne huegelii</i> var. <i>huegelii</i>			
791.	15459 <i>Alyogyne huegelii</i> var. <i>wrayae</i>			
792.	4907 <i>Alyogyne pinoniana</i> (Sand Hibiscus)			
793.	20082 <i>Alyogyne purpurea</i>			
794.	20078 <i>Alyogyne wrayae</i>			
795.	6565 <i>Alyxia buxifolia</i> (Dysentery Bush)			
796.	2671 <i>Amaranthus viridis</i> (Green Amaranth)	Y		
797.	6209 <i>Ammi majus</i> (Bishop's Weed)	Y		
798.	126 <i>Amphibolis antarctica</i> (Sea Nymph)			
799.	127 <i>Amphibolis griffithii</i>			
800.	196 <i>Amphipogon caricinus</i> (Long Greybeard Grass)			
801.	-3593 <i>Amphipogon caricinus</i> - <i>strictus</i> complex			
802.	12025 <i>Amphipogon caricinus</i> var. <i>caricinus</i>			
803.	26463 <i>Amphiroa gracilis</i>			
804.	2372 <i>Amyema fitzgeraldii</i> (Pincushion Mistletoe)			
805.	13266 <i>Amyema miraculosa</i> subsp. <i>miraculosa</i>			
806.	-11696 <i>Amyema miraculosum</i>			Y
807.	2383 <i>Amyema preissii</i> (Wireleaf Mistletoe)			
808.	6480 <i>Anagallis arvensis</i> (Pimpernel)	Y		
809.	7827 <i>Angianthus cunninghamii</i> (Coast Angianthus)			
810.	-4422 <i>Angianthus</i> sp.			
811.	7836 <i>Angianthus tomentosus</i> (Camel-grass)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
812.	1409 <i>Anigozanthos humilis</i> (Catspaw)			
813.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
814.	1411 <i>Anigozanthos manglesii</i> (Mangles Kangaroo Paw)			
815.	11565 <i>Anigozanthos manglesii</i> subsp. <i>quadrans</i>			
816.	2332 <i>Anthobolus foveolatus</i>			
817.	11725 <i>Anthocercis ilicifolia</i> subsp. <i>ilicifolia</i>			
818.	6948 <i>Anthocercis intricata</i>		P3	
819.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
820.	-7127 <i>Anthoceros</i> sp.			
821.	6953 <i>Anthotroche walcottii</i>			
822.	3180 <i>Aphanopetalum clematideum</i>			
823.	1117 <i>Aphelia cyperoides</i>			
824.	12040 <i>Apium prostratum</i> var. <i>prostratum</i> (Sea Celery)			
825.	7838 <i>Arctotheca calendula</i> (Cape Weed)	Y		
826.	7839 <i>Arctotheca populifolia</i> (Dune Arctotheca)	Y		
827.	17797 <i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	Y		
828.	207 <i>Aristida contorta</i> (Bunched Kerosene Grass)			
829.	210 <i>Aristida holathera</i>			
830.	12063 <i>Aristida holathera</i> var. <i>holathera</i>			
831.	11542 <i>Arrhenatherum elatius</i> var. <i>bulbosum</i> (Onion Twitch)	Y		
832.	1266 <i>Arthropodium dyeri</i>			
833.	-11798 <i>Arthropodium</i> sp.			
834.	6580 <i>Asclepias curassavica</i> (Redhead Cottonbush)	Y		
835.	-10279 <i>Asterella</i> sp.			
836.	7845 <i>Asteridea asteroides</i>			
837.	7850 <i>Asteridea nivea</i>			
838.	6328 <i>Astroloma glaucescens</i>			
839.	6332 <i>Astroloma microdonta</i> (Sandplain Cranberry)			
840.	16941 <i>Astroloma pedicellatum</i>			
841.	6336 <i>Astroloma serratifolium</i> (Kondrung)			
842.	2450 <i>Atriplex amnicola</i> (Swamp Saltbush)			
843.	2452 <i>Atriplex cinerea</i> (Grey Saltbush)			
844.	2463 <i>Atriplex isatidea</i> (Coast Saltbush)			
845.	2476 <i>Atriplex semilunaris</i> (Annual Saltbush)			
846.	-8696 <i>Atriplex</i> sp.			
847.	2479 <i>Atriplex stipitata</i> (Mallee Saltbush)			
848.	17951 <i>Austrodanthonia acerosa</i>			
849.	17950 <i>Austrodanthonia caespitosa</i>			
850.	17945 <i>Austrodanthonia setacea</i>			
851.	-3439 <i>Austrodanthonia setacea</i> group			
852.	-8365 <i>Austrodanthonia</i> sp.			
853.	17234 <i>Austrostipa compressa</i>			
854.	17235 <i>Austrostipa crinita</i>			
855.	17237 <i>Austrostipa elegantissima</i>			
856.	17239 <i>Austrostipa exilis</i>			
857.	17240 <i>Austrostipa flavescens</i>			
858.	17241 <i>Austrostipa hemipogon</i>			
859.	17244 <i>Austrostipa macalpinei</i>			
860.	17246 <i>Austrostipa nitida</i>			
861.	17251 <i>Austrostipa scabra</i>			
862.	37421 <i>Austrostipa</i> sp. <i>Marchagee</i> (B.R. Maslin 1407)			
863.	17254 <i>Austrostipa tenuifolia</i>			
864.	17255 <i>Austrostipa trichophylla</i>			
865.	17257 <i>Austrostipa variabilis</i>			
866.	231 <i>Avellinia michelii</i>	Y		
867.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
868.	234 <i>Avena fatua</i> (Wild Oat)	Y		
869.	5341 <i>Baeckea crispiflora</i>			
870.	5350 <i>Baeckea grandiflora</i> (Large-flowered Baeckea)			
871.	16815 <i>Baeckea</i> sp. <i>Mingenew</i> (M.E. Trudgen 12029)			
872.	14476 <i>Baeckea</i> sp. <i>Walkaway</i> (A.S. George 11249)		P3	
873.	5366 <i>Baeckea staminosa</i>		P1	
874.	1799 <i>Banksia ashbyi</i> (Ashby's Banksia)			
875.	1800 <i>Banksia attenuata</i> (Slender Banksia)			
876.	32623 <i>Banksia carlinoides</i> (Pink Dryandra)			
877.	32576 <i>Banksia dallanneyi</i> (Couch Honeyypot)			
878.	1816 <i>Banksia elegans</i> (Elegant Banksia)		P4	
879.	32524 <i>Banksia fraseri</i> var. <i>ashbyi</i>			
880.	32523 <i>Banksia fraseri</i> var. <i>fraseri</i>			
881.	1828 <i>Banksia leptophylla</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
882.	11386 <i>Banksia leptophylla</i> var. <i>melletica</i>			
883.	1829 <i>Banksia lindleyana</i> (Porcupine Banksia)			
884.	-1257 <i>Banksia menz_ellii</i>			
885.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
886.	1842 <i>Banksia prionotes</i> (Acorn Banksia)			
887.	1846 <i>Banksia scabrella</i> (Burma Road Banksia)		P4	
888.	1847 <i>Banksia sceptra</i> (Sceptre Banksia)			
889.	32079 <i>Banksia sessilis</i> var. <i>flabellifolia</i>			
890.	32080 <i>Banksia sessilis</i> var. <i>sessilis</i>			
891.	1855 <i>Banksia victoriae</i> (Woolly Orange Banksia)			
892.	32315 <i>Barbula calycina</i>			
893.	15037 <i>Bartsia trixago</i>	Y		
894.	2482 <i>Bassia scoparia</i>	Y		
895.	740 <i>Baumea arthropophylla</i>			
896.	743 <i>Baumea juncea</i> (Bare Twigrush)			
897.	17761 <i>Beaufortia aestiva</i>			
898.	-4152 <i>Beaufortia</i> sp.			
899.	4601 <i>Beyeria viscosa</i> (Pinkwood)			
900.	20815 <i>Biserrula pelecinus</i>	Y		Y
901.	31606 <i>Blackallia nudiflora</i> (Wedge-leaved Cryptandra)		P3	
902.	7856 <i>Blennochora drummondii</i>			
903.	2770 <i>Boerhavia coccinea</i> (Tar Vine)			
904.	-5923 <i>Boerhavia</i> sp.			
905.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
906.	6609 <i>Bonamia rosea</i> (Felted Bellflower)			
907.	-4800 <i>Bonamia</i> sp.			
908.	4409 <i>Boronia coerulescens</i>			
909.	11498 <i>Boronia coerulescens</i> subsp. <i>spicata</i>			
910.	11274 <i>Boronia coerulescens</i> subsp. <i>spinescens</i>			
911.	4414 <i>Boronia cymosa</i> (Granite Boronia)			
912.	4438 <i>Boronia ramosa</i>			
913.	11381 <i>Boronia ramosa</i> subsp. <i>anethifolia</i>			
914.	16639 <i>Boronia scabra</i> subsp. <i>scabra</i>			
915.	-4748 <i>Boronia</i> sp.			
916.	1273 <i>Borya sphaerocephala</i> (Pincushions)			
917.	30232 <i>Bossiaea calcicola</i>		P3	
918.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
919.	3719 <i>Bossiaea spinescens</i>			
920.	240 <i>Bothriochloa ewartiana</i> (Desert Bluegrass)			
921.	15000 <i>Brachychiton populneus</i> subsp. <i>populneus</i>	Y		
922.	30132 <i>Brachyloma pirara</i>			
923.	8661 <i>Brachypodium distachyon</i> (False Brome)	Y		
924.	7870 <i>Brachyscome cheilocarpa</i>			
925.	7871 <i>Brachyscome ciliaris</i>			
926.	7872 <i>Brachyscome ciliocarpa</i>			
927.	7878 <i>Brachyscome iberidifolia</i>			
928.	7881 <i>Brachyscome oncocarpa</i>			
929.	7882 <i>Brachyscome perpusilla</i>			
930.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
931.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
932.	245 <i>Briza minor</i> (Shivery Grass)	Y		
933.	248 <i>Bromus catharticus</i> (Prairie Grass)	Y		
934.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
935.	250 <i>Bromus hordeaceus</i> (Soft Brome)	Y		
936.	252 <i>Bromus madritensis</i> (Madrid Brome)	Y		
937.	253 <i>Bromus rubens</i> (Red Brome)	Y		
938.	7413 <i>Brunonia australis</i> (Native Cornflower)			
939.	6675 <i>Buglossoides arvensis</i> (Corn Gromwell)	Y		
940.	12770 <i>Burchardia congesta</i>			
941.	3167 <i>Bursaria occidentalis</i>			
942.	15445 <i>Caesia alfordii</i>			
943.	1276 <i>Caesia micrantha</i> (Pale Grass-lily)			
944.	29439 <i>Caesia</i> sp. <i>Wongan</i> (K.F. Kenneally 8820)			
945.	3002 <i>Cakile maritima</i> (Sea Rocket)	Y		
946.	15337 <i>Caladenia bryceana</i> subsp. <i>cracens</i>		T	
947.	1584 <i>Caladenia deformis</i> (Blue Fairy Orchid)			
948.	11136 <i>Caladenia denticulata</i>			
949.	13618 <i>Caladenia elegans</i>		T	
950.	1592 <i>Caladenia flava</i> (Cowslip Orchid)			
951.	15348 <i>Caladenia flava</i> subsp. <i>flava</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
952.	15349 <i>Caladenia flava</i> subsp. <i>maculata</i>			
953.	15502 <i>Caladenia footeana</i>			
954.	13857 <i>Caladenia hoffmanii</i>		T	
955.	-11348 <i>Caladenia hoffmanii</i> x <i>longicauda</i>			
956.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
957.	1602 <i>Caladenia longicauda</i> (Common White Spider Orchid)			
958.	15360 <i>Caladenia longicauda</i> subsp. <i>borealis</i>			
959.	1603 <i>Caladenia longiclavata</i> (Clubbed Spider Orchid)			
960.	17760 <i>Caladenia nobilis</i>			
961.	1611 <i>Caladenia radialis</i> (Drooping Spider Orchid)			
962.	15378 <i>Caladenia reptans</i> subsp. <i>impensa</i>			
963.	1620 <i>Caladenia wanosa</i> (Kalbarri Spider Orchid)		T	
964.	2845 <i>Calandrinia brevipedata</i> (Short-stalked Purslane)			
965.	2846 <i>Calandrinia calyptata</i> (Pink Purslane)			
966.	2848 <i>Calandrinia corrigioloides</i> (Strap Purslane)			
967.	2854 <i>Calandrinia granulifera</i> (Pygmy Purslane)			
968.	2855 <i>Calandrinia lehmannii</i>			
969.	2860 <i>Calandrinia polyandra</i> (Parakeelya)			
970.	2867 <i>Calandrinia remota</i>			
971.	-3613 <i>Calandrinia</i> sp.			
972.	20478 <i>Calandrinia</i> sp. Blackberry (D.M. Porter 171)			
973.	19832 <i>Calandrinia</i> sp. Ongerup (K.R. Newbey 11834)			
974.	20477 <i>Calandrinia</i> sp. SW coastal (J. Dodd 753)			
975.	19304 <i>Calectasia browneana</i>		P2	
976.	5395 <i>Callistemon phoeniceus</i> (Lesser Bottlebrush)			
977.	36560 <i>Callitris arenaria</i> (Sandplain Cypress)			
978.	26533 <i>Callophycus costatus</i>			
979.	26536 <i>Callophycus oppositifolius</i>			
980.	5401 <i>Calothamnus blepharospermus</i>			
981.	34196 <i>Calothamnus chrysanthereus</i> (Claw Flower)			
982.	35856 <i>Calothamnus glaber</i>			
983.	35696 <i>Calothamnus phellosus</i>			
984.	35756 <i>Calothamnus quadrifidus</i> subsp. <i>angustifolius</i>			
985.	35758 <i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> (Murchison Clawflower)			
986.	35759 <i>Calothamnus quadrifidus</i> subsp. <i>obtusus</i>			
987.	5429 <i>Calothamnus sanguineus</i> (Silky-leaved Blood flower)			
988.	7903 <i>Calotis hispidula</i> (Bindy Eye)			
989.	7905 <i>Calotis multicaulis</i> (Many-stemmed Burr-daisy)			
990.	-12966 <i>Calotis</i> sp.			
991.	5443 <i>Calytrix brevifolia</i>			
992.	5450 <i>Calytrix depressa</i>			
993.	5462 <i>Calytrix gracilis</i>			
994.	5465 <i>Calytrix leschenaultii</i>			
995.	5468 <i>Calytrix oldfieldii</i>			
996.	19978 <i>Calytrix pimeleoides</i>		P3	
997.	5475 <i>Calytrix purpurea</i>		P2	
998.	5479 <i>Calytrix strigosa</i>			
999.	5485 <i>Calytrix variabilis</i>			
1000.	2796 <i>Carpobrotus modestus</i> (Inland Pigface)			
1001.	-7790 <i>Carpobrotus praecox</i>			Y
1002.	2798 <i>Carpobrotus virescens</i> (Coastal Pigface)			
1003.	7911 <i>Carthamus lanatus</i> (Saffron Thistle)	Y		
1004.	7913 <i>Carthamus tinctorius</i>	Y		
1005.	12073 <i>Cassytha aurea</i> var. <i>aurea</i>			
1006.	11351 <i>Cassytha aurea</i> var. <i>hirta</i>			
1007.	2952 <i>Cassytha glabella</i> (Tangled Dodder Laurel)			
1008.	11211 <i>Cassytha glabella</i> forma <i>dispar</i>			
1009.	11857 <i>Cassytha glabella</i> forma <i>glabella</i>			
1010.	2956 <i>Cassytha pomiformis</i> (Dodder Laurel)			
1011.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
1012.	11242 <i>Cassytha racemosa</i> forma <i>pilosa</i>			
1013.	11799 <i>Cassytha racemosa</i> forma <i>racemosa</i>			
1014.	-9051 <i>Cassytha</i> sp.			
1015.	1742 <i>Casuarina obesa</i> (Swamp Sheoak)			
1016.	13685 <i>Catapodium rigidum</i> (Rigid Fescue)	Y		
1017.	26555 <i>Caulerpa brownii</i>			
1018.	26556 <i>Caulerpa cactoides</i>			
1019.	26557 <i>Caulerpa cliftonii</i>			
1020.	26560 <i>Caulerpa distichophylla</i>			
1021.	27380 <i>Caulerpa flexilis</i> var. <i>muelleri</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1022.	26573 <i>Caulerpa racemosa</i>			
1023.	26578 <i>Caulerpa simpliciuscula</i>			
1024.	258 <i>Cenchrus ciliaris</i> (Buffel Grass)	Y		
1025.	259 <i>Cenchrus echinatus</i> (Burrgrass)	Y		
1026.	262 <i>Cenchrus longispinus</i> (Spiny Burrgrass)	Y		
1027.	29721 <i>Cenchrus setiger</i> (Birdwood Grass)	Y		
1028.	6539 <i>Centaurium erythraea</i> (Common Centaury)	Y		
1029.	6542 <i>Centaurium tenuiflorum</i>	Y		
1030.	6214 <i>Centella asiatica</i>			
1031.	19759 <i>Centipeda crateriformis</i> subsp. <i>crateriformis</i>			
1032.	26587 <i>Centroceras clavulatum</i>			
1033.	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
1034.	1124 <i>Centrolepis cephaliformis</i>			
1035.	1125 <i>Centrolepis drummondiana</i>			
1036.	1131 <i>Centrolepis inconspicua</i>			
1037.	1133 <i>Centrolepis pilosa</i>			
1038.	1134 <i>Centrolepis polygyna</i> (Wiry Centrolepis)			
1039.	7922 <i>Cephalopterum drummondii</i> (Pompom Head)			
1040.	7923 <i>Cephalosorus carpesioides</i>			
1041.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
1042.	7924 <i>Ceratogyne obionoides</i> (Wingwort)			
1043.	17685 <i>Chaetanthus aristatus</i>			
1044.	18156 <i>Chamaecytisus palmensis</i> (Tagasaste)	Y		
1045.	11299 <i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>			
1046.	-3963 <i>Chamaescilla</i> sp.			
1047.	8788 <i>Chamaescilla versicolor</i>			
1048.	14808 <i>Chamelaucium drummondii</i> subsp. <i>drummondii</i>			
1049.	5496 <i>Chamelaucium micranthum</i>			
1050.	5497 <i>Chamelaucium pauciflorum</i>			
1051.	35596 <i>Chamelaucium</i> sp. <i>Yuna</i> (A.C. Burns 53)		P2	
1052.	5498 <i>Chamelaucium uncinatum</i> (Geraldton Wax)			
1053.	1513 <i>Chasmanthe floribunda</i> (African Cornflag)	Y		
1054.	12796 <i>Cheilanthes adiantoides</i>			
1055.	31 <i>Cheilanthes austrotenuifolia</i>			
1056.	12818 <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			
1057.	31768 <i>Cheiranthra simplicifolia</i>			
1058.	2489 <i>Chenopodium gaudichaudianum</i> (Cottony Saltbush)			
1059.	2494 <i>Chenopodium murale</i> (Nettle-leaf Goosefoot)	Y		
1060.	270 <i>Chloris pumilio</i>			
1061.	271 <i>Chloris truncata</i> (Windmill Grass)			
1062.	7925 <i>Chondrilla juncea</i> (Skeleton Weed)	Y		
1063.	763 <i>Chorizandra enodis</i> (Black Bristlerush)			
1064.	13111 <i>Chorizema aciculare</i> subsp. <i>laxum</i>			
1065.	13115 <i>Chorizema humile</i>		T	
1066.	13114 <i>Chorizema racemosum</i>			
1067.	11900 <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Y		
1068.	7928 <i>Chrysanthemum coronarium</i>	Y		
1069.	12612 <i>Chrysocephalum apiculatum</i>			
1070.	7933 <i>Chthonocephalus pseudevax</i> (Woolly Groundheads)			
1071.	-9828 <i>Chthonocephalus</i> sp.			
1072.	6543 <i>Cicendia filiformis</i> (Slender Cicendia)	Y		
1073.	7936 <i>Cirsium arvense</i> (Canada Thistle)	Y		Y
1074.	-7982 <i>Cirsium</i> sp.			Y
1075.	7370 <i>Citrullus lanatus</i> (Pie Melon)	Y		
1076.	26659 <i>Cladophora valonioides</i>			
1077.	26663 <i>Cladurus elatus</i>			
1078.	26665 <i>Clavicleonium ovatum</i>			
1079.	4853 <i>Clematicissus angustissima</i>			
1080.	10804 <i>Clematis linearifolia</i>			
1081.	26677 <i>Codium mamillosum</i>			
1082.	2778 <i>Codonocarpus cotinifolius</i> (Native Poplar)			
1083.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
1084.	4555 <i>Comesperma integerrimum</i>			
1085.	4560 <i>Comesperma rhadinocarpum</i> (Slender-fruited Comesperma)		P2	
1086.	4561 <i>Comesperma scoparium</i> (Broom Milkwort)			
1087.	4563 <i>Comesperma spinosum</i> (Spiny Milkwort)			
1088.	4564 <i>Comesperma virgatum</i> (Milkwort)			
1089.	20541 <i>Commersonia bivillosa</i>		P1	
1090.	5002 <i>Commersonia gaudichaudii</i>			
1091.	5004 <i>Commersonia microphylla</i>		P2	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1092.	2776 <i>Commicarpus australis</i> (Perennial Tar Vine)			
1093.	15608 <i>Conospermum acerosum</i> subsp. <i>hirsutum</i>			
1094.	15512 <i>Conospermum boreale</i> subsp. <i>ascendens</i>			
1095.	15513 <i>Conospermum boreale</i> subsp. <i>boreale</i>			
1096.	1876 <i>Conospermum incurvum</i> (Plume Smokebush)			
1097.	16849 <i>Conospermum microflorum</i>			
1098.	1882 <i>Conospermum stoechadis</i> (Common Smokebush)			
1099.	15611 <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> (Common Smokebush)			
1100.	15523 <i>Conospermum wycherleyi</i>			
1101.	15522 <i>Conospermum wycherleyi</i> subsp. <i>wycherleyi</i>			
1102.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
1103.	11641 <i>Conostylis aculeata</i> subsp. <i>rhipidion</i>			
1104.	-8419 <i>Conostylis aculeata</i> x <i>prolifera</i> subsp. <i>rhipidion</i>			Y
1105.	1420 <i>Conostylis androstemma</i> (Trumpets)			
1106.	1423 <i>Conostylis aurea</i> (Golden Conostylis)			
1107.	12027 <i>Conostylis candicans</i> subsp. <i>calcicola</i>			
1108.	-6130 <i>Conostylis candicans</i> x <i>robusta</i>			
1109.	-12821 <i>Conostylis candicans</i> x <i>stylidioides</i>			
1110.	1442 <i>Conostylis neocymosa</i>			
1111.	1446 <i>Conostylis prolifera</i> (Mat Cottonheads)			
1112.	1448 <i>Conostylis resinosa</i>			
1113.	1450 <i>Conostylis robusta</i>			
1114.	1456 <i>Conostylis stylidioides</i>			
1115.	5502 <i>Conothamnus trinervis</i>			
1116.	6614 <i>Convolvulus remotus</i>			
1117.	7938 <i>Conyza albida</i> (Tall Fleabane)	Y		
1118.	7939 <i>Conyza bonariensis</i> (Flaxleaf Fleabane)	Y		
1119.	2891 <i>Corrigiola litoralis</i> (Strapwort)	Y		
1120.	17104 <i>Corymbia calophylla</i> (Marri)			
1121.	11834 <i>Corynotheca micrantha</i> var. <i>acanthoclada</i>			
1122.	11283 <i>Corynotheca micrantha</i> var. <i>micrantha</i>			
1123.	7943 <i>Cotula australis</i> (Common Cotula)			
1124.	7944 <i>Cotula bipinnata</i> (Ferry Cotula)	Y		
1125.	7945 <i>Cotula coronopifolia</i> (Waterbuttons)	Y		
1126.	3136 <i>Crassula alata</i>	Y		
1127.	17701 <i>Crassula closiana</i>			
1128.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
1129.	11709 <i>Crassula colorata</i> var. <i>acuminata</i>			
1130.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
1131.	3138 <i>Crassula decumbens</i> (Rufous Stonecrop)			
1132.	11349 <i>Crassula decumbens</i> var. <i>decumbens</i>			
1133.	3142 <i>Crassula natans</i>	Y		
1134.	19861 <i>Cristonia biloba</i>			
1135.	35839 <i>Cristonia stenophylla</i>			
1136.	4792 <i>Cryptandra arbutiflora</i> (Waxy Cryptandra)			
1137.	16018 <i>Cryptandra arbutiflora</i> var. <i>borealis</i>			
1138.	31614 <i>Cryptandra multispina</i>			
1139.	4802 <i>Cryptandra mutila</i>			
1140.	9076 <i>Cryptandra myriantha</i>			
1141.	4809 <i>Cryptandra pungens</i>			
1142.	-7517 <i>Cryptandra</i> sp.			
1143.	4811 <i>Cryptandra spyridioides</i>			
1144.	9077 <i>Cryptandra wichurae</i>			Y
1145.	26709 <i>Cryptonemia undulata</i>			
1146.	29599 <i>Cryptostegia grandiflora</i>	Y		
1147.	6663 <i>Cuscuta epithymum</i> (Lesser Dodder)	Y		
1148.	11021 <i>Cuscuta planiflora</i>	Y		
1149.	-11671 <i>Cuscuta</i> sp.			
1150.	15114 <i>Cyanicula gemmata</i>			
1151.	6216 <i>Cyclosporum leptophyllum</i>	Y		
1152.	281 <i>Cymbopogon obtectus</i> (Silkyheads)			
1153.	-12436 <i>Cymbopogon</i> sp.			
1154.	6584 <i>Cynanchum floribundum</i> (Dumara Bush)			
1155.	283 <i>Cynodon dactylon</i> (Couch)	Y		
1156.	786 <i>Cyperus cunninghamii</i>			
1157.	789 <i>Cyperus difformis</i> (Rice Sedge)			
1158.	794 <i>Cyperus gymnocaulos</i> (Spiny Flat-sedge)			
1159.	809 <i>Cyperus rigidellus</i>			
1160.	810 <i>Cyperus rotundus</i> (Nut Grass)	Y		
1161.	-13069 <i>Cyperus</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1162.	815 <i>Cyperus tenellus</i> (Tiny Flatsedge)	Y		
1163.	818 <i>Cyperus vaginatus</i> (Stiffleaf Sedge)			
1164.	10916 <i>Cyrtostylis huegelii</i>			
1165.	7421 <i>Dampiera altissima</i> (Tall Dampiera)			
1166.	7443 <i>Dampiera haematotricha</i>			
1167.	7448 <i>Dampiera incana</i> (Hoary Dampiera)			
1168.	11326 <i>Dampiera incana</i> var. <i>fuscescens</i>			
1169.	7453 <i>Dampiera lindleyi</i>			
1170.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
1171.	7459 <i>Dampiera oligophylla</i> (Sparse-leaved Dampiera)			
1172.	-10054 <i>Dampiera</i> sp.			
1173.	7475 <i>Dampiera spicigera</i> (Spiked Dampiera)			
1174.	5522 <i>Darwinia pauciflora</i>			
1175.	26738 <i>Dasya elongata</i>			
1176.	26752 <i>Dasyclonium incisum</i>			
1177.	26753 <i>Dasyphila preissii</i>			
1178.	10823 <i>Datura innoxia</i>	Y		
1179.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
1180.	3797 <i>Daviesia cardiophylla</i>			
1181.	3807 <i>Daviesia divaricata</i> (Marmo)			
1182.	18561 <i>Daviesia divaricata</i> subsp. <i>lanulosa</i>			
1183.	3814 <i>Daviesia hakeoides</i>			
1184.	11879 <i>Daviesia hakeoides</i> subsp. <i>hakeoides</i>			
1185.	3831 <i>Daviesia pedunculata</i>			
1186.	3832 <i>Daviesia physodes</i>			
1187.	17663 <i>Desmocladius asper</i>			
1188.	17624 <i>Desmocladius glomeratus</i>		P2	Y
1189.	17662 <i>Desmocladius lateriticus</i>			
1190.	17846 <i>Desmocladius parthenicus</i>			
1191.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
1192.	11636 <i>Dianella revoluta</i> var. <i>divaricata</i>			
1193.	1287 <i>Dichopogon capillipes</i>			
1194.	-5372 <i>Dichopogon</i> sp.			
1195.	26758 <i>Dicranema revolutum</i>			
1196.	6760 <i>Dicrastylis fulva</i>			
1197.	26762 <i>Dictyomenia sonderi</i>			
1198.	-5123 <i>Dictyomenia</i> sp.			
1199.	26763 <i>Dictyomenia tridens</i>			
1200.	26782 <i>Digenea simplex</i>			
1201.	311 <i>Digitaria ciliaris</i> (Summer Grass)	Y		
1202.	1509 <i>Dioscorea hastifolia</i> (Warrine)			
1203.	15270 <i>Diplolaena geraldtonensis</i>			
1204.	-10113 <i>Diplolaena geraldtonensis</i> x <i>grandiflora</i>			Y
1205.	4456 <i>Diplolaena grandiflora</i> (Wild Rose)			
1206.	15273 <i>Diplolaena leemaniana</i>			
1207.	18541 <i>Diplopeltis huegelii</i> subsp. <i>huegelii</i>			
1208.	18542 <i>Diplopeltis huegelii</i> subsp. <i>subintegra</i>			
1209.	4748 <i>Diplopeltis petiolaris</i>			
1210.	7961 <i>Dittrichia graveolens</i> (Stinkwort)	Y		
1211.	11049 <i>Diuris corymbosa</i>			
1212.	1634 <i>Diuris laxiflora</i> (Bee Orchid)			
1213.	12936 <i>Diuris recurva</i>		P4	
1214.	-8553 <i>Diuris refracta</i>			
1215.	1638 <i>Diuris setacea</i> (Bristly Donkey Orchid)			
1216.	19457 <i>Diuris</i> sp. <i>Eneabba</i> (A.H. Burbidge 3941)			
1217.	4754 <i>Dodonaea aptera</i> (Coast Hop-bush)			
1218.	4761 <i>Dodonaea ericoides</i>			
1219.	4766 <i>Dodonaea inaequifolia</i>			
1220.	4768 <i>Dodonaea larreoides</i>			
1221.	13633 <i>Drakaea concolor</i>		T	
1222.	3092 <i>Drosera bulbosa</i> (Red-leaved Sundew)			
1223.	13219 <i>Drosera bulbosa</i> subsp. <i>bulbosa</i>			
1224.	13220 <i>Drosera bulbosa</i> subsp. <i>major</i>			
1225.	3098 <i>Drosera glanduligera</i> (Pimpernel Sundew)			
1226.	8910 <i>Drosera humilis</i>			
1227.	3106 <i>Drosera macrantha</i> (Bridal Rainbow)			
1228.	14298 <i>Drosera macrantha</i> subsp. <i>macrantha</i>			
1229.	3107 <i>Drosera macrophylla</i> (Showy Sundew)			
1230.	11196 <i>Drosera menziesii</i> subsp. <i>thysanosepala</i>			
1231.	11246 <i>Drosera neesii</i> subsp. <i>borealis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1232.	3116 <i>Drosera omissa</i> (Bright Sundew)			
1233.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
1234.	3127 <i>Drosera radicans</i>			
1235.	8911 <i>Drosera rosulata</i>			
1236.	3131 <i>Drosera stolonifera</i> (Leafy Sundew)			
1237.	4458 <i>Drummondita ericoides</i> (Moresby Range Drummondita)		T	Y
1238.	1908 <i>Dryandra fraseri</i>			
1239.	6966 <i>Duboisia hopwoodii</i> (Pituri)			
1240.	31334 <i>Duperreya sericea</i>			
1241.	33597 <i>Dysphania melanocarpa</i> forma <i>melanocarpa</i> (Black Goosefoot)			
1242.	33480 <i>Dysphania pumilio</i> (Clammy Goosefoot)			
1243.	1066 <i>Ecdeiocolea monostachya</i>			
1244.	6681 <i>Echium plantagineum</i> (Paterson's Curse)	Y		
1245.	11485 <i>Ehrharta brevifolia</i> var. <i>cuspidata</i>	Y		
1246.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
1247.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
1248.	1644 <i>Elythranthera emarginata</i> (Pink Enamel Orchid)			
1249.	2510 <i>Enchylaena lanata</i>			
1250.	12064 <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Barrier Saltbush)			
1251.	29555 <i>Enekbatus bounites</i>		P2	Y
1252.	376 <i>Eragrostis curvula</i> (African Lovegrass)	Y		
1253.	378 <i>Eragrostis dielsii</i> (Mallee Lovegrass)			
1254.	393 <i>Eragrostis setifolia</i> (Neverfail Grass)			
1255.	5536 <i>Eremaea acutifolia</i> (Rusty Eremaea)		P2	
1256.	5537 <i>Eremaea beaufortoides</i>			
1257.	5538 <i>Eremaea brevifolia</i>			
1258.	14102 <i>Eremaea ebracteata</i> var. <i>ebracteata</i>			
1259.	5541 <i>Eremaea pauciflora</i>			
1260.	7185 <i>Eremophila brevifolia</i> (Spotted Eremophila)		P2	
1261.	7189 <i>Eremophila clarkei</i> (Turpentine Bush)			
1262.	7200 <i>Eremophila drummondii</i>			
1263.	7215 <i>Eremophila glabra</i> (Tar Bush)			
1264.	17175 <i>Eremophila glabra</i> subsp. <i>albicans</i>			
1265.	14193 <i>Eremophila glabra</i> subsp. <i>carcosa</i>			
1266.	14191 <i>Eremophila glabra</i> subsp. <i>tomentosa</i>			
1267.	7230 <i>Eremophila latrobei</i> (Warty Fuchsia Bush)			
1268.	7273 <i>Eremophila strongylophylla</i>			
1269.	17162 <i>Eremophila subfloccosa</i> subsp. <i>lanata</i>			
1270.	408 <i>Eriachne flaccida</i> (Claypan Grass)			
1271.	413 <i>Eriachne mucronata</i> (Mountain Wanderrie Grass)			
1272.	415 <i>Eriachne ovata</i>			
1273.	1646 <i>Eriochilus dilatatus</i> (White Bunny Orchid)			
1274.	30432 <i>Eriochilus dilatatus</i> subsp. <i>brevifolius</i>			
1275.	15410 <i>Eriochilus dilatatus</i> subsp. <i>dilatatus</i>			
1276.	15413 <i>Eriochilus dilatatus</i> subsp. <i>undulatus</i>			
1277.	4331 <i>Erodium aureum</i>	Y		
1278.	4335 <i>Erodium cygnorum</i> (Blue Heronsbill)			
1279.	4336 <i>Erodium moschatum</i> (Musky Crowfoot)	Y		
1280.	3013 <i>Eruca sativa</i> (Purplevein Rocket)	Y		
1281.	14376 <i>Erymophyllum ramosum</i> subsp. <i>involucratum</i>			
1282.	12740 <i>Erymophyllum tenellum</i>			
1283.	26823 <i>Erythroclonium sonderi</i>			
1284.	12896 <i>Eucalyptus arachnaea</i> (Black-stemmed Mallee)			
1285.	12895 <i>Eucalyptus arachnaea</i> subsp. <i>arachnaea</i>			
1286.	9141 <i>Eucalyptus baudiniana</i>			
1287.	13039 <i>Eucalyptus blaxellii</i>		P4	
1288.	-4900 <i>Eucalyptus blaxellii</i> / <i>loxophleba</i>			Y
1289.	-3984 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i>			Y
1290.	-7085 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i> subsp. <i>supralaevis</i>			Y
1291.	35345 <i>Eucalyptus camaldulensis</i> subsp. <i>obtusa</i> (Blunt-budded River Red Gum)			
1292.	15441 <i>Eucalyptus camaldulensis</i> var. <i>obtusa</i> (Blunt-budded River Red Gum)			
1293.	13510 <i>Eucalyptus cuprea</i> (Mallee Box)		T	
1294.	15494 <i>Eucalyptus diminuta</i>			
1295.	15804 <i>Eucalyptus dolichocera</i>			
1296.	13550 <i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>		P4	
1297.	5640 <i>Eucalyptus eudesmioides</i> (Malalie)			
1298.	5648 <i>Eucalyptus flocktoniae</i> (Merri)			
1299.	5673 <i>Eucalyptus horistes</i>			
1300.	5681 <i>Eucalyptus jucunda</i> (Yuna Mallee)			
1301.	11295 <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> (York Gum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1302.	13038 <i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i>			
1303.	5722 <i>Eucalyptus obtusiflora</i> (Dongara Mallee)			
1304.	5725 <i>Eucalyptus oldfieldii</i> (Oldfield's Mallee)			
1305.	5730 <i>Eucalyptus oraria</i> (Ooragmandee)			
1306.	5756 <i>Eucalyptus pyriformis</i> (Pear-fruited Mallee)			
1307.	5761 <i>Eucalyptus rigidula</i> (Stiff-leaved Mallee)			
1308.	5763 <i>Eucalyptus rudis</i> (Flooded Gum)			
1309.	12883 <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i>			
1310.	5793 <i>Eucalyptus transcontinentalis</i> (Redwood)			
1311.	11011 <i>Eulalia aurea</i>			
1312.	4617 <i>Euphorbia australis</i> (Namana)			
1313.	4620 <i>Euphorbia boophthona</i> (Gascoyne Spurge)			
1314.	4626 <i>Euphorbia drummondii</i> (Caustic Weed)			
1315.	17896 <i>Euphorbia drummondii</i> subsp. <i>drummondii</i>			
1316.	20014 <i>Euphorbia hyssopifolia</i>	Y		
1317.	4638 <i>Euphorbia peplus</i> (Petty Spurge)	Y		
1318.	4644 <i>Euphorbia sharkoensis</i>			
1319.	12097 <i>Euphorbia tannensis</i> subsp. <i>eremophila</i> (Desert Spurge)			
1320.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
1321.	-4286 <i>Euptilota</i> sp.			
1322.	10765 <i>Exocarpos sparteus</i> (Broom Ballart)			
1323.	1515 <i>Ferraria crispa</i> (Black Flag)	Y		
1324.	430 <i>Festuca arundinacea</i> (Tall Fescue)	Y		
1325.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
1326.	18392 <i>Freesia alba</i> x <i>leichtlinii</i>	Y		
1327.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
1328.	904 <i>Gahnia drummondii</i>			
1329.	906 <i>Gahnia lanigera</i> (Little Sedge)			
1330.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
1331.	7323 <i>Galium murale</i> (Small Goosegrass)	Y		
1332.	3907 <i>Gastrolobium laytonii</i> (Breelya)			
1333.	20482 <i>Gastrolobium nervosum</i>			
1334.	3912 <i>Gastrolobium oxylobioides</i> (Champion Bay Poison)			
1335.	3915 <i>Gastrolobium plicatum</i>			
1336.	3917 <i>Gastrolobium propinquum</i> (Hutt River Poison)		P3	
1337.	3924 <i>Gastrolobium spinosum</i> (Prickly Poison)			
1338.	19189 <i>Gastrolobium triangulare</i>			Y
1339.	16311 <i>Gazania linearis</i>	Y		
1340.	38241 <i>Geleznovia</i> sp. <i>Binnu</i> (K.A. Shepherd & J. Wege KS 1301)			
1341.	38242 <i>Geleznovia</i> sp. <i>Marchagee</i> (A. Crawford ADC 1353)			
1342.	4483 <i>Geleznovia verrucosa</i>			
1343.	12780 <i>Gilberta tenuifolia</i>			
1344.	33620 <i>Glischrocaryon angustifolium</i>			
1345.	6143 <i>Glischrocaryon aureum</i> (Common Popflower)			
1346.	7060 <i>Glossostigma diandrum</i>			
1347.	3938 <i>Glycine canescens</i> (Silky Glycine)			
1348.	8002 <i>Gnephosis tenuissima</i>			
1349.	19215 <i>Gompholobium glutinosum</i>			
1350.	10777 <i>Gompholobium gompholobioides</i>			
1351.	3951 <i>Gompholobium marginatum</i>			
1352.	19295 <i>Gompholobium pungens</i>			
1353.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
1354.	2677 <i>Gomphrena celosioides</i> (Gomphrena Weed)	Y		
1355.	11801 <i>Gonocarpus confertifolius</i> var. <i>helmsii</i>			
1356.	6159 <i>Gonocarpus nodulosus</i>			
1357.	6160 <i>Gonocarpus paniculatus</i>			
1358.	7495 <i>Goodenia berardiana</i>			
1359.	29362 <i>Goodenia coerulea</i>			
1360.	17806 <i>Goodenia drummondii</i> subsp. <i>drummondii</i>			
1361.	7513 <i>Goodenia hassallii</i>			
1362.	12551 <i>Goodenia micrantha</i>			
1363.	7527 <i>Goodenia mimuloides</i>			
1364.	7535 <i>Goodenia pinnatifida</i> (Cutleaf Goodenia)			
1365.	1951 <i>Grevillea amplexans</i>			
1366.	19357 <i>Grevillea amplexans</i> subsp. <i>amplexans</i>			
1367.	1956 <i>Grevillea argyrophylla</i> (Silvery-leaved Grevillea)			
1368.	15763 <i>Grevillea biformis</i> subsp. <i>biformis</i>			
1369.	1965 <i>Grevillea biternata</i>			
1370.	1968 <i>Grevillea bracteosa</i> (Bracted Grevillea)			
1371.	33579 <i>Grevillea bracteosa</i> subsp. <i>howatharra</i>		T	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1372.	1973 <i>Grevillea candelabroides</i>			
1373.	18116 <i>Grevillea commutata</i> subsp. <i>commutata</i>			
1374.	18130 <i>Grevillea commutata</i> subsp. <i>pinnatisecta</i>			
1375.	13453 <i>Grevillea didymobotrya</i> subsp. <i>didymobotrya</i>			
1376.	13454 <i>Grevillea didymobotrya</i> subsp. <i>involuta</i>			
1377.	1989 <i>Grevillea dielsiana</i> (<i>Diels Grevillea</i>)			
1378.	1999 <i>Grevillea erinacea</i>		P3	
1379.	2001 <i>Grevillea eriostachya</i> (<i>Flame Grevillea</i>)			
1380.	15816 <i>Grevillea filifolia</i>		P1	Y
1381.	15817 <i>Grevillea hirtella</i>		P3	
1382.	2022 <i>Grevillea integrifolia</i> (<i>Entire-leaved Grevillea</i>)			
1383.	2023 <i>Grevillea intricata</i>			
1384.	2032 <i>Grevillea leucopteris</i> (<i>White Plume Grevillea</i>)			
1385.	13416 <i>Grevillea petrophiloides</i> subsp. <i>petrophiloides</i>			
1386.	2063 <i>Grevillea phanerophlebia</i> (<i>Prominent Vein Grevillea</i>)		T	
1387.	8638 <i>Grevillea pinaster</i>			
1388.	15839 <i>Grevillea preissii</i> subsp. <i>preissii</i>			
1389.	-3994 <i>Grevillea</i> sp.			
1390.	2113 <i>Grevillea triloba</i>		P3	
1391.	17416 <i>Guichenotia angustifolia</i>			
1392.	5011 <i>Guichenotia ledifolia</i>			
1393.	5012 <i>Guichenotia macrantha</i> (<i>Large-flowered Guichenotia</i>)			
1394.	5013 <i>Guichenotia micrantha</i> (<i>Small Flowered Guichenotia</i>)			
1395.	-11458 <i>Guichenotia</i> sp.			
1396.	2807 <i>Gunnopsia quadrifida</i> (<i>Sturts Pigface</i>)			
1397.	2783 <i>Gyrostemon racemiger</i>			
1398.	2784 <i>Gyrostemon ramulosus</i> (<i>Corkybark</i>)			
1399.	2788 <i>Gyrostemon subnudus</i>			
1400.	1465 <i>Haemodorum discolor</i>			
1401.	1468 <i>Haemodorum laxum</i>			
1402.	1470 <i>Haemodorum paniculatum</i> (<i>Mardja</i>)			
1403.	1472 <i>Haemodorum simplex</i>			
1404.	1473 <i>Haemodorum simulans</i>			
1405.	-4252 <i>Haemodorum</i> sp.			
1406.	1474 <i>Haemodorum sparsiflorum</i>			
1407.	2131 <i>Hakea auriculata</i>			
1408.	2135 <i>Hakea bucculenta</i> (<i>Red Pokers</i>)			
1409.	2140 <i>Hakea circumalata</i>			
1410.	2146 <i>Hakea costata</i> (<i>Ribbed Hakea</i>)			
1411.	11924 <i>Hakea cygna</i> subsp. <i>cygna</i> (<i>Swan Fruit Hakea</i>)			
1412.	16908 <i>Hakea eneabba</i>			
1413.	2166 <i>Hakea incrassata</i> (<i>Marble Hakea</i>)			
1414.	2175 <i>Hakea lissocarpha</i> (<i>Honey Bush</i>)			
1415.	2190 <i>Hakea oldfieldii</i>		P3	
1416.	16901 <i>Hakea orthorrhyncha</i> var. <i>filiformis</i>			
1417.	2195 <i>Hakea platysperma</i> (<i>Cricket Ball Hakea</i>)			
1418.	2196 <i>Hakea preissii</i> (<i>Needle Tree</i>)			
1419.	2197 <i>Hakea prostrata</i> (<i>Harsh Hakea</i>)			
1420.	12233 <i>Hakea psilorrhyncha</i>			
1421.	2198 <i>Hakea pycnoneura</i>			
1422.	17557 <i>Hakea recurva</i> subsp. <i>recurva</i>			
1423.	2206 <i>Hakea stenocarpa</i> (<i>Narrow-fruited Hakea</i>)			
1424.	2214 <i>Hakea trifurcata</i> (<i>Two-leaf Hakea</i>)			
1425.	17485 <i>Halgania anagalloides</i>			
1426.	6685 <i>Halgania argyrophylla</i>			
1427.	10904 <i>Halgania bebrana</i>			
1428.	30294 <i>Halgania gustafsenii</i> var. <i>Mid West</i> (<i>G. Perry 370</i>)			
1429.	6696 <i>Halgania sericiflora</i>			
1430.	29716 <i>Halgania</i> sp. <i>Wongan Hills</i> (<i>K.F. Kenneally 2393</i>)			
1431.	13141 <i>Haliptilon roseum</i>			
1432.	-6317 <i>Halophila</i> sp.			
1433.	6180 <i>Haloragis trigonocarpa</i>			
1434.	17781 <i>Hannafordia quadrivalvis</i> subsp. <i>quadrivalvis</i>			
1435.	28253 <i>Hedynois rhagadioloides</i> subsp. <i>cretica</i>	Y		
1436.	8008 <i>Helianthus annuus</i> (<i>Sunflower</i>)	Y		
1437.	29594 <i>Helichrysum luteoalbum</i> (<i>Jersey Cudweed</i>)			
1438.	8027 <i>Helichrysum macranthum</i>			
1439.	17299 <i>Heliotropium ammophilum</i>			
1440.	6707 <i>Heliotropium curassavicum</i> (<i>Smooth Heliotrope</i>)			
1441.	26912 <i>Helminthocladia australis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1442.	11451 <i>Hemarthria uncinata</i> var. <i>uncinata</i>			
1443.	6840 <i>Hemiandra rubriflora</i>			
1444.	6849 <i>Hemigenia diplanthera</i>			
1445.	6869 <i>Hemigenia saligna</i>		P3	
1446.	26915 <i>Hennedya crispa</i>			
1447.	26925 <i>Heterocladia caudata</i>			
1448.	26927 <i>Heterodoxia denticulata</i>			
1449.	5108 <i>Hibbertia acerosa</i> (Needle Leaved Guinea Flower)			
1450.	5112 <i>Hibbertia aurea</i>			
1451.	5115 <i>Hibbertia conspicua</i> (Leafless Hibbertia)			
1452.	5116 <i>Hibbertia crassifolia</i>			
1453.	5120 <i>Hibbertia desmophylla</i>			
1454.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
1455.	5148 <i>Hibbertia mylnei</i>			
1456.	5158 <i>Hibbertia potentilliflora</i>			
1457.	5166 <i>Hibbertia rupicola</i>			
1458.	-10292 <i>Hibbertia</i> sp.			
1459.	5171 <i>Hibbertia spicata</i>			
1460.	11481 <i>Hibbertia spicata</i> subsp. <i>spicata</i>			
1461.	5177 <i>Hibbertia verrucosa</i>			
1462.	4927 <i>Hibiscus drummondii</i> (Drummond's Hibiscus)			
1463.	9085 <i>Hibiscus huegelii</i> (Lilac Hibiscus)			Y
1464.	-7172 <i>Hibiscus</i> sp.			
1465.	5807 <i>Homalocalyx chapmanii</i>		P2	
1466.	5812 <i>Homalocalyx inerrabundus</i>		P2	
1467.	8476 <i>Hordeum hystrix</i> (Mediterranean Region Barley Grass)	Y		
1468.	449 <i>Hordeum leporinum</i> (Barley Grass)	Y		
1469.	450 <i>Hordeum marinum</i>	Y		
1470.	3968 <i>Hovea trisperma</i> (Common Hovea)			
1471.	12741 <i>Hyalosperma cotula</i>			
1472.	12742 <i>Hyalosperma demissum</i>			
1473.	-12666 <i>Hyalosperma glutinosa</i> subsp. <i>glutinosa</i>			
1474.	12743 <i>Hyalosperma glutinosum</i>			
1475.	15447 <i>Hyalosperma glutinosum</i> subsp. <i>glutinosum</i>			
1476.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
1477.	5221 <i>Hybanthus floribundus</i>			
1478.	12007 <i>Hybanthus floribundus</i> subsp. <i>floribundus</i>			
1479.	6223 <i>Hydrocotyle alata</i>			
1480.	6226 <i>Hydrocotyle callicarpa</i> (Small Pennywort)			
1481.	11546 <i>Hydrocotyle pilifera</i> var. <i>glabrata</i>			
1482.	452 <i>Hyparrhenia hirta</i> (Tambookie Grass)	Y		
1483.	5180 <i>Hypericum gramineum</i> (Small St John's Wort)			
1484.	5181 <i>Hypericum japonicum</i> (Matted St John's Wort)			
1485.	26973 <i>Hypnea valentiae</i>			
1486.	5817 <i>Hypocalymma angustifolium</i> (White Myrtle)			
1487.	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
1488.	1070 <i>Hypolaena exsulca</i>			
1489.	11699 <i>Hypoxis glabella</i> var. <i>glabella</i>			
1490.	11604 <i>Hypoxis glabella</i> var. <i>leptantha</i>			
1491.	1503 <i>Hypoxis occidentalis</i>			
1492.	11736 <i>Hypoxis occidentalis</i> var. <i>occidentalis</i>			
1493.	14884 <i>Indigofera occidentalis</i>			
1494.	6620 <i>Ipomoea cairica</i> (Coast Morning Glory)	Y		
1495.	6622 <i>Ipomoea carnea</i>	Y		
1496.	6630 <i>Ipomoea indica</i> (Morning Glory)	Y		
1497.	8087 <i>Isoetopsis graminifolia</i> (Cushion Grass)			
1498.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
1499.	911 <i>Isolepis congrua</i>			
1500.	912 <i>Isolepis cyperoides</i>			
1501.	917 <i>Isolepis marginata</i> (Coarse Club-rush)	Y		
1502.	923 <i>Isolepis setiformis</i>			
1503.	2227 <i>Isopogon divergens</i> (Spreading Coneflower)			
1504.	2229 <i>Isopogon dubius</i> (Pincushion Coneflower)			
1505.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
1506.	3992 <i>Isotropis cuneifolia</i> (Granny Bonnets)			
1507.	19700 <i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			
1508.	-7160 <i>Isotropis</i> sp.			
1509.	3998 <i>Jacksonia angulata</i>			
1510.	14780 <i>Jacksonia arenicola</i>			
1511.	14783 <i>Jacksonia calcicola</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1512.	4006 <i>Jacksonia cupulifera</i>			
1513.	4010 <i>Jacksonia floribunda</i> (Holly Pea)			
1514.	4015 <i>Jacksonia hakeoides</i>			
1515.	14778 <i>Jacksonia nutans</i>			
1516.	14785 <i>Jacksonia rigida</i>			
1517.	-6184 <i>Jacksonia</i> sp.			
1518.	4029 <i>Jacksonia sternbergiana</i> (Stinkwood)			
1519.	-5319 <i>Jania</i> sp.			
1520.	6500 <i>Jasminum calcareum</i> (Poison Creeper)			
1521.	20454 <i>Juncus acutus</i> subsp. <i>acutus</i>	Y		
1522.	1178 <i>Juncus bufonius</i> (Toad Rush)	Y		
1523.	1180 <i>Juncus capitatus</i> (Capitate Rush)	Y		
1524.	11922 <i>Juncus kraussii</i> subsp. <i>australiensis</i>			
1525.	1194 <i>Juncus radula</i>			
1526.	4043 <i>Kennedia prorepens</i>			
1527.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
1528.	5022 <i>Keraudrenia hermanniifolia</i>			
1529.	12008 <i>Kickxia elatine</i> subsp. <i>crinita</i>	Y		
1530.	26994 <i>Kuetzingia angusta</i>			
1531.	26995 <i>Kuetzingia canaliculata</i>			
1532.	3667 <i>Labichea lanceolata</i> (Tall Labichea)			
1533.	11289 <i>Labichea lanceolata</i> subsp. <i>lanceolata</i>			
1534.	11545 <i>Labichea teretifolia</i> subsp. <i>grandistipulata</i>			
1535.	4046 <i>Lablab purpureus</i> (Lablab Bean)	Y		
1536.	20019 <i>Lachnagrostis filiformis</i>			
1537.	6780 <i>Lachnostachys eriobotrya</i> (Lambswool)			
1538.	6781 <i>Lachnostachys ferruginea</i> (Rusty Lambstail)			
1539.	-11593 <i>Lachnostachys</i> sp.			
1540.	17209 <i>Lachnostachys verbascifolia</i> var. <i>verbascifolia</i>			
1541.	18585 <i>Lagenophora huegelii</i>			
1542.	468 <i>Lamarckia aurea</i> (Goldentop)	Y		
1543.	6733 <i>Lantana camara</i> (Common Lantana)	Y		
1544.	-12044 <i>Lantana</i> sp.			Y
1545.	9099 <i>Lasiopetalum angustifolium</i> (Narrow Leaved Lasiopetalum)			
1546.	27001 <i>Laurencia filiformis</i>			
1547.	27002 <i>Laurencia forsteri</i>			
1548.	27005 <i>Laurencia majuscula</i>			
1549.	13284 <i>Lawrencella rosea</i>			
1550.	4959 <i>Lawrencia squamata</i>			
1551.	1305 <i>Laxmannia omnifertilis</i>			
1552.	11679 <i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i>			
1553.	11732 <i>Laxmannia sessiliflora</i> subsp. <i>sessiliflora</i>			
1554.	-10586 <i>Laxmannia</i> sp.			
1555.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
1556.	7580 <i>Lechenaultia linarioides</i> (Yellow Leschenaultia)			
1557.	19727 <i>Leiocarpa semicalva</i> subsp. <i>semicalva</i>			
1558.	27011 <i>Lenormandia latifolia</i>			
1559.	27013 <i>Lenormandia spectabilis</i>			
1560.	3018 <i>Lepidium africanum</i> (Rubble Peppergrass)	Y		
1561.	3030 <i>Lepidium lyratogynum</i>			
1562.	1073 <i>Lepidobolus chaetocephalus</i> (Bristle-headed Chaff Rush)			
1563.	1075 <i>Lepidobolus preissianus</i>			
1564.	18074 <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
1565.	-3273 <i>Lepidosperma</i> aff. <i>squamatum</i> (GJK & NG 5462)			
1566.	-3376 <i>Lepidosperma</i> aff. <i>tenuis</i>			
1567.	928 <i>Lepidosperma brunonianum</i>			
1568.	930 <i>Lepidosperma costale</i>			
1569.	936 <i>Lepidosperma leptostachyum</i>			
1570.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
1571.	944 <i>Lepidosperma scabrum</i>			
1572.	-10997 <i>Lepidosperma</i> sp.			
1573.	-3301 <i>Lepidosperma</i> sp. (NG 3944)			Y
1574.	-10998 <i>Lepidosperma</i> sp. <i>K</i>			
1575.	29147 <i>Lepidosperma</i> sp. <i>Moresby Range</i> (R.J. Cranfield 2751)		P1	Y
1576.	29145 <i>Lepidosperma</i> sp. <i>Zuytdorp</i> (G.J. Keighery & N. Gibson 1710)			
1577.	945 <i>Lepidosperma squamatum</i>			
1578.	947 <i>Lepidosperma tenuis</i>			
1579.	1653 <i>Leporella fimbriata</i> (Hare Orchid)			
1580.	19124 <i>Leptochloa fusca</i> subsp. <i>fusca</i>			
1581.	2350 <i>Leptomeria pauciflora</i> (Sparse-flowered Currant Bush)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1582.	15428 <i>Leptosema aphyllum</i>			
1583.	5853 <i>Leptospermum oligandrum</i>			
1584.	6354 <i>Leucopogon allittii</i>			
1585.	31794 <i>Leucopogon borealis</i>		P2	Y
1586.	6412 <i>Leucopogon marginatus</i>		T	
1587.	14832 <i>Leucopogon oblongus</i>			Y
1588.	6437 <i>Leucopogon psammophilus</i>		P1	
1589.	-7718 <i>Leucopogon</i> sp.			
1590.	20365 <i>Leucopogon</i> sp. <i>Howatharra</i> (D. & N. McFarland 1046)		P2	Y
1591.	31754 <i>Leucopogon</i> sp. <i>Kojarena</i> (J. Brooker 232)		P1	Y
1592.	20364 <i>Leucopogon</i> sp. <i>Mid West</i> (J.S. Beard 7388)			
1593.	20360 <i>Leucopogon</i> sp. <i>Moresby Range</i> (S. Patrick 2614)		P3	
1594.	-3306 <i>Leucopogon</i> sp. <i>Morseby Range</i> (GJK & NG 6526)			Y
1595.	37042 <i>Leucopogon</i> sp. <i>Nabawa</i> (M. Hislop 2765)			Y
1596.	34157 <i>Leucopogon</i> sp. <i>Northern ciliate</i> (R. Davis 3393)			
1597.	27018 <i>Leveillea jungermannioides</i>			
1598.	7670 <i>Levenhookia dubia</i> (<i>Hairy Stylewort</i>)			
1599.	7671 <i>Levenhookia leptantha</i> (<i>Trumpet Stylewort</i>)			
1600.	7676 <i>Levenhookia pusilla</i> (<i>Midget Stylewort</i>)			
1601.	7677 <i>Levenhookia stipitata</i> (<i>Common Stylewort</i>)			
1602.	6489 <i>Limonium sinuatum</i> (<i>Perennial Sea Lavender</i>)	Y		
1603.	7075 <i>Linaria maroccana</i>	Y		
1604.	4362 <i>Linum marginale</i> (<i>Wild Flax</i>)			
1605.	7400 <i>Lobelia alata</i> (<i>Angled Lobelia</i>)			
1606.	9289 <i>Lobelia anceps</i> (<i>Angled Lobelia</i>)			
1607.	7402 <i>Lobelia gibbosa</i> (<i>Tall Lobelia</i>)			
1608.	7407 <i>Lobelia rhytidospema</i> (<i>Wrinkled-seeded Lobelia</i>)			
1609.	16798 <i>Logania litoralis</i>			
1610.	6512 <i>Logania spermacocea</i>			
1611.	6515 <i>Logania vaginalis</i> (<i>White Spray</i>)			
1612.	10957 <i>Lolium perenne</i> x <i>rigidum</i>	Y		
1613.	478 <i>Lolium rigidum</i> (<i>Wimmera Ryegrass</i>)	Y		
1614.	11384 <i>Lolium temulentum</i> forma <i>temulentum</i>	Y		
1615.	1226 <i>Lomandra effusa</i> (<i>Scented Matrush</i>)			
1616.	1231 <i>Lomandra maritima</i>			
1617.	14542 <i>Lomandra micrantha</i> subsp. <i>micrantha</i>			
1618.	1234 <i>Lomandra nigricans</i>			
1619.	4060 <i>Lotus australis</i> (<i>Austral Trefoil</i>)			
1620.	4066 <i>Lupinus cosentinii</i>	Y		
1621.	6968 <i>Lycium ferocissimum</i> (<i>African Boxthorn</i>)	Y		
1622.	18049 <i>Lyginia imberbis</i>			
1623.	2396 <i>Lysiana casuarinae</i>			
1624.	36375 <i>Lysimachia arvensis</i> (<i>Pimpernel</i>)	Y		
1625.	34736 <i>Lysinema pentapetalum</i>			
1626.	5281 <i>Lythrum hyssopifolia</i> (<i>Lesser Loosestrife</i>)	Y		
1627.	2839 <i>Macarthuria australis</i>			
1628.	4070 <i>Macroptilium atropurpureum</i> (<i>Purple Bean</i>)	Y		
1629.	2539 <i>Maireana convexa</i> (<i>Mulga Bluebush</i>)			
1630.	2556 <i>Maireana planifolia</i> (<i>Low Bluebush</i>)			
1631.	-12679 <i>Maireana</i> sp.			
1632.	5861 <i>Malleostemon hursthousei</i>			
1633.	5864 <i>Malleostemon peltiger</i>			
1634.	14469 <i>Malleostemon</i> sp. <i>Moonyoonooka</i> (R.J. Cranfield 2947)		P2	Y
1635.	4961 <i>Malva parviflora</i> (<i>Marshmallow</i>)	Y		
1636.	19421 <i>Marianthus bicolor</i> (<i>Painted Marianthus</i>)			
1637.	17632 <i>Marianthus ringens</i>			
1638.	76 <i>Marsilea hirsuta</i> (<i>Nardoo</i>)			
1639.	-13015 <i>Marsilea</i> sp.			
1640.	11275 <i>Medicago laciniata</i> var. <i>laciniata</i>	Y		
1641.	4077 <i>Medicago minima</i> (<i>Small Burr Medic</i>)	Y		
1642.	4079 <i>Medicago polymorpha</i> (<i>Burr Medic</i>)	Y		
1643.	15064 <i>Melaleuca acuminata</i> subsp. <i>websteri</i>			
1644.	37580 <i>Melaleuca acutifolia</i>			
1645.	5876 <i>Melaleuca aspalathoides</i>			
1646.	19384 <i>Melaleuca bisulcata</i>			
1647.	19048 <i>Melaleuca campanae</i>			
1648.	5887 <i>Melaleuca cardiophylla</i> (<i>Tangling Melaleuca</i>)			
1649.	5893 <i>Melaleuca concreta</i>			
1650.	16088 <i>Melaleuca coroncarpa</i>			
1651.	5904 <i>Melaleuca depressa</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1652.	15602 <i>Melaleuca fulgens</i> subsp. <i>steadmanii</i>			
1653.	18129 <i>Melaleuca hollidayi</i>			
1654.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
1655.	19451 <i>Melaleuca huttensis</i>		P1	
1656.	5922 <i>Melaleuca lanceolata</i> (Rottnest Teatree)			
1657.	5930 <i>Melaleuca leiopyxis</i>			
1658.	18112 <i>Melaleuca leuropoma</i>			
1659.	18435 <i>Melaleuca longistaminea</i>			
1660.	5936 <i>Melaleuca megacephala</i>			
1661.	5958 <i>Melaleuca radula</i> (Graceful Honeymyrtle)			
1662.	5959 <i>Melaleuca rhapsiophylla</i> (Swamp Paperbark)			
1663.	-3184 <i>Melaleuca</i> sp.			
1664.	37660 <i>Melaleuca spectabilis</i>			Y
1665.	19449 <i>Melaleuca stereophloia</i>			
1666.	18598 <i>Melaleuca systema</i>			
1667.	5983 <i>Melaleuca trichophylla</i>			
1668.	-3611 <i>Melaleuca uncinata</i> group			
1669.	-9503 <i>Melaleuca urceolaris</i> x <i>zonalis</i>			
1670.	5987 <i>Melaleuca viminea</i> (Mohan)			
1671.	13280 <i>Melaleuca viminea</i> subsp. <i>viminea</i>			
1672.	4085 <i>Melilotus indicus</i>	Y		
1673.	14985 <i>Melinis repens</i>	Y		
1674.	6884 <i>Mentha spicata</i> (Spearmint)	Y		
1675.	2813 <i>Mesembryanthemum crystallinum</i> (Iceplant)	Y		
1676.	954 <i>Mesomelaena preissii</i>			
1677.	955 <i>Mesomelaena pseudostygia</i>			
1678.	27070 <i>Metamastophora flabellata</i>			
1679.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
1680.	37680 <i>Micromyrtus collina</i>		P1	
1681.	19855 <i>Micromyrtus rubricalyx</i>		P2	Y
1682.	8814 <i>Microtis brownii</i>			
1683.	17423 <i>Microtis graniticola</i>			
1684.	10954 <i>Microtis media</i> (Tall Mignonette Orchid)			
1685.	15419 <i>Microtis media</i> subsp. <i>media</i>			
1686.	-3881 <i>Microtis</i> sp.			
1687.	8105 <i>Millotia myosotidifolia</i>			
1688.	8107 <i>Minuria cunninghamii</i> (Bush Minuria)			
1689.	4089 <i>Mirbelia depressa</i>			
1690.	4091 <i>Mirbelia floribunda</i> (Purple Mirbelia)			
1691.	4097 <i>Mirbelia ramulosa</i>			
1692.	4100 <i>Mirbelia spinosa</i>			
1693.	4104 <i>Mirbelia trichocalyx</i>			
1694.	7085 <i>Misopates orontium</i> (Lesser Snapdragon)	Y		
1695.	33136 <i>Molineriella minuta</i> (Small Hairgrass)	Y		
1696.	29418 <i>Monoculus monstrosus</i>	Y		
1697.	7410 <i>Monopsis debilis</i>	Y		
1698.	37440 <i>Monopsis debilis</i> var. <i>depressa</i>	Y		
1699.	19584 <i>Monotaxis bracteata</i>			
1700.	4663 <i>Monotaxis lurida</i>			Y
1701.	19177 <i>Moraea setifolia</i>	Y		
1702.	2412 <i>Muehlenbeckia adpressa</i> (Climbing Lignum)			
1703.	7289 <i>Myoporum caprarioides</i> (Slender Myoporum)			
1704.	7291 <i>Myoporum insulare</i> (Blueberry Tree)			
1705.	17158 <i>Myoporum montanum</i> (Native Myrtle)			
1706.	10978 <i>Nemcia pauciflora</i>			
1707.	6243 <i>Neosciadium glochidiatum</i>			
1708.	492 <i>Neurachne alopecuroidea</i> (Foftail Mulga Grass)			
1709.	27100 <i>Neurymenia fraxinifolia</i>			
1710.	6974 <i>Nicotiana glauca</i> (Tree Tobacco)	Y		
1711.	11327 <i>Nicotiana occidentalis</i> subsp. <i>hesperis</i>			
1712.	11331 <i>Nicotiana occidentalis</i> subsp. <i>obliqua</i>			
1713.	6978 <i>Nicotiana rotundifolia</i> (Round-leaved Tobacco)			
1714.	4366 <i>Nitraria billardierei</i> (Nitre Bush)			
1715.	27103 <i>Nizymenia conferta</i>			
1716.	1381 <i>Nothoscordum gracile</i>	Y		
1717.	2401 <i>Nuytsia floribunda</i> (Christmas Tree)			
1718.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
1719.	15449 <i>Olearia dampieri</i> subsp. <i>dampieri</i>			
1720.	15450 <i>Olearia dampieri</i> subsp. <i>eremicola</i>			
1721.	8136 <i>Olearia homolepis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1722.	19801 <i>Oligochaetochilus sanguineus</i>			
1723.	19804 <i>Oligochaetochilus vittatus</i>			
1724.	-11061 <i>Opercularia</i> sp.			
1725.	18256 <i>Opercularia spermacocea</i>			
1726.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
1727.	-9864 <i>Opuntia</i> sp.			
1728.	7122 <i>Orobanche minor</i> (Lesser Broomrape)	Y		
1729.	11749 <i>Orthrosanthus laxus</i> var. <i>laxus</i> (Morning Iris)			
1730.	27107 <i>Osmundaria prolifera</i>			
1731.	4355 <i>Oxalis perennans</i>			
1732.	4356 <i>Oxalis pes-caprae</i> (Soursob)	Y		
1733.	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
1734.	36259 <i>Palisada cruciata</i>			
1735.	503 <i>Panicum decompositum</i> (Native Millet)			
1736.	516 <i>Parapholis incurva</i> (Coast Bargrass)	Y		
1737.	17114 <i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>			
1738.	7089 <i>Parentucellia latifolia</i> (Common Bartsia)	Y		
1739.	7090 <i>Parentucellia viscosa</i> (Sticky Bartsia)	Y		
1740.	12670 <i>Parietaria cardiostegia</i>			
1741.	1762 <i>Parietaria debilis</i> (Pellitory)			
1742.	10975 <i>Paspalidium basicladum</i>			
1743.	-12177 <i>Paspalidium</i> sp.			
1744.	-1528 <i>Paspalidium</i> sp. <i>indet</i>			
1745.	528 <i>Paspalum distichum</i> (Water Couch)	Y		
1746.	533 <i>Paspalum vaginatum</i> (Salt Water Couch)	Y		
1747.	1550 <i>Patersonia occidentalis</i> (Purple Flag)			
1748.	30476 <i>Patersonia occidentalis</i> var. <i>latifolia</i>			
1749.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
1750.	537 <i>Pennisetum glaucum</i> (Pearl Millet)	Y		
1751.	541 <i>Pennisetum setaceum</i> (Fountain Grass)	Y		
1752.	542 <i>Pennisetum villosum</i> (Feathertop)	Y		
1753.	7593 <i>Pentaptilon careyi</i>			
1754.	543 <i>Pentaschistis airoides</i> (False Hairgrass)	Y		
1755.	24022 <i>Pentaschistis airoides</i> subsp. <i>airoides</i>	Y		
1756.	11052 <i>Persicaria prostrata</i>			
1757.	2255 <i>Persoonia angustiflora</i>			
1758.	15629 <i>Persoonia hexagona</i>			
1759.	15632 <i>Persoonia stricta</i>			
1760.	2286 <i>Petrophile brevifolia</i>			
1761.	2290 <i>Petrophile conifera</i>			
1762.	2301 <i>Petrophile macrostachya</i>			
1763.	2303 <i>Petrophile megalostegia</i>			
1764.	29192 <i>Petrophile pilostyla</i> subsp. <i>pilostyla</i>			
1765.	10784 <i>Petrophile scabriuscula</i>			
1766.	19825 <i>Petrorhagia dubia</i>	Y		
1767.	27134 <i>Phacelocarpus peperocarpos</i>			
1768.	-12141 <i>Phaeoceros laevis</i>			
1769.	551 <i>Phalaris minor</i> (Lesser Canary Grass)	Y		
1770.	20460 <i>Pheladenia deformis</i>			
1771.	18505 <i>Philothea wonganensis</i>		T	
1772.	1173 <i>Philydrella pygmaea</i> (Butterfly Flowers)			
1773.	14306 <i>Philydrella pygmaea</i> subsp. <i>pygmaea</i>			
1774.	16825 <i>Phyllangium divergens</i>			
1775.	-3338 <i>Phyllangium paradoxum</i> complex.			
1776.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
1777.	4681 <i>Phyllanthus maitlandianus</i>			
1778.	4685 <i>Phyllanthus scaber</i>			
1779.	6009 <i>Pileanthus filifolius</i> (Summer Coppercups)			
1780.	20219 <i>Pileanthus peduncularis</i> subsp. <i>peduncularis</i>			
1781.	20220 <i>Pileanthus rubronitidus</i>			
1782.	18250 <i>Pileanthus vernicosus</i>			
1783.	5231 <i>Pimelea angustifolia</i> (Narrow-leaved Pimelea)			
1784.	5232 <i>Pimelea argentea</i> (Silvery Leaved Pimelea)			
1785.	5244 <i>Pimelea floribunda</i>			
1786.	5246 <i>Pimelea gilgiana</i>			
1787.	11402 <i>Pimelea imbricata</i> var. <i>piliger</i>			
1788.	11185 <i>Pimelea microcephala</i> subsp. <i>microcephala</i>			
1789.	19744 <i>Pittosporum angustifolium</i>			
1790.	19745 <i>Pittosporum ligustrifolium</i>			
1791.	3173 <i>Pittosporum phylliraeoides</i> (Weeping Pittosporum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1792.	6798 <i>Pityrodia atriplicina</i>			
1793.	6811 <i>Pityrodia hemigenioides</i>			
1794.	6814 <i>Pityrodia loxocarpa</i>			
1795.	6816 <i>Pityrodia oldfieldii</i> (Oldfields Foxglove)			
1796.	6824 <i>Pityrodia verbascina</i> (Golden Bush)			
1797.	11785 <i>Plantago coronopus</i> subsp. <i>commutata</i>	Y		
1798.	7299 <i>Plantago debilis</i>			
1799.	6247 <i>Platysace cirrosa</i> (Karna)			
1800.	6255 <i>Platysace juncea</i>			
1801.	14996 <i>Platysace</i> sp. <i>Eneabba</i> (R. Hnatiuk 770001)			
1802.	27156 <i>Plocamium mertensii</i>			
1803.	571 <i>Poa annua</i> (Winter Grass)	Y		
1804.	577 <i>Poa poliformis</i> (Coastal Poa)			
1805.	8172 <i>Podolepis canescens</i>			
1806.	8173 <i>Podolepis capillaris</i> (Wiry Podolepis)			
1807.	8177 <i>Podolepis lessonii</i>			
1808.	8182 <i>Podotheca angustifolia</i> (Sticky Longheads)			
1809.	8184 <i>Podotheca gnaphalioides</i> (Golden Long-heads)			
1810.	8188 <i>Pogonolepis stricta</i>			
1811.	29919 <i>Polianthion wichurae</i>			
1812.	2905 <i>Polycarpon tetraphyllum</i> (Fourleaf Allseed)	Y		
1813.	2419 <i>Polygonum aviculare</i> (Wireweed)	Y		
1814.	582 <i>Polypogon monspeliensis</i> (Annual Beardgrass)	Y		
1815.	27173 <i>Polysiphonia decipiens</i>			
1816.	4688 <i>Poranthera drummondii</i>			
1817.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
1818.	2884 <i>Portulaca oleracea</i> (Purslane)	Y		
1819.	111 <i>Potamogeton ochreateus</i> (Blunt Pondweed)			
1820.	1669 <i>Prasophyllum cyphochilum</i> (Pouched Leek Orchid)			
1821.	1671 <i>Prasophyllum elatum</i> (Tall Leek Orchid)			
1822.	1672 <i>Prasophyllum fimbria</i> (Fringed Leek Orchid)			
1823.	1674 <i>Prasophyllum giganteum</i> (Bronze Leek Orchid)			
1824.	16688 <i>Prasophyllum gracile</i>			
1825.	-1736 <i>Prasophyllum macrostachyum</i> var. <i>ringens</i>			
1826.	1682 <i>Prasophyllum sargentii</i>			
1827.	3620 <i>Prosopis pallida</i> (Algaroba)	Y		
1828.	6919 <i>Prostanthera magnifica</i> (Magnificent Prostanthera)			
1829.	8189 <i>Pseudognaphalium luteoalbum</i> (Jersey Cudweed)	Y		
1830.	57 <i>Pteridium esculentum</i> (Bracken)			
1831.	13255 <i>Pterochaeta paniculata</i>			
1832.	1690 <i>Pterostylis nana</i> (Snail Orchid)			
1833.	1693 <i>Pterostylis recurva</i> (Jug Orchid)			
1834.	12217 <i>Pterostylis sanguinea</i>			
1835.	18657 <i>Pterostylis</i> sp. <i>inland</i> (A.C. Beauglehole 11880)			
1836.	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
1837.	2710 <i>Ptilotus chortophyllum</i>			
1838.	2716 <i>Ptilotus declinatus</i> (Curved Mulla Mulla)			
1839.	2717 <i>Ptilotus divaricatus</i> (Climbing Mulla Mulla)			
1840.	11251 <i>Ptilotus divaricatus</i> var. <i>divaricatus</i>			
1841.	2718 <i>Ptilotus drummondii</i> (Narrowleaf Mulla Mulla)			
1842.	11260 <i>Ptilotus drummondii</i> var. <i>drummondii</i> (Pussytail)			
1843.	11797 <i>Ptilotus drummondii</i> var. <i>minor</i>			
1844.	2719 <i>Ptilotus eriochichus</i>			
1845.	11225 <i>Ptilotus exaltatus</i> var. <i>exaltatus</i> (Tall Mulla Mulla)			
1846.	11577 <i>Ptilotus gaudichaudii</i> var. <i>gaudichaudii</i>			
1847.	12001 <i>Ptilotus gaudichaudii</i> var. <i>parviflorus</i>			
1848.	11311 <i>Ptilotus grandiflorus</i> var. <i>grandiflorus</i>			
1849.	11775 <i>Ptilotus humilis</i> subsp. <i>humilis</i>			
1850.	17962 <i>Ptilotus humilis</i> subsp. <i>parviflorus</i>			
1851.	2742 <i>Ptilotus manglesii</i> (Pom Poms)			
1852.	2747 <i>Ptilotus obovatus</i> (Cotton Bush)			
1853.	2751 <i>Ptilotus polystachyus</i> (Prince of Wales Feather)			
1854.	17657 <i>Ptilotus polystachyus</i> var. <i>polystachyus</i> (Prince of Wales Feather)			
1855.	28340 <i>Ptilotus</i> sp. <i>Northampton</i> (R. Davis 10952)			
1856.	11364 <i>Ptilotus stirlingii</i> var. <i>stirlingii</i>			
1857.	2766 <i>Ptilotus villosiflorus</i>			
1858.	16367 <i>Pyrorchis nigricans</i> (Red beaks)			
1859.	8195 <i>Quinetia urvillei</i>			
1860.	4964 <i>Radyera farragei</i> (Knobby Hibiscus)			
1861.	3061 <i>Raphanus raphanistrum</i> (Wild Radish)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1862.	8197 <i>Reichardia tingitana</i> (False Sowthistle)	Y		
1863.	3083 <i>Reseda alba</i> (White Mingonette)	Y		
1864.	3085 <i>Reseda luteola</i> (Wild Mingonette)	Y		
1865.	19183 <i>Retama raetam</i>	Y		
1866.	11930 <i>Rhagodia baccata</i> subsp. <i>dioica</i> (Sea Berry Saltbush)			
1867.	2583 <i>Rhagodia latifolia</i>			
1868.	11316 <i>Rhagodia latifolia</i> subsp. <i>recta</i>			
1869.	2584 <i>Rhagodia preissii</i>			
1870.	11240 <i>Rhagodia preissii</i> subsp. <i>obovata</i>			
1871.	11254 <i>Rhagodia preissii</i> subsp. <i>preissii</i>			
1872.	-7999 <i>Rhagodia</i> sp.			
1873.	13308 <i>Rhodanthe charsleyae</i>			
1874.	13241 <i>Rhodanthe chlorocephala</i> subsp. <i>rosea</i>			
1875.	13242 <i>Rhodanthe chlorocephala</i> subsp. <i>splendida</i>			
1876.	13300 <i>Rhodanthe citrina</i>			
1877.	15035 <i>Rhodanthe corymbosa</i>			
1878.	13294 <i>Rhodanthe laevis</i>			
1879.	13234 <i>Rhodanthe manglesii</i>			
1880.	13249 <i>Rhodanthe oppositifolia</i> subsp. <i>oppositifolia</i>			
1881.	13296 <i>Rhodanthe polycephala</i>			
1882.	13251 <i>Rhodanthe propinqua</i>			
1883.	13309 <i>Rhodanthe spicata</i>			
1884.	13254 <i>Rhodanthe stricta</i>			
1885.	27224 <i>Rhodymenia sonderi</i>			
1886.	4699 <i>Ricinocarpos psilocladus</i>			
1887.	19942 <i>Ricinocarpos undulatus</i>			
1888.	4705 <i>Ricinus communis</i> (Castor Oil Plant)	Y		
1889.	1556 <i>Romulea rosea</i> (Guildford Grass)	Y		
1890.	3066 <i>Rorippa nasturtium-aquaticum</i> (Watercress)	Y		
1891.	10970 <i>Rostraria cristata</i>	Y		
1892.	11151 <i>Rostraria pumila</i>	Y		
1893.	20419 <i>Rulingia borealis</i>			
1894.	5059 <i>Rulingia densiflora</i>			
1895.	2433 <i>Rumex crispus</i> (Curled Dock)	Y		
1896.	2438 <i>Rumex obtusifolius</i> (Broadleaf Dock)	Y		Y
1897.	-13100 <i>Ruppia</i> sp.			
1898.	30434 <i>Salsola australis</i>			
1899.	18599 <i>Salsola tragus</i>			
1900.	6929 <i>Salvia verbenaca</i> (Wild Sage)	Y		
1901.	79 <i>Salvinia molesta</i> (Salvinia)	Y		
1902.	6484 <i>Samolus repens</i> (Creeping Brookweed)			
1903.	14108 <i>Samolus repens</i> var. <i>floribundus</i>			
1904.	14107 <i>Samolus repens</i> var. <i>paucifolius</i>			
1905.	2356 <i>Santalum acuminatum</i> (Quandong)			
1906.	2359 <i>Santalum spicatum</i> (Sandalwood)			
1907.	2593 <i>Sarcocornia quinqueflora</i> (Beaded Samphire)			
1908.	27230 <i>Sarconema filiforme</i>			
1909.	7595 <i>Scaevola anchusifolia</i>			
1910.	7603 <i>Scaevola canescens</i> (Grey Scaevola)			
1911.	7606 <i>Scaevola crassifolia</i> (Thick-leaved Fan-flower)			
1912.	13068 <i>Scaevola globosa</i>		P3	
1913.	7614 <i>Scaevola globulifera</i>			
1914.	7618 <i>Scaevola humifusa</i> (Procumbent Scaevola)			
1915.	7619 <i>Scaevola lanceolata</i>			
1916.	7627 <i>Scaevola oldfieldii</i>		P3	
1917.	7634 <i>Scaevola phlebopetala</i> (Velvet Fanflower)			
1918.	7637 <i>Scaevola porocarya</i> (Striate-fruit Scaevola)			
1919.	7643 <i>Scaevola sericophylla</i>			
1920.	-8719 <i>Scaevola</i> sp.			
1921.	7644 <i>Scaevola spinescens</i> (Currant Bush)			
1922.	13152 <i>Scaevola thesioides</i> subsp. <i>thesioides</i>			
1923.	7648 <i>Scaevola tomentosa</i> (Raggedleaf Fanflower)			
1924.	12588 <i>Scaevola virgata</i>			
1925.	11027 <i>Schinus terebinthifolius</i>	Y		
1926.	8200 <i>Schoenia cassiniana</i> (Schoenia)			
1927.	13356 <i>Schoenia filifolia</i> subsp. <i>subulifolia</i>		T	
1928.	972 <i>Schoenus armeria</i>			
1929.	17571 <i>Schoenus badius</i>		P2	
1930.	982 <i>Schoenus clandestinus</i>			
1931.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrusher)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1932.	17606	<i>Schoenus griffinianus</i>		P3	
1933.	994	<i>Schoenus humilis</i>			
1934.	1002	<i>Schoenus nanus</i> (Tiny Bog Rush)			
1935.	1006	<i>Schoenus odontocarpus</i>			
1936.	1009	<i>Schoenus pleiostemoneus</i>			
1937.	1013	<i>Schoenus sculptus</i> (Gimlet Bog-rush)			
1938.	-8000	<i>Schoenus</i> sp.			
1939.	16254	<i>Schoenus</i> sp. G Broad Sheath (K.L. Wilson 2633)			
1940.	1026	<i>Schoenus unispiculatus</i>			
1941.	17409	<i>Schoenus varicellae</i>			
1942.	6030	<i>Scholtzia ciliata</i>			
1943.	6034	<i>Scholtzia laxiflora</i>			
1944.	6035	<i>Scholtzia leptantha</i>			
1945.	6036	<i>Scholtzia oligandra</i> (Pink Scholtzia)			
1946.	6037	<i>Scholtzia parviflora</i>			
1947.	-10542	<i>Scholtzia</i> sp.			
1948.	20092	<i>Scholtzia</i> sp. Burma Road (A.C. Burns 138)			
1949.	14655	<i>Scholtzia</i> sp. Kojarena (A.M. Ashby 1904)		P1	Y
1950.	17398	<i>Scholtzia</i> sp. Northampton (A. Strid 20714)			
1951.	15427	<i>Scholtzia spatulata</i>			
1952.	6041	<i>Scholtzia umbellifera</i>			
1953.	27274	<i>Sebdenia flabellata</i>			
1954.	6	<i>Selaginella gracillima</i> (Tiny Clubmoss)			
1955.	8207	<i>Senecio glossanthus</i> (Slender Groundsel)			
1956.	15678	<i>Senecio hispidulus</i> var. <i>hispidulus</i>			
1957.	20663	<i>Senecio multicaulis</i> subsp. <i>multicaulis</i>			
1958.	20161	<i>Senecio pinnatifolius</i>			
1959.	25884	<i>Senecio pinnatifolius</i> var. <i>latilobus</i>			
1960.	12276	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			
1961.	12279	<i>Senna artemisioides</i> subsp. <i>helmsii</i>			
1962.	12282	<i>Senna artemisioides</i> subsp. <i>stricta</i>			Y
1963.	18444	<i>Senna charlesiana</i>			
1964.	12305	<i>Senna glutinosa</i> subsp. <i>chatelainiana</i>			
1965.	-9409	<i>Senna</i> sp.			
1966.	31575	<i>Serichonus gracilipes</i>		P3	
1967.	4970	<i>Sida calyxhymenia</i> (Tall Sida)			
1968.	19712	<i>Sida</i> sp. dark green fruits (S. van Leeuwen 2260)			
1969.	15972	<i>Silene gallica</i> var. <i>gallica</i>	Y		
1970.	8225	<i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
1971.	14583	<i>Siloxerus multiflorus</i>			
1972.	3068	<i>Sinapis arvensis</i> (Charlock)	Y		
1973.	6988	<i>Solanum americanum</i> (Glossy Nightshade)	Y		
1974.	7006	<i>Solanum ellipticum</i> (Potato Bush)			
1975.	7018	<i>Solanum lasiophyllum</i> (Flannel Bush)			
1976.	7020	<i>Solanum linnaeanum</i>	Y		
1977.	7022	<i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
1978.	7023	<i>Solanum nummularium</i> (Money-leaved Solanum)			
1979.	7025	<i>Solanum oldfieldii</i>			
1980.	11241	<i>Solanum orbiculatum</i> subsp. <i>orbiculatum</i> (Round-leaved Solanum)			
1981.	7037	<i>Solanum symonii</i>			
1982.	27281	<i>Solleria robusta</i>			
1983.	8231	<i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
1984.	617	<i>Sorghum halepense</i> (Johnson Grass)	Y		
1985.	-9207	<i>Sorghum</i> sp.			
1986.	35236	<i>Sorghum x drummondii</i> (Sudan Grass)	Y		
1987.	1312	<i>Sowerbaea laxiflora</i> (Purple Tassels)			
1988.	2912	<i>Spergula arvensis</i> (Corn Spurry)	Y		
1989.	2915	<i>Spergularia rubra</i> (Sand Spurry)	Y		
1990.	-11526	<i>Spergularia</i> sp.			
1991.	4203	<i>Sphaerolobium gracile</i>			
1992.	625	<i>Spinifex longifolius</i> (Beach Spinifex)			
1993.	635	<i>Sporobolus virginicus</i> (Marine Couch)			
1994.	4828	<i>Spyridium globulosum</i> (Basket Bush)			
1995.	4730	<i>Stackhousia dielsii</i> (Yellow Stackhousia)			
1996.	4733	<i>Stackhousia monogyna</i>			
1997.	7102	<i>Stemodia viscosa</i> (Pagurda)			
1998.	16190	<i>Stenanthemum complicatum</i>			
1999.	15065	<i>Stenanthemum notiale</i> subsp. <i>notiale</i>			
2000.	13476	<i>Stenanthemum pomaderroides</i>			
2001.	2316	<i>Stirlingia latifolia</i> (Blueboy)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2002.	27318	<i>Struvea plumosa</i>			
2003.	7679	<i>Stylidium adpressum</i> (Trigger-on-stilts)			
2004.	30278	<i>Stylidium androsaceum</i>			
2005.	7694	<i>Stylidium bulbiferum</i> (Circus Triggerplant)			
2006.	7698	<i>Stylidium caricifolium</i> (Milkmaids)			
2007.	7709	<i>Stylidium crossocephalum</i> (Posy Triggerplant)			
2008.	7712	<i>Stylidium despectum</i> (Dwarf Triggerplant)			
2009.	7716	<i>Stylidium diuroides</i> (Donkey Triggerplant)			
2010.	12855	<i>Stylidium drummondianum</i>		P3	
2011.	7720	<i>Stylidium elongatum</i> (Tall Triggerplant)			
2012.	7721	<i>Stylidium emarginatum</i>			
2013.	17412	<i>Stylidium kalbarriense</i>			
2014.	7749	<i>Stylidium leptophyllum</i> (Needle-leaved Triggerplant)			
2015.	7759	<i>Stylidium macrocarpum</i> (Flagon Triggerplant)			
2016.	7773	<i>Stylidium petiolare</i> (Horn Triggerplant)			
2017.	25837	<i>Stylidium purpureum</i>			
2018.	7785	<i>Stylidium repens</i> (Matted Triggerplant)			
2019.	19247	<i>Stylidium septentrionale</i>			
2020.	17510	<i>Stylidium</i> sp. Kalbarri (A. Carr 145)			
2021.	17578	<i>Stylidium udusicola</i>			
2022.	3181	<i>Stylobasium australe</i>			
2023.	3182	<i>Stylobasium spathulatum</i> (Pebble Bush)			
2024.	1260	<i>Stypandra glauca</i> (Blind Grass)			
2025.	4220	<i>Swainsona canescens</i> (Grey Swainsona)			
2026.	19805	<i>Symphotrichum subulatum</i> (Bushy Starwort)	Y		
2027.	16861	<i>Synaphea recurva</i>			
2028.	-6840	<i>Synaphea</i> sp. ASG 34			
2029.	15533	<i>Synaphea spinulosa</i> subsp. <i>borealis</i>			Y
2030.	15532	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
2031.	20024	<i>Tagetes erecta</i>	Y		
2032.	15741	<i>Tamarix aphylla</i> (Athele Tree)	Y		
2033.	33319	<i>Tecticornia indica</i> subsp. <i>bidens</i>			
2034.	4256	<i>Templetonia retusa</i> (Cockies Tongues)			
2035.	2791	<i>Tersonia cyathiflora</i> (Button Creeper)			
2036.	2820	<i>Tetragonia decumbens</i> (Sea Spinach)	Y		
2037.	2823	<i>Tetragonia implexicoma</i> (Bower Spinach)			
2038.	1035	<i>Tetralia microcarpa</i>			
2039.	4528	<i>Tetralia confertifolia</i>			
2040.	-9994	<i>Thalassodendron</i> sp.			
2041.	1701	<i>Thelymitra antennifera</i> (Vanilla Orchid)			
2042.	-12431	<i>Thelymitra antennifera</i> x <i>macrophylla</i>			
2043.	10856	<i>Thelymitra benthamiana</i> (Cinnamon Sun Orchid)			
2044.	1707	<i>Thelymitra flexuosa</i> (Twisted Sun Orchid)			
2045.	20732	<i>Thelymitra petrophila</i>			
2046.	673	<i>Themeda triandra</i>			
2047.	10874	<i>Thinopyrum distichum</i>	Y		
2048.	5084	<i>Thomasia grandiflora</i> (Large Flowered Thomasia)			
2049.	2644	<i>Threlkeldia diffusa</i> (Coast Bonefruit)			
2050.	6051	<i>Thryptomene baeckeacea</i>			
2051.	6055	<i>Thryptomene denticulata</i>			
2052.	6057	<i>Thryptomene hyporhysis</i>			
2053.	6064	<i>Thryptomene racemulosa</i>			
2054.	-10092	<i>Thryptomene</i> sp.			
2055.	36097	<i>Thryptomene</i> sp. Greenough River (J. Docherty 169)			
2056.	19115	<i>Thryptomene</i> sp. Moresby Range (A.S. George 14873)		P3	Y
2057.	20366	<i>Thryptomene</i> sp. Red Bluff (A.G. Gunness 2358)			
2058.	17265	<i>Thryptomene</i> sp. Yuna Reserve (A.C. Burns 100)		P2	
2059.	6066	<i>Thryptomene stenophylla</i>		P2	
2060.	6067	<i>Thryptomene strongylophylla</i>			
2061.	1319	<i>Thysanotus arenarius</i>			
2062.	14387	<i>Thysanotus brittanii</i>			
2063.	1328	<i>Thysanotus dichotomus</i> (Branching Fringe Lily)			
2064.	1338	<i>Thysanotus manglesianus</i> (Fringed Lily)			
2065.	1343	<i>Thysanotus patersonii</i>			
2066.	1346	<i>Thysanotus pyramidalis</i>			
2067.	1348	<i>Thysanotus rectantherus</i>			
2068.	-9372	<i>Thysanotus</i> sp.			
2069.	1351	<i>Thysanotus sparteus</i>			
2070.	27335	<i>Tolypocladia calodictyon</i>			
2071.	27336	<i>Tolypocladia glomerulata</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2072.	1368 <i>Trachyandra divaricata</i>	Y		
2073.	19253 <i>Trachymene ceratocarpa</i>			
2074.	6268 <i>Trachymene cyanopetala</i>			
2075.	6279 <i>Trachymene ornata</i> (Spongefruit)			
2076.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
2077.	1485 <i>Tribonanthes violacea</i>			
2078.	-7030 <i>Tribulus</i> sp.			
2079.	6727 <i>Trichodesma zeylanicum</i> (Camel Bush)			
2080.	13559 <i>Trichodesma zeylanicum</i> var. <i>grandiflorum</i>			
2081.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
2082.	17542 <i>Trifolium arvense</i> var. <i>arvense</i>	Y		
2083.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
2084.	17763 <i>Trifolium campestre</i> var. <i>campestre</i> (Hop Clover)	Y		
2085.	4297 <i>Trifolium glomeratum</i> (Cluster Clover)	Y		
2086.	4298 <i>Trifolium hirtum</i> (Rose Clover)	Y		
2087.	4313 <i>Trifolium subterraneum</i> (Subterranean Clover)	Y		
2088.	142 <i>Triglochin calcitrapum</i>			
2089.	15821 <i>Triglochin huegelii</i>			
2090.	15820 <i>Triglochin linearis</i>			
2091.	147 <i>Triglochin mucronata</i>			
2092.	18587 <i>Triglochin nana</i>			
2093.	-8420 <i>Triglochin</i> sp.			
2094.	19175 <i>Triglochin</i> sp. <i>B Flora of Australia</i> (P.G. Wilson 4294)			
2095.	17885 <i>Triodia bromoides</i>		P4	
2096.	17882 <i>Triodia danthonioides</i>			
2097.	705 <i>Tripogon loliiformis</i> (Five Minute Grass)			
2098.	4737 <i>Tripterococcus brunonis</i> (Winged Stackhousia)			
2099.	708 <i>Triticum aestivum</i> (Wheat)	Y		
2100.	4360 <i>Tropaeolum majus</i> (Garden Nasturtium)	Y		
2101.	4840 <i>Trymalium daphnifolium</i>			
2102.	18326 <i>Urochloa panicoides</i>	Y		
2103.	9008 <i>Urodon dasyphyllus</i> (Mop Bushpea)			
2104.	8254 <i>Urospermum picroides</i> (False Hawkbit)	Y		
2105.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
2106.	38388 <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
2107.	1767 <i>Urtica urens</i> (Small Nettle)	Y		
2108.	7656 <i>Velleia cynopotamica</i>			
2109.	7664 <i>Velleia rosea</i> (Pink Velleia)			
2110.	8257 <i>Vellereophyton dealbatum</i> (White Cudweed)	Y		
2111.	15725 <i>Verbesina encelioides</i>	Y		
2112.	7666 <i>Verreauxia reinwardtii</i> (Common Verreauxia)			
2113.	12399 <i>Verticordia capillaris</i>		P4	
2114.	12401 <i>Verticordia centipeda</i>			
2115.	6073 <i>Verticordia chrysantha</i>			
2116.	12402 <i>Verticordia chrysanthella</i>			
2117.	14709 <i>Verticordia chrysostachys</i> var. <i>chrysostachys</i>			
2118.	12403 <i>Verticordia chrysostachys</i> var. <i>pallida</i>		P3	
2119.	-5117 <i>Verticordia chrysostachys</i> var. <i>pallida</i> x			Y
2120.	15432 <i>Verticordia densiflora</i> var. <i>densiflora</i>			
2121.	12413 <i>Verticordia densiflora</i> var. <i>roseostella</i>		P3	
2122.	12414 <i>Verticordia densiflora</i> var. <i>stelluligera</i>			
2123.	14712 <i>Verticordia dichroma</i> var. <i>dichroma</i>		P3	
2124.	6083 <i>Verticordia grandis</i> (Scarlet Featherflower)			
2125.	12430 <i>Verticordia huegelii</i> var. <i>stylosa</i>			
2126.	12437 <i>Verticordia laciniata</i>			
2127.	15622 <i>Verticordia lepidophylla</i> var. <i>lepidophylla</i>			
2128.	12443 <i>Verticordia monadelpha</i> var. <i>callitricha</i>			
2129.	15435 <i>Verticordia monadelpha</i> var. <i>monadelpha</i>			
2130.	12444 <i>Verticordia muelleriana</i> subsp. <i>minor</i>		P2	
2131.	10822 <i>Verticordia nobilis</i>			
2132.	6102 <i>Verticordia oculata</i>			
2133.	6106 <i>Verticordia penicillaris</i>		P4	
2134.	6107 <i>Verticordia pennigera</i>			
2135.	6109 <i>Verticordia picta</i> (Painted Featherflower)			
2136.	15615 <i>Verticordia spicata</i> subsp. <i>spicata</i>			
2137.	27360 <i>Vidalia spiralis</i>			
2138.	4325 <i>Viminaria juncea</i> (Swishbush)			
2139.	8262 <i>Vittadinia cervicalis</i>			
2140.	11387 <i>Vittadinia cervicalis</i> var. <i>cervicalis</i>			
2141.	11278 <i>Vittadinia cervicalis</i> var. <i>occidentalis</i>		P1	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2142.	8264 <i>Vittadinia dissecta</i>			
2143.	8266 <i>Vittadinia gracilis</i>			
2144.	-8692 <i>Vittadinia</i> sp.			
2145.	722 <i>Vulpia bromoides</i> (Squirrel Tail Fescue)	Y		
2146.	724 <i>Vulpia myuros</i> (Rat's Tail Fescue)	Y		
2147.	12052 <i>Vulpia myuros</i> forma megalura	Y		
2148.	33101 <i>Vulpia myuros</i> forma myuros	Y		
2149.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
2150.	7388 <i>Wahlenbergia multicaulis</i>			
2151.	7389 <i>Wahlenbergia preissii</i>			
2152.	7393 <i>Wahlenbergia tumidifruca</i>			
2153.	8275 <i>Waitzia acuminata</i> (Orange Immortelle)			
2154.	13331 <i>Waitzia acuminata</i> var. <i>acuminata</i>			
2155.	13330 <i>Waitzia acuminata</i> var. <i>albicans</i>			
2156.	13328 <i>Waitzia nitida</i>			
2157.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
2158.	32455 <i>Weissia controversa</i>			
2159.	6939 <i>Westringia dampieri</i>			
2160.	1391 <i>Wurmbea densiflora</i>			
2161.	1393 <i>Wurmbea dilatata</i>			
2162.	1394 <i>Wurmbea dioica</i> (Early Nancy)			
2163.	12072 <i>Wurmbea dioica</i> subsp. <i>alba</i>			
2164.	1398 <i>Wurmbea monantha</i>			
2165.	1401 <i>Wurmbea pygmaea</i>			
2166.	-9534 <i>Wurmbea</i> sp. <i>Nabawa</i> (T.D. Macfarlane et al. TDM 4408)			Y
2167.	1403 <i>Wurmbea tenella</i> (Eight Nancy)			
2168.	1404 <i>Wurmbea tubulosa</i> (Long-flowered Nancy)		T	
2169.	1252 <i>Xanthorrhoea drummondii</i>			
2170.	1256 <i>Xanthorrhoea preissii</i> (Grass tree)			
2171.	19938 <i>Xerochrysum bracteatum</i>			
2172.	7113 <i>Zaluzianskya divaricata</i> (Spreading Night Phlox)	Y		
2173.	4385 <i>Zygophyllum apiculatum</i> (Gallweed)			
2174.	4390 <i>Zygophyllum fruticosum</i> (Shrubby Twinleaf)			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX D - EPBC Act Protected Matters Search Results



EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 06/05/11 17:02:48

[Summary](#)

[Details](#)

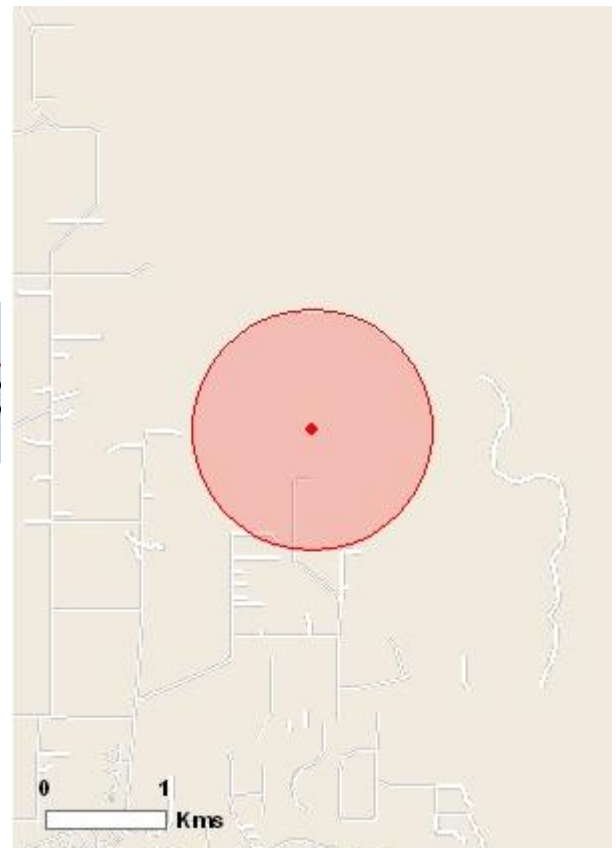
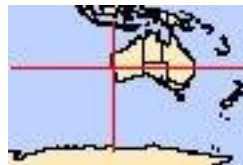
[Matters of NES](#)

[Other matters protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	3
Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	7
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

BIRDS

[Calyptorhynchus latirostris](#)

Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
---	------------	--

PLANTS

[Drummondita ericoides](#)

Morseby Range Drummondita [9193]	Endangered	Species or species habitat likely to occur within area
-------------------------------------	------------	--

[Eucalyptus cuprea](#)

Mallee Box [56773]	Endangered	Species or species habitat likely to occur within area
--------------------	------------	--

Migratory Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

Migratory Marine Birds

[Apus pacificus](#)

Fork-tailed Swift [678]		Species or species habitat may occur within area
-------------------------	--	--

[Ardea alba](#)

Great Egret, White Egret [59541]		Species or species habitat may occur within area
-------------------------------------	--	--

[Ardea ibis](#)

Cattle Egret [59542]		Species or species habitat may occur within area
----------------------	--	--

Migratory Terrestrial Species

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
-------------------------------	--	--

[Merops ornatus](#)

Rainbow Bee-eater [670]		Species or species habitat may occur within area
-------------------------	--	--

Migratory Wetlands Species

[Ardea alba](#)

Great Egret, White Egret
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species

[\[Resource Information \]](#)

Name

Status

Type of Presence

Birds

[Apus pacificus](#)

Fork-tailed Swift [678]

Species or species habitat may occur within area

[Ardea alba](#)

Great Egret, White Egret
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]

Species or species habitat likely to occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

Extra Information

Invasive Species

[\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name

Status

Type of Presence

Mammals

[Capra hircus](#)

Goat [2]

Species or species habitat likely to occur within area

[Felis catus](#)

Cat, House Cat, Domestic Cat
[19]

Species or species habitat likely to occur within area

[Oryctolagus cuniculus](#)

Rabbit, European Rabbit [128]

Species or species habitat likely to occur within area

[Vulpes vulpes](#)

Red Fox, Fox [18]

Species or species habitat likely to occur within area

Plants

[Cenchrus ciliaris](#)

Buffel-grass, Black Buffel-grass
[20213]

Species or species habitat may occur within area

[Lantana camara](#)

Lantana, Common Lantana,
Kamara Lantana, Large-leaf
Lantana, Pink Flowered
Lantana, Red Flowered Lantana,

Species or species habitat may occur within area

Red-Flowered Sage, White Sage, Wild Sage [10892]

[Lycium ferocissimum](#)

African Boxthorn, Boxthorn [19235]

Species or species habitat may occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.68636 114.6643

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

[Accessibility](#) | [Disclaimer](#) | [Privacy](#) | [© Commonwealth of Australia](#) | [Help](#)

Last updated: Thursday, 16-Sep-2010 09:13:25 EST

[Department of Sustainability, Environment, Water, Population and Communities](#)

GPO Box 787

Canberra ACT 2601 Australia

+61 2 6274 1111 [ABN](#)

| [Australian Government](#) |

APPENDIX E - DIA Registered Sites Search Results



Search Criteria

0 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6823202	270696
6826048	272100

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

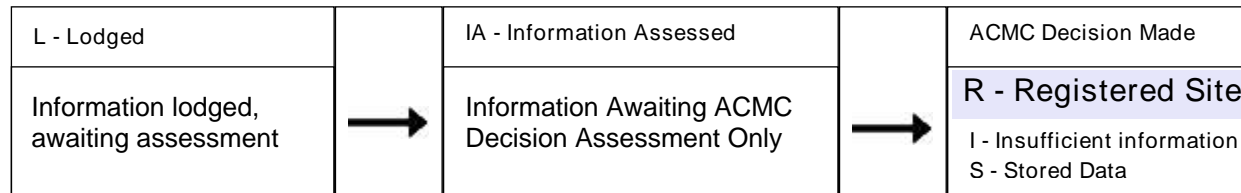
Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register of Aboriginal Sites established and maintained under the Aboriginal Heritage Act 1972 (AHA).

Legend

Restriction	Access	Coordinate Accuracy
N No restriction	C Closed	Accuracy is shown as a code in brackets following the site coordinates.
M Male access only	O Open	[Reliable] The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
F Female access	V Vulnerable	[Unreliable] The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status



*Explanation of Assessment

Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not the final assessment.

Final assessment and decisions will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

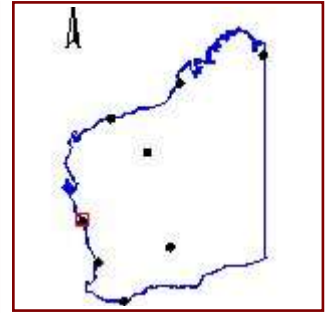
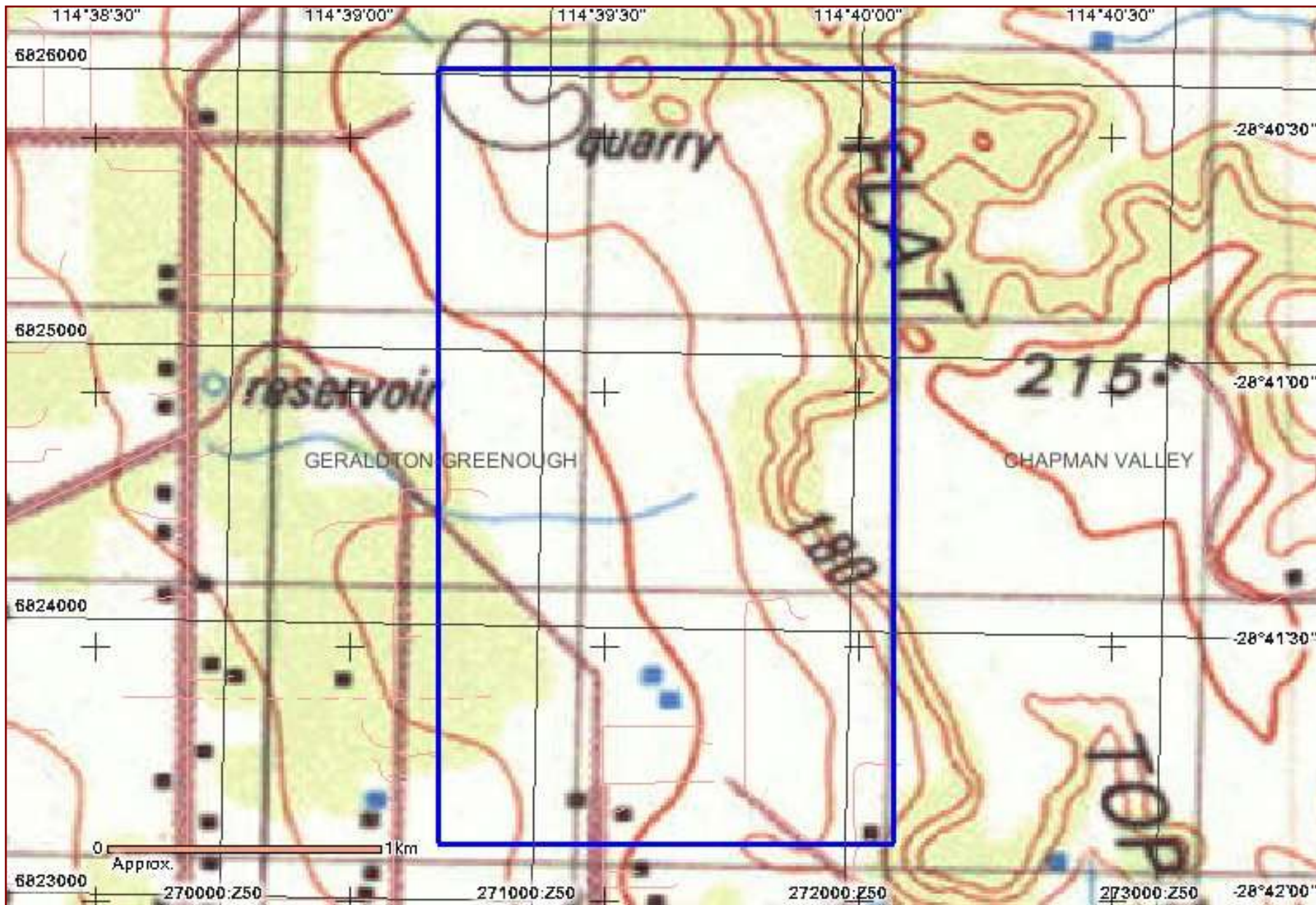
Sites Shown on Maps

Site boundaries may not appear on maps at low zoom levels



List of Registered Aboriginal Sites with Map

No results



Legend

Selected Heritage Sites

Registered Sites

Town

Map Area

Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

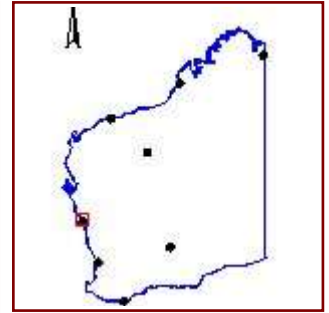
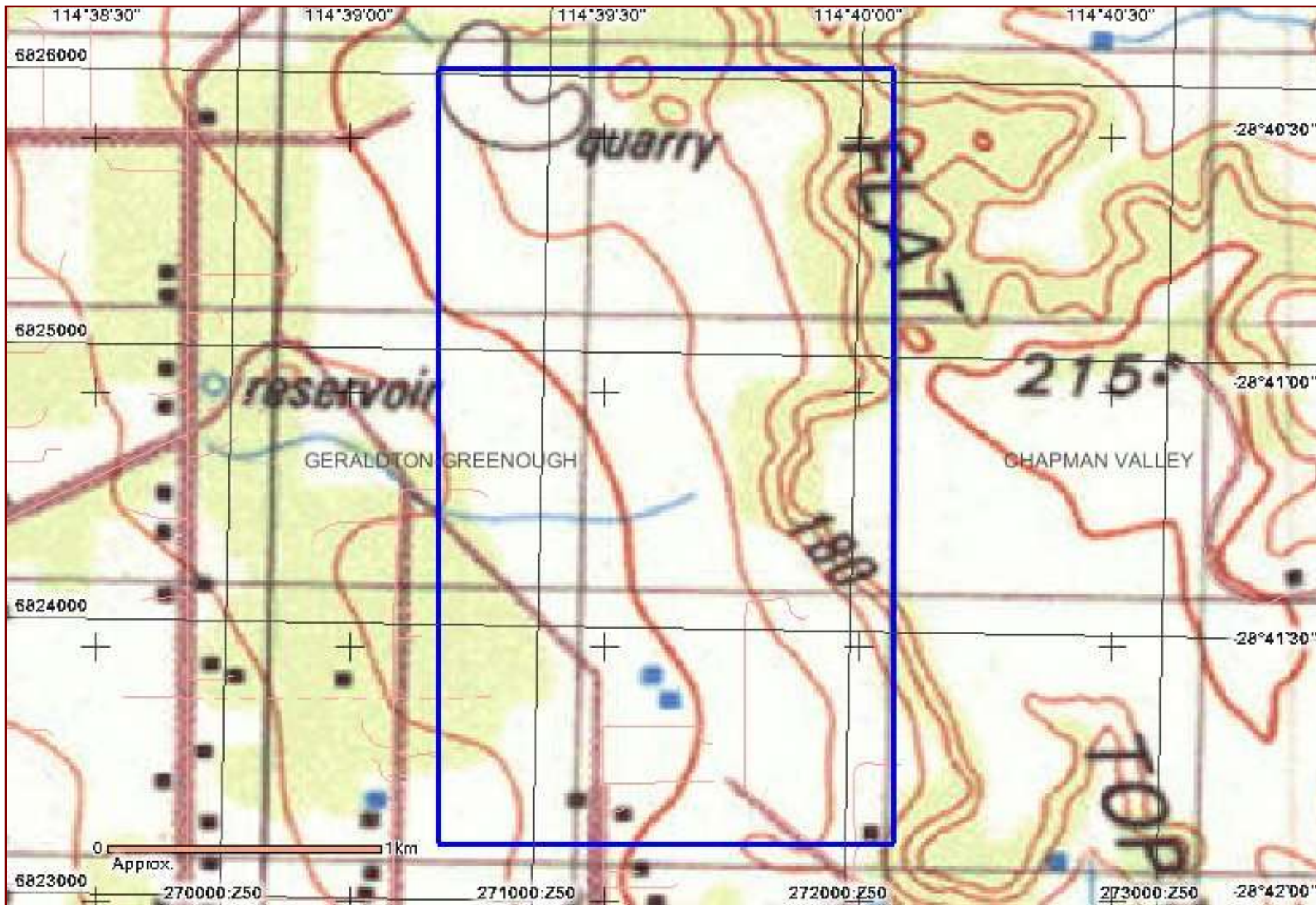
Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



List of Other Heritage Places with Map

No results



Legend

- Selected Heritage Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

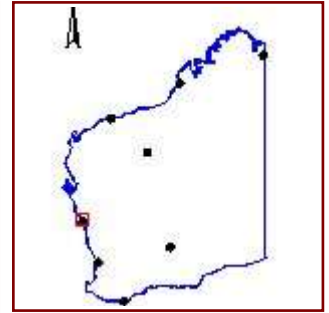
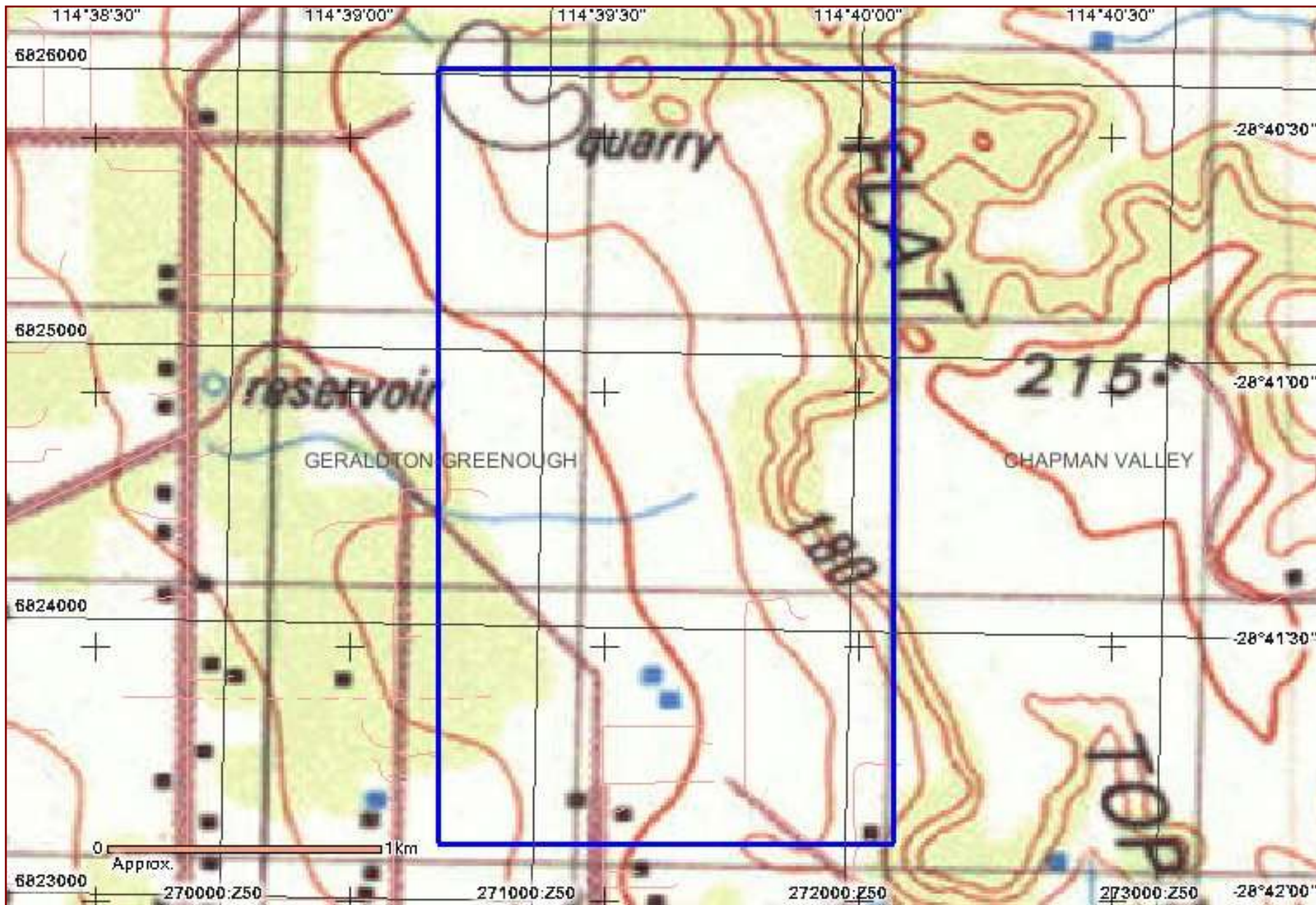
Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



Map Showing Registered Aboriginal Sites and Other Heritage Places



Legend

- Selected Heritage Sites
- Registered Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>

APPENDIX F - UXO Search Results and FESA Confirmation

IN REPLY, PLEASE QUOTE
605-05-01

GHD
76 Forrest Street
GERALDTON WA 6530

FESA Unexploded Ordnance Services
Telephone: (08) 9331 7218
Facsimile: (08) 9331 5928
E-mail: aarnold@fesa.wa.gov.au
ABN: 39 563 851 304

Attention: Ms C Miller

Dear Cathee

UNEXPLODED ORDNANCE RECONNAISSANCE OF LOTS 80 & 81 HACKETTS ROAD, WAGGRAKINE - GERALDTON

Further to the Unexploded Ordnance field reconnaissance carried out by FESA UXO Services on the 14th September 2006, on Lots 80 & 81 Hackett's Road, Geraldton.

As witnessed, a limited field investigation with the support of an electro magnetic Metal detector was carried out by myself over several areas of interest within the area of Lots 80 & 81 Hackett's Road. Those sites that I chose for the limited investigations I considered to be the most likely affected areas if the Department of Defence had in fact, fired explosive munitions onto the property during training exercises in WW11. The sites consisted of elevated features that would have represented good targets for artillery or infantry training exercises, however, after conducting the limited investigative searching, no such evidence (fragmentation from exploded munitions, actual artillery projectiles, mortars or other produce) was located to support this theory. Whilst several items of small arms munitions (a spent 410 shot gun cartridge, .22 calibre cartridge case and a .303 calibre projectile) were found, these were not of military origins, but from normal farm culling/shooting activities. Whilst .303 calibre projectiles would normally be associated with infantry training from the WW11 period, many ex service Lee Enfield .303 Rifles and ammunition stocks were released by the Commonwealth and widely used by farmers and other individuals in the post WW11 period, prior to more stringent licensing and gun controls introduced in the 60s and 70s. Had a quantity of these projectiles been found during the limited search, it would be reasonable to assume that infantry units may have conducted small arms training in the area. This may still be the case however, but as this type of munition is not considered UXO (ball ammunition in small arms manufacture does not contain explosives) no further searching will be required.

After careful consideration, I have now come to the conclusion that this particular region of the Red Peak Artillery Range as identified in the WA UXO Register of former Department of Defence Training Areas – WW11 (Site C-303, N126) poses a minimal risk as far as UXO Contamination is concerned. In this regard, no further searching for UXO is recommended prior to the development of this site. It would appear that the training activities as mentioned in the war Diaries from which the details of the Red Peak area were first identified, are that the risk areas lie more to the east of Lots 80 & 81, in the area stretching between Mount Fairfax, Red Peak and Wokatherra/Yetna on the eastern side of the Moresby Flat Topped Range.

Please be advised that this Office will make recommendations to the Department of Planning and Infrastructure (Geraldton Office) to apply a "UXO Advice Note" only to any referral received for the proposed development of Lots 80 & 81 Hackett's Road, Waggrakine, advising that the risk of UXO contamination is considered to be absolute minimal and that no further searching for UXO is necessary, nor required prior to the proposed development of the site. This "Advice note" will then be reflected in the WAPC Reference: Approval Subject to Conditions, and will be worded similar to the following:

The Fire and Emergency Services Authority of Western Australia (FESA) advises that historical research has revealed that during the past 100 years, former elements of the Australian Defence Forces may have conducted training and/or operational activities within or close to the area of the proposed subdivision. It is possible that as a result of these activities, the subject area may contain unexploded ordnance (UXO). Whilst it is considered that the possible risk from UXO on the land subject to this approval is minimal, an absolute guarantee that the area is free from UXO cannot be given. Should, during subdivisional works, or at any other time, a form or suspected form of UXO be located, FESA has advised that the following process should be initiated:

1. *Do not disturb the site of the known or suspected UXO;*
2. *Without disturbing the immediate vicinity, clearly mark the site of the UXO;*
3. *Notify FESA of the circumstances/situation as quickly as possible; and*
4. *Maintain a presence near the site until advised to the contrary by a member of FESA, the Western Australian Police Service or Defence Forces.*

Further advice on this issue may be obtained by contacting the Unexploded Ordnance Unit, Fire and Emergency Services Authority of Western Australia

Having said that and despite the sample searching conducted, no absolute guarantee can be given by this Office that Lots 80 & 81 are in fact, completely free of UXO. In the unlikely event that you and your Company locate a UXO or suspect UXO during your research site investigations, please follow the above process and let me know ASAP.

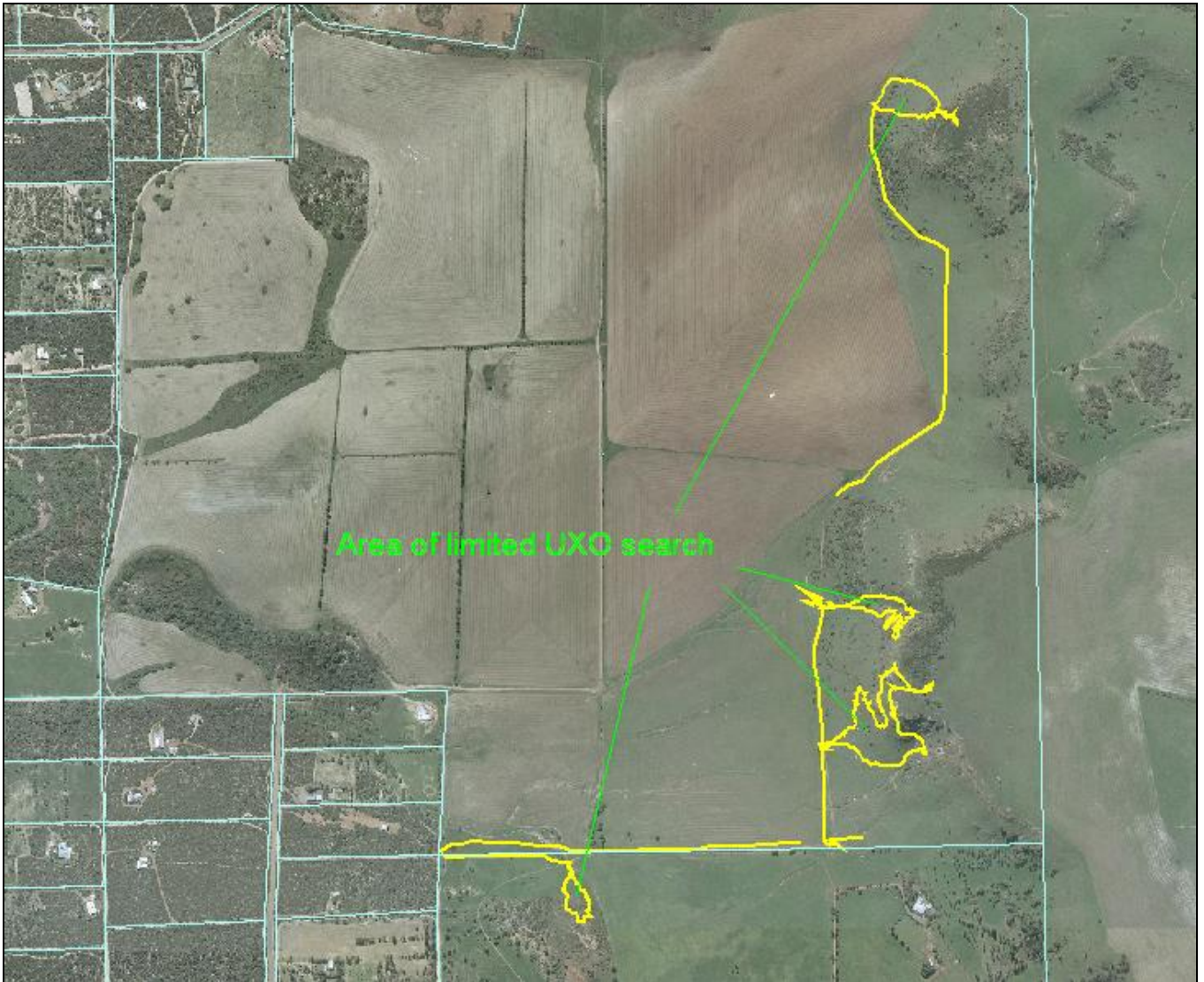
I have included a map on the following page showing the GPS track of most of the vehicle path, and the four search areas investigated for your records.

Again, I thank you for your company whilst on site and look forward to working with you again in the future as I am sure that the occasion will arise where GHD will be involved with other developments within potential UXO sites.

Yours sincerely

Andrew Arnold
FESA UXO LIAISON OFFICER
19 September 2006

**UXO Reconnaissance including limited detector search of several elevated areas
Lots 80 & 81 Hackett's Road, Waggrakine - Geraldton
Conducted by FESA UXO Services on the 14th September 2006**



Items of interest found



View looking south west over Lots 80-81 from top of ridge

Andrew Arnold
FESA UXO Liaison Officer

APPENDIX G - Draft Structure Plan Provisions

Appendix F – Proposed Local Structure Plan Provisions

1 – Public Open Space Management Plan

1-1 The preparation of a Public Open Space (POS) Management Plan is required for the areas reserved for Public Open Space across the proposed development area, including the areas of existing vegetation retained in POS and the section of the Moresby Ranges outside the development area, within Lots 80 and 81 Hackett Road, Waggrakine. Implementation of the Plan shall be required as a condition of subdivision in the event that a subdivision application for urban development of Lots 80 and 81 Hackett Road, Waggrakine is approved by the Western Australian Planning Commission.

1-2: The POS Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission on advice of the City of Geraldton Greenough, the Environmental Protection Authority, and the Department of Environment and Conservation.

1-3: The POS Management Plan shall address:

- (1) minimisation of clearing and vegetation disturbance during construction,
- (2) access control (during construction and post-construction),
- (3) revegetation species and establishment,
- (4) weed control,
- (5) dieback control and management,
- (6) stormwater management,
- (7) ongoing maintenance and management of the vegetated areas,
- (8) protection of wetlands,
- (9) fire management, and
- (10) interface management.

APPENDIX 6

Traffic Report (Riley Consulting, December 2013)

HUMPHREY LAND DEVELOPMENT
MORIESBY HEIGHTS
STRUCTURE PLAN TRAFFIC REPORT

December 2013



PO BOX Z5578

Perth WA 6831

0413 607 779 Mobile

Issued on	16-12-2013	Amendments	Date
Version	V5	V4 Bus route amended	Aug 13
Reference	644	V5 distribution amended (CGG)	Dec 2013

CONTENTS

- 1.0 EXECUTIVE SUMMARY
- 2.0 THE SITE AND SURROUNDING ROAD NETWORK
- 3.0 TRAFFIC GENERATION AND DISTRIBUTION
- 4.0 DEVELOPMENT TRAFFIC IMPACTS
- 5.0 ACCESS
- 6.0 THE INTERNAL ROAD NETWORK
- 7.0 PEDESTRIANS, CYCLISTS AND PUBLIC TRANSPORT
- 8.0 DEVELOPMENT STAGING

1.0 EXECUTIVE SUMMARY

Riley Consulting has been commissioned by Sutcliffe Road Joint Venture to consider the traffic and transport impacts of developing 1,800 residential lots at land known as Moresby Heights. The key findings of the traffic overview are:

- The site can be expected to generate 16,200 vehicle movements per day of which about 11,300 vehicles per day can be expected to access the external road network.
- Traffic increases to the external road network would indicate that North West Coastal Highway south of Chapman Valley Road will require duplication (MRWA).
- The intersection of North West Coastal Highway / Cooper Street is probably sufficient in its current layout (subject to detail planning) but it is recommended that full standard left turn and right turn lanes be provided.
- The intersection of North West Coastal Highway / Tramway Road will require a full standard right turn lane. Priority control is shown to operate with excellent Levels of Service. However, this matter should be reviewed when Oakagee is developed.
- The creation of four-way intersections on Tramway Road may need to be addressed with traffic management. There may be a need to upgrade other external roads as a result of the development proposal, which should be considered at the time of subdivision.
- Local roads providing access through to Chapman Valley Road can accommodate the forecast traffic volumes, but some may require upgrading to provide kerbs and a wider carriageway.

2.0 THE SITE AND SURROUNDING ROAD NETWORK

Moresby Heights is an existing rural site located approximately 10 kilometres north east of Geraldton town centre. The location of the subject site is shown in Figure 1.

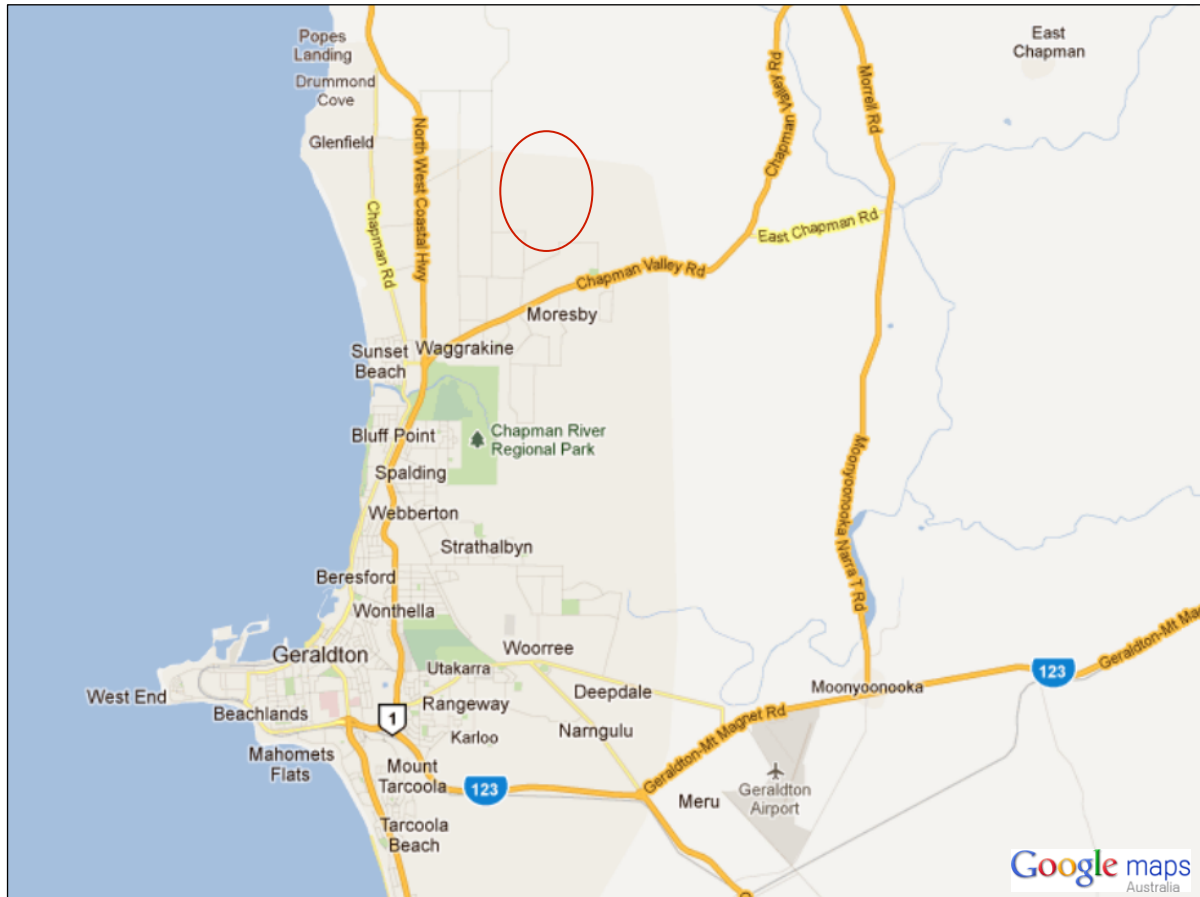


Figure 1 Site Location

Roads expected to be affected by the development of the site are considered below.

2.1 North West Coastal Highway

The North West Coastal Highway is a primary distributor road falling under the control of Main Roads Western Australia (MRWA). It provides significant regional access between Geraldton and mining activity to the north. It will also provide a strategic link to the future Oakagee port to the north of Geraldton.

The highway is constructed as a two-lane single carriageway road for the majority of its length. Through the urban area of Geraldton it has been widened to provide four traffic lanes. MRWA traffic data indicates 11,840 vehicles per day (vpd) north of Hosken Road reducing slightly to 10,800vpd north of Webberton Road. To the north of Chapman Valley

Road the volume decreases significantly to 2,945vpd (south of Drummond Cove Road). The traffic data was recorded in 2010.

2.2 Chapman Valley Road

Chapman Valley Road is a district level road linking the North West Coastal Highway to East Chapman and Nabawa to the east. It is constructed as a single carriageway two-lane road with a pavement of about 7.2 metres between North West Coastal Highway and Sutcliffe Road and typically about 6.1 metres to the east of Sutcliffe Road. The road reservation is 20m.

The posted speed limit is 60kph between North West Coastal Highway and Webber Road (approximately). Further east the posted speed is 90kph. The road is currently operating as a neighbourhood connector based on approved new intersection spacing, however, it should be considered as a district distributor road.

Traffic data on the MRWA website shows a volume of 7,848vpd (2012) to the east of North West Coastal Highway. Further east by David Road, the volume reduces to 6,707vpd.

The intersection of Chapman Valley Road / North West Coastal Highway is controlled by a roundabout with a merge lane for the left turn from Chapman Valley Road.

2.3 Hackett Road

Hackett Road is a local access street and is constructed with a 6.5 metre wide pavement. It has a posted speed of 70kph and is fronted by rural residential type lots. It is rural in nature with no kerbs and has no footpaths. To the north of Stephen Road is a tight bend that restricts forward visibility. The use of this road would require that this issue is rectified.

Traffic data provided by the City indicates 320 vehicles per day.

2.4 Arnold Road / Bore Road

Arnold Road runs north-south and at its southern end continues as Bore Road through to Sutcliffe Road. It has a standard 6.5 metre wide road pavement. It is rural in nature with no kerbs and has no footpaths.

No traffic data is available for Arnold Road or Bore Road, but based on the current level of residential construction, it is estimated to carry less than 150 vehicles per day.

2.5 Sutcliffe Road

Sutcliffe Road is a local access street providing a north-south connection through new residential development north of Chapman Valley Road. Between Chapman Valley Road and Bore Street it is constructed with a 7.2 metre wide pavement. To the north of Bore Road it has a 6.5 metre wide road pavement. It is rural in nature with no kerbs and has no footpaths.

Traffic data provided by the City shows 455 vehicles per day.

2.6 Tramway Road

Tramway Road is constructed with a 7.5 metre wide road pavement and provides a straight link between David Road and North West Coastal Highway. A Government reserves lies between the subject site and Tramway Road. Connection of the site to Tramway Road will result in a new four-way intersection being located on David Road. Subject to future traffic demands, this may require some form of traffic management.

No traffic data is available for Tramway Road, but based on the current level of residential construction, it is estimated to carry less than 200 vehicles per day. It has a posted speed of 80kph.

Its intersection with the North West Coastal Highway operates with yield conditions for traffic on Tramway Road. A left turn deceleration lane is provided on North West Coastal Highway, but no right turn deceleration lane is provided. Good visibility is provided at this intersection.

2.7 Cooper Street

Cooper Street lies to the very north of the subject land and is constructed with a standard 7.2 metre wide road pavement to the west of David Road. To the east of David Road the pavement reduces to 6.2 metres. It is rural in nature and has no footpaths.

At its western end Cooper Street joins Beatie Road where access is achieved to the North West Coastal Highway. At this intersection a left turn deceleration lane has been provided, but no right turn deceleration lane. Given there is a tight bend to the south of this intersection, the lack of a right turn lane would be a road safety issue (MRWA).

No traffic data is available for Cooper Street, but based on the current level of residential construction, it is estimated to carry less than 300 vehicles per day.

Figure 2 shows the site concept plan.



Figure 2 Site Concept Plan

3.0 TRAFFIC GENERATION AND DISTRIBUTION

The development of residential land at Moresby Heights will provide for the growing population forecast for Geraldton.

Reference to trip generation source documents suggest that the trip generation of a typical household can vary from 5 trips to 11 trips per day. Traffic analysis of developments to the south of Geraldton identified a residential trip rate of 9 trips per dwelling per day based on local traffic counts. The trip rate is based on typical R20 density which is attractive to families. Moresby Heights would generate a similar level of traffic from the larger lot sizes provided. However, the development will also include some higher density lots that can be expected to generate less traffic.

Whilst Moresby Heights will provide some higher density dwellings, this traffic report is based on the more typical 9 trips per lot and should, therefore, provide a more robust assessment.

The concept plan indicates a yield of 1,800 residential lots and on the basis of 9 trips per lot can be expected to generate (1,800 x 9) 16,200 vehicle movements per day.

Moresby Heights will provide a primary school and local shopping facilities, which will retain traffic within the developable area. A traffic model has been built to consider the distribution of the traffic generation of the development over the local and district road network.

The model is based on the Education Department's assessment of 0.35 pupils per household and normal trip rates for local commercial facilities.

3.1 Distribution

By the time the site is fully developed, it can be expected that the Oakagee industrial area will be functional. The model has assumed that employment will be available in Oakagee. The model assigns education trips based on 0.55 trips per lot to primary schools and 0.25 trips per lot to secondary schools. Local commercial activity is based upon a rough rule of thumb of 2m² of retail / commercial floor space per lot¹.

¹ This is an approximation to allocate internal trip capture.

Table 1 shows the distribution assumptions by trip purpose used in the model to assign traffic onto the external road network. The distribution is shown by compass direction with south being Geraldton CBD and the highway commercial areas and west is the locality of Sunset Beach etc.

Table 1 Moresby Heights Distribution

Purpose ¹	North	East	South	West
Work Trips @ 29%	10%	5%	70%	15%
Home based Other @ 36%	10%	0%	75%	15%
Home Based Evening @ 21%	10%	0%	75%	15%
Non Home Based 14%	10%	5%	70%	15%

¹ Trip purpose is based on the Perth Metropolitan Travel Survey 1986, factored to exclude education trips.

In aggregate the distribution is equal to 90% of traffic heading south as discussed with the City of Geraldton officers.

Figure 3 shows the forecast daily volumes.

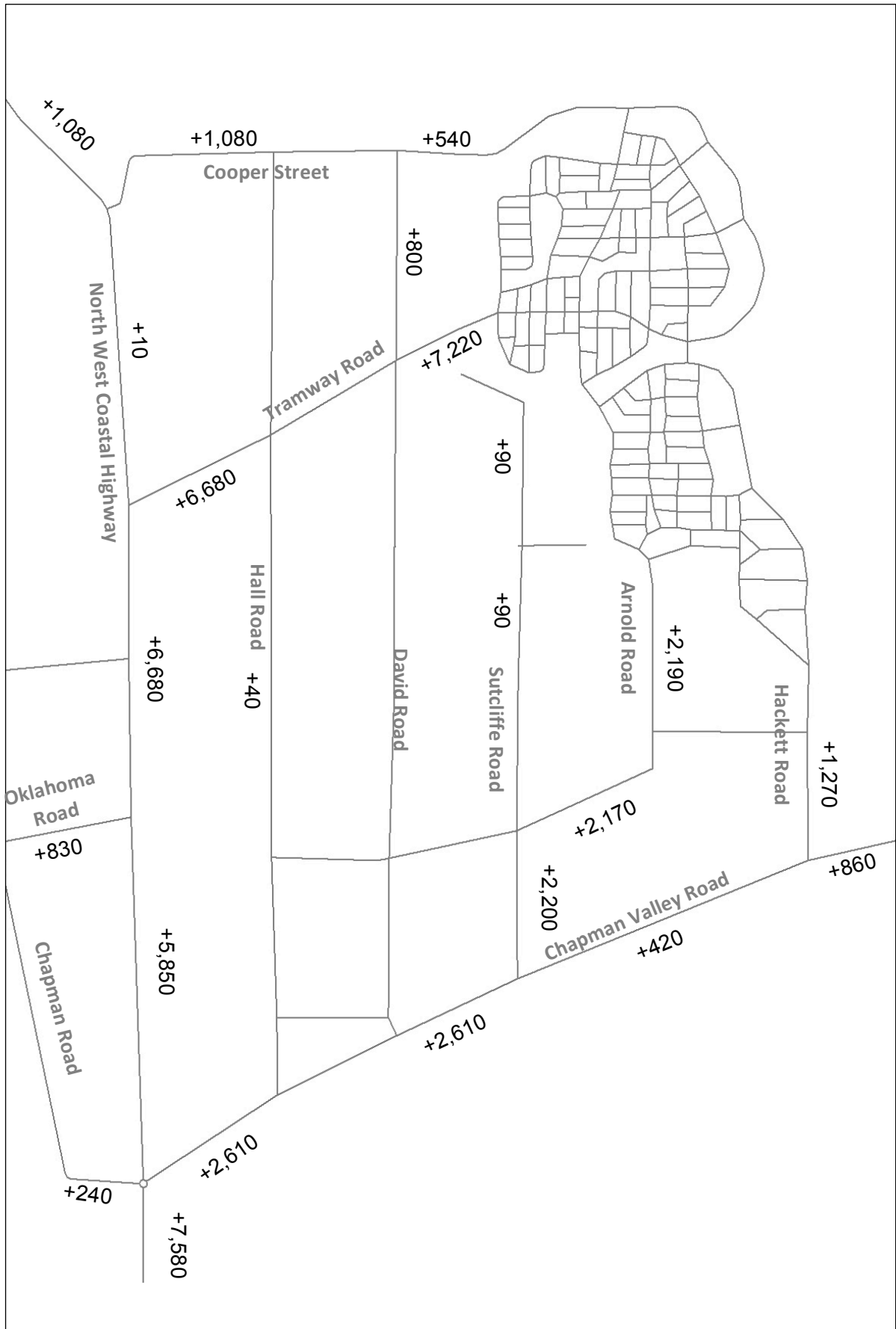


Figure 3 Forecast Traffic Volumes on External Roads

4.0 DEVELOPMENT TRAFFIC IMPACTS

Table 2 shows the potential impacts to the road network in terms of Levels of Service (LoS).

Table 2 Daily Traffic Volumes and Development Increase Impacts to LoS

Road	Daily Flow	LoS	Development	LoS
North West Coastal Highway north	2,740	B	+1,080	C
North West Coastal Highway	2,740	B	+6,680	D
North West Coastal Highway south	11,840	D	+7,580	F
Chapman Valley Road east	750	A	+860	A
Chapman Valley Road west	7,848	D	+2,550	D
Sutcliffe Road	455	A	+2,200	A
Tramway Road	@200	A	+6,680	C
Cooper Street	@300	A	+1,080	A

The LoS is based on Appendix A

Table 2 indicates that acceptable Levels of Service can be maintained on all roads except North West Coastal Highway to the south of Chapman Valley Road. These roads are considered in more detail below:

4.1 North West Coastal Highway

The North West Coastal Highway is the primary road through Geraldton and based on Table 1, would be expected to operate with a Level of Service D at the present time to the south of the subject land. With full development, the Level of Service would decrease to F and from an operational perspective the highway would fail to operate in an acceptable manner. Duplication of the highway to a four-lane divided road would be required (MRWA). With the future development of Oakagee port and the industrial land areas proposed by Landcorp, the need to upgrade North West Coastal Highway will not be solely as a result of proposed residential development. Indeed, the primary driver will be to provide good access between Oakagee Port and the Webberton / Nargulu industrial areas.

North West Coastal Highway will require four lanes south of Chapman Valley Road.

North of Chapman Valley Road the existing single carriageway would continue to operate in an acceptable manner. However, this does not take into account any future increase as a result of the Oakagee port development.

4.2 Chapman Valley Road

Chapman Valley Road west can be seen to maintain Level of Service D with the full development of Moresby Heights. The forecast volume is 10,750 vehicles per day and it can be expected that side road traffic will experience delays entering this flow during peak periods without assistance. Based on the Road Reserves Review document², Chapman Valley Road could be considered to require upgrading to provide a four-lane divided road. However, it is commonly accepted that a single carriageway road can be expected to continue to operate in an acceptable manner with 13,000 vehicles³. Widening to a four-lane road would not therefore, be considered to be warranted. Further, the provision of a four-lane carriageway will have a significant impact upon the North West Coastal Highway intersection layout.

To the east of Hackett Road the future volumes are low and will not require any works to the existing road.

4.3 Sutcliffe Road

Based on current traffic flows, Sutcliffe Road would be expected to continue to operate in an appropriate manner. It would need to be classified as a neighbourhood connector, which is an appropriate designation for a connecting road.

The increase in traffic flows using Sutcliffe Road can be expected to impact Chapman Valley Road and a roundabout to control the intersection could be considered.

4.4 Tramway Road

Tramway Road could have a forecast volume of just under 9,000 vehicles per day and would fall into the category of a district distributor (integrator arterial under LN). From a capacity perspective the volume can be accommodated.

The forecast volume may require turn treatments to be implemented at the North West Coastal Highway. The provision of a right turn lane as a minimum can be expected. Subject

² Ministry for Planning 1982

³ James Street in Guildford passes 26,000vpd as a two-lane boulevard style road.

to modelling, a roundabout or traffic signals may need to be contemplated. However, given the high use of the highway by large trucks, such treatments may be considered inappropriate and alternative links may need to be encouraged.

4.5 Cooper Street

The indicative increase to Cooper Street is manageable and would suggest that a local distributor road classification be adopted (neighbourhood connector under LN). The increase passing through its intersection with North West Coastal Highway is anticipated to be accommodated (subject to detail review). Minor works at this intersection may however, be required.

Some external road upgrading may be required to support the subdivision of the subject land.

5.0 ACCESS

Access to Moresby Heights will be provided initially from Hackett Road and Sutcliffe Road. An extension to Tramway Road is proposed and will become the focal entry point to the estate. Ultimately a northern connection to Cooper Road will also be achieved.

Analysis of the critical intersections is provided to assess the likely operation of these access points and to determine whether upgrading will be required to accommodate the proposed development.

5.1 North West Coastal Highway / Chapman Valley Road

This is an existing roundabout controlled intersection with a merging slip lane for Chapman Valley Road westbound. Figure 4 shows the layout of the existing intersection taken from Google Maps.



Figure 4 North West Coastal Highway / Chapman Valley Road Intersection

Analysis of the future operation of the roundabout at North West Coastal Highway / Chapman Valley Road has been undertaken using SIDRA. Tables 3 and 4 show the summary of the analysis attached as Appendix B for the AM and PM peak periods

respectively. It should be noted that the analysis includes the geometric delay of the intersection. The actual yield line delays are less than indicated.

Table 3 North West Coastal Highway / Chapman Valley Road AM Peak

Approach	V/C	Delay	LoS
Existing			
NWCH south	21%	8s	A
Chapman Valley Road west	20%	4s	A
NWCH north	11%	4s	A
Chapman Valley Road east	9%	10s	A
With Proposed Development			
NWCH south	32%	9s	A
Chapman Valley Road west	29%	4s	A
NWCH north	43%	5s	A
Chapman Valley Road east	10%	10s	A

Where V/C = volume of capacity
 Delay is average delay per vehicle
 LoS = Level of Service

Table 4 North West Coastal Highway / Chapman Valley Road PM Peak

Approach	V/C	Delay	LoS
Existing			
NWCH South	28%	8s	A
Chapman Valley Road west	12%	4s	A
NWCH North	7%	4s	A
Chapman Valley Road east	6%	10s	A
With Proposed Development			
NWCH South	60%	7s	A
Chapman Valley Road west	16%	4s	A
NWCH North	22%	5s	A
Chapman Valley Road east	12%	13s	A

Where V/C = volume of capacity
 Delay is average delay per vehicle
 LoS = Level of Service

Analysis indicates that the existing roundabout at North West Coastal Highway / Chapman Valley Road can be expected to operate at Level of Service A with the full development of Moresby Heights.

Regional traffic growth has not been applied to the North West Coastal Highway as growth is normally reliant upon development in the locality. It can be expected that Moresby Heights will be a contributing factor to regional traffic growth on the Highway. Also at the time of writing this report, the future of Oakagee port was unknown. The development of Oakagee port could have significant impacts upon the operation of the North West Coastal Highway. This report should be used by MRWA in assessing the future impact of Oakagee.

5.2 Tramway Road intersection

Tramway Road has an existing intersection to the North West Coastal Highway as shown in Figure 5.



Figure 5 North West Coastal Highway / Tramway Road

A full left turn deceleration lane is provided, but surprisingly no right turn lane is provided. A right turn lane would be recommended to be provided to this intersection if used as access to Moresby Heights.

Analysis of the intersection has been undertaken using Sidra to assess the impact of the full development of Moresby Heights in the AM and PM peak periods. The analysis is attached as Appendix C and summarised in Table 5 for the AM and PM peak hours.

Table 5 North West Coastal Highway / Tramway Road with Development

Approach	V/C	Delay	LoS
AM Peak Hour			
NWCH south	16%	6s	A
Tramway Road	44%	10s	A
NWCH north	8%	1s	A
PM Peak Hour			
NWCH south	35%	7s	A
Tramway Road	18%	10s	A
NWCH north	5%	2s	A

Where V/C – volume of capacity
 Delay is average delay per vehicle
 LoS – Level of Service

Analysis indicates that the existing intersection of North West Coastal Highway / Tramway Road can be expected to operate at Level of Service A with the full development of Moresby Heights. The analysis includes the provision of a full standard right turn lane which is recommended in the interest of road safety regardless of development traffic flows.

5.3 North West Coastal Highway / Cooper Road

Located to the north of Moresby Heights is Cooper Road. Modelling indicates that this link will be used by traffic to access locations north of Geraldton. It can be expected that traffic passing through this intersection will be associated with the future port and industrial areas at Oakagee. It can be seen from the traffic demands that Cooper Road can be expected to attract less than 2,000 vehicles per day.

The layout of the North West Coastal Highway / Cooper Road intersection is shown in Figure 6.

It has been shown that Tramway Road has an attraction of over 6,000vpd and is expected to operate with Level of Service A during peak periods. With a significantly lower volume of traffic passing through the intersection of North West Coastal Highway / Cooper Road, Level of Service A will occur. Analysis of the intersection is not required.



Figure 6 North West Coastal Highway / Cooper Road

Although analysis is not required, it is recommended that the intersection be provided with full standard deceleration lanes for traffic turning left and right at the intersection.

All intersections with North West Coastal Highway should be provided with full right turn and left turn deceleration lanes.

5.4 Local Road Network

Traffic volume increases to the local road network are to be managed so that existing roads operate in a manner suited to their function. *Liveable Neighbourhood* guidelines have been used to assess the possible impact to these roads.

There are intersections on existing local roads that will be affected by increases to current traffic volumes. Of significance will be the intersections of Tramway Road with David Road north and Hall Road. It is recommended that median islands be provided to David Road and Hall Road to highlight the intersection. The side road volumes would be unlikely to warrant roundabout control.

6.0 THE INTERNAL ROAD NETWORK

The traffic model has been used to determine the anticipated daily traffic flows on local streets. Figures 7 through 10 show the modelled forecast flows.

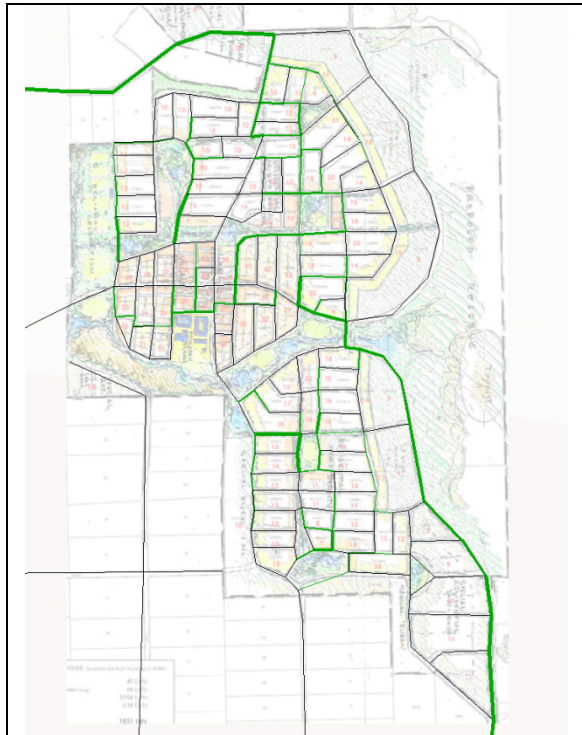


Figure 7 Roads less than 1,000vpd

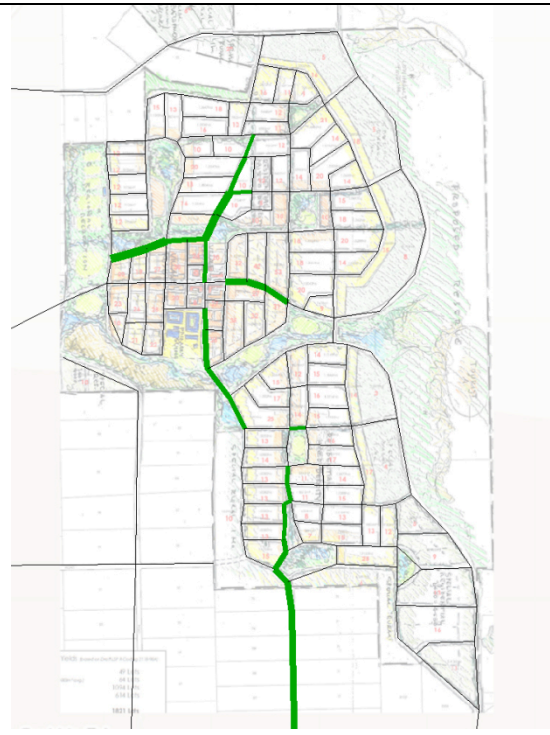


Figure 8 Roads 1,000-3,000vpd

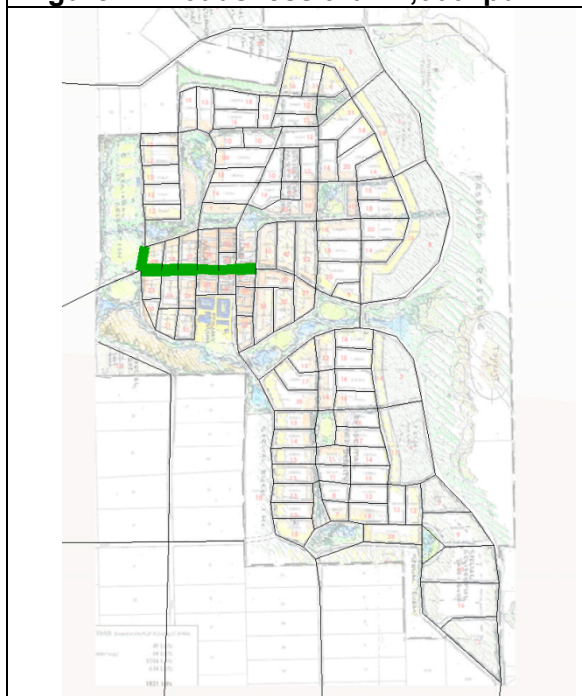


Figure 9 Roads 3,000 – 6,000vpd

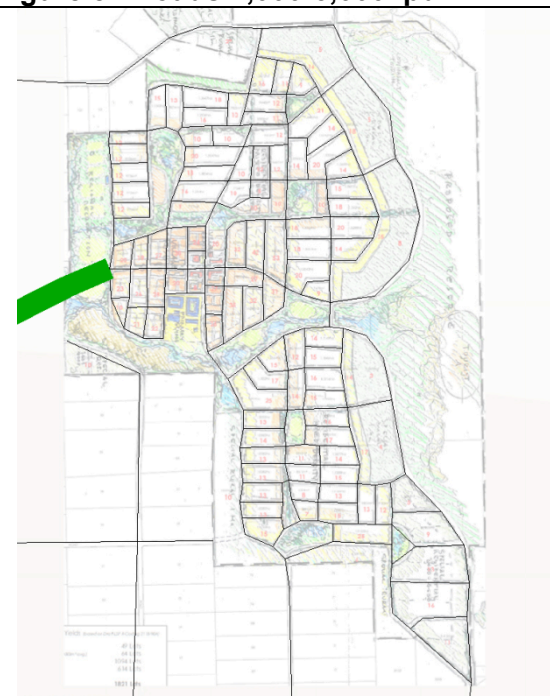


Figure 10 Roads greater than 6,000vpd

The forecast traffic flows provide a basis to develop an internal road hierarchy. Table 6 reproduces the advice on road types recommended by *Liveable Neighbourhoods*.

Table 6 *Liveable Neighbourhoods Road Hierarchy*

Indicative Daily Traffic Flow*	Designation	Street Characteristics
< 1,000 vpd	Access Street	Narrower access streets (5.5 to 6m) may be appropriate in locations further away from centres and activity where traffic flows are less than 1,000 vpd and a low on-street parking demand exists.
1,000 vpd to 3,000 vpd	Higher Order Access Street	Wider access streets (7 to 7.5m) cater for higher traffic volumes and are located closer to neighbourhood centres.
3,000 vpd to 7,000 vpd	Neighbourhood Connectors	Generally 2-lane undivided. These are 'special' streets and their design needs to have regard to context, function and adjacent land uses.
7,000 vpd to 20,000 vpd	District Distributor Type B	Typically will have 1 clear lane of travel in each direction and a parking / manoeuvring lane.
15,000 vpd to 35,000 vpd	District Distributor Type A	Typically have service roads and development frontage with ample on-street parking to support a mixture of land uses. Direct vehicle access from adjoining property should be limited where no service roads are provided.

* Function of streets needs to be considered as well as traffic volume.

The road hierarchy considers those streets that have a connective function and assigns an appropriate classification based on volume and continuity of movement.

Figure 11 shows the suggested road hierarchy for Moresby Heights.

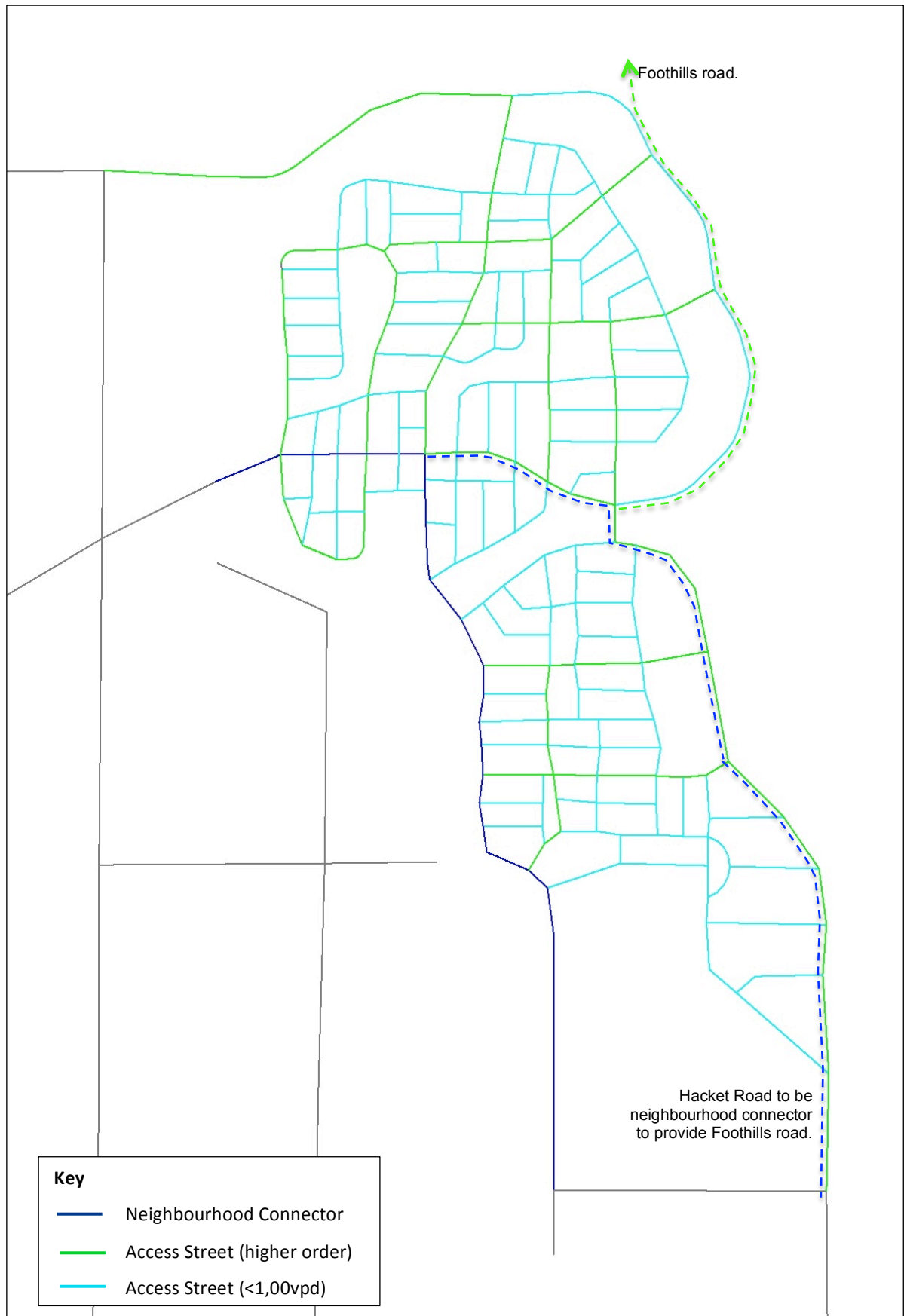


Figure 11 Moresby Heights Road Hierarchy

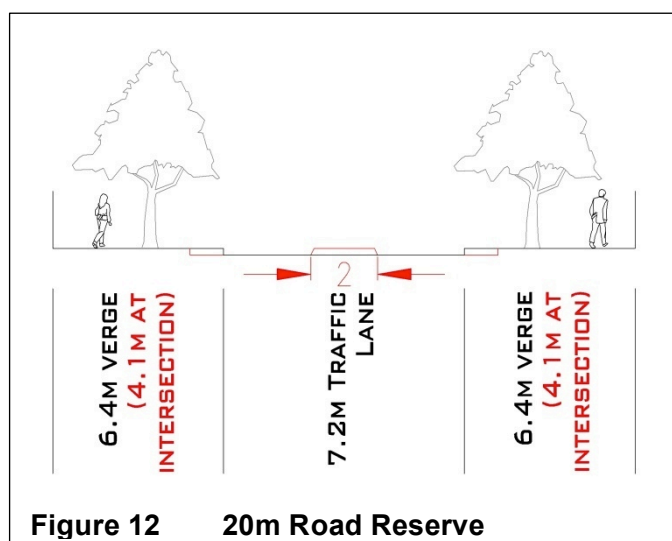
The following section provides guidance on the suggested hierarchy with regard to reserves and cross-sections. The cross-sections indicated are the minimum widths recommended for the various street types. The philosophy of providing constrained streets is to encourage a slower speed environment. However, wider reservation widths may be used to suit the character of the development and increase the opportunity for landscaping and frontage activity.

6.1 Neighbourhood Connectors

Liveable Neighbourhoods provides the following comment on neighbourhood connectors:

Neighbourhood connectors link neighbourhoods and towns, are carefully designed to calm traffic, limit noise and facilitate pedestrian use. They have frequent local street connections. They should not attract substantial long distance through traffic, but provide for safe and convenient local travel to and from arterial routes, usually at signal controlled intersections.

Roads shown blue in Figure 11 are considered as neighbourhood connectors as they provide the primary access to the structure plan area. Daily traffic flows on these roads are well within the 7,000 vehicles per day recommended. These streets can be provided with a standard 7.2 metre carriageway, which is suited to bus movements. A footpath to both sides of the street is required, although one side may be designated as a shared path. Figure 12 shows a suitable cross-section with localised widening at intersections.

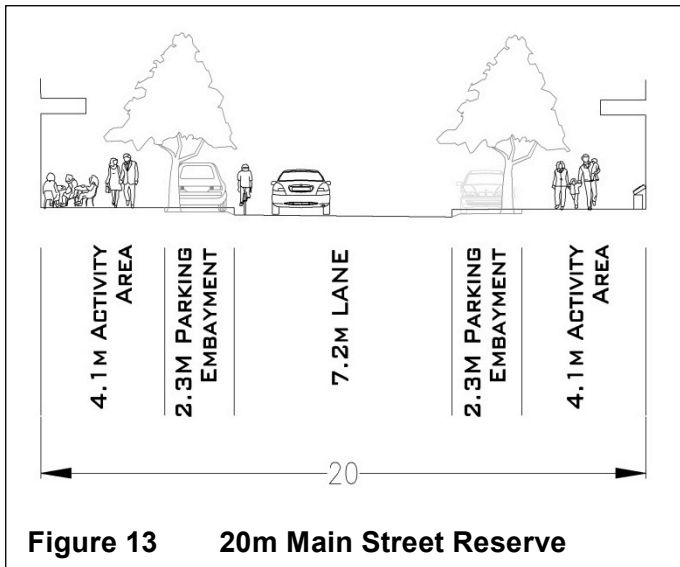


At intersections, median islands of 2.0 metres width would be desirable to provide safer pedestrian crossing points and to highlight the intersection. A residual verge width of 4.1 metres will occur where such medians are provided.

A minimum 20.0 metre cross-section is recommended for neighbourhood connectors

6.2 Main Street

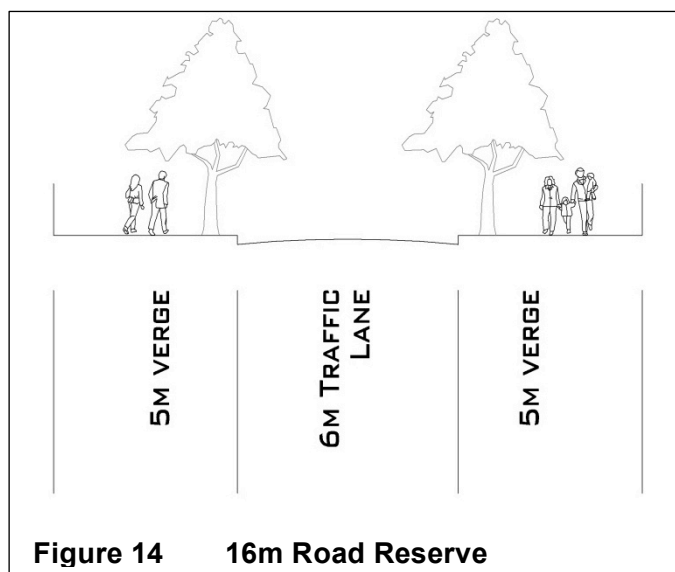
Within the main street area a 20 metre road reservation is still appropriate and can provide



for on-street parking embayments of 2.3 metres and a 7.2 metre wide carriageway. Residual verges of 4.1 metres are sufficient to allow street trees and al-fresco opportunity. Figure 13 shows a suitable cross section.

6.3 Access Streets

Access streets are the main residential streets within the development and provide direct lot access. A typical access street would be provided with a 6.0 metre to 7.0 metre carriageway depending on bus routes and Local Government requirements. It is recommended however, that the minimum carriageway width be provided to encourage a slower speed environment. Unfortunately many streets with 7.0+ metre carriageways and low density lots frequently experience traffic speeds well in excess of the posted 50kph limit. A reduced carriageway width will assist in achieving a more appropriate 40kph typical travel speed.



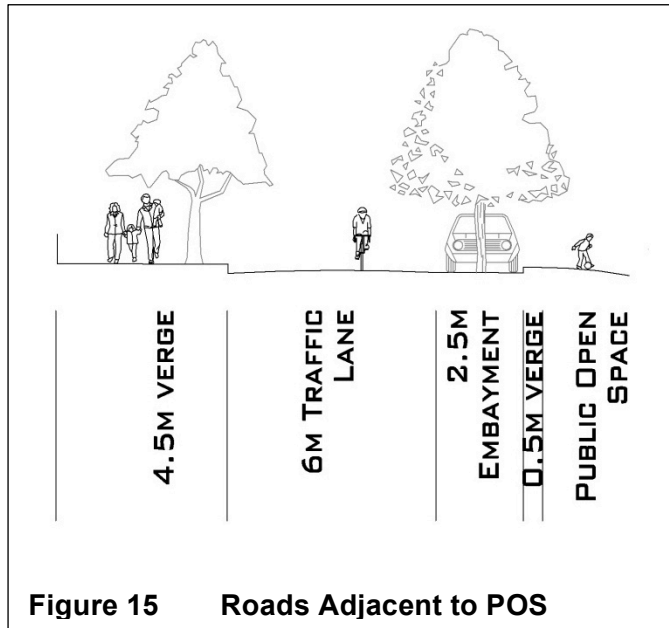
Access streets with daily traffic flows less than 1,000 vehicles are suited to a 6.0 metre carriageway and two residual 5.0 metre verges. There should be no need to provide medians in these low volume streets. Should a wider carriageway be required of 7.0 metres (not recommended) then residual verges of 4.5 metres would be provided and can accommodate standard

residential utilities. Figure 14 shows an appropriate cross-section.

A minimum 16.0 metre cross-section is recommended for access streets.

6.4 Roads Adjacent to Open Space

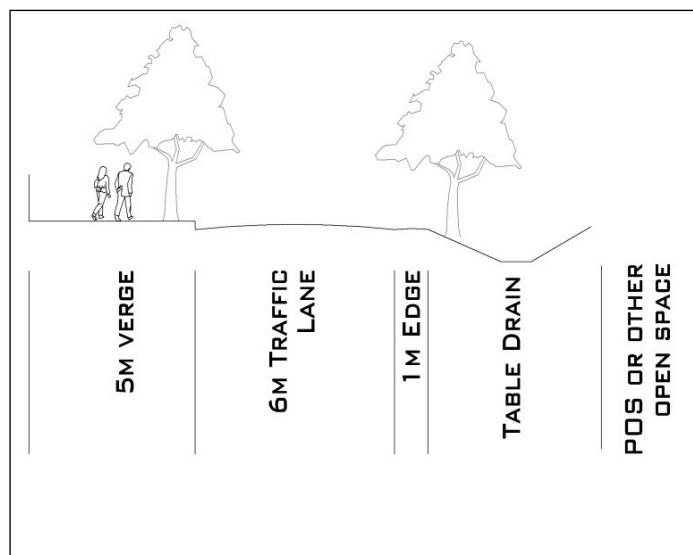
Where the road reservation abuts POS, bushland, golf courses etc, there is limited need to provide a verge. The verge may be reduced where parking and/or services are not required



and should be considered at the time of subdivision. A minimum verge of 0.75 metres is advised by current road planning standards to accommodate street furniture. Footpaths do not need to be adjacent to the road where POS is provided, but must be provided in a safe and appropriate manner. Figure 15 shows an example of a reduced road reservation adjacent to open space.

6.5 Roads with Table Drains

The rural nature of the site lends itself to providing on-street drainage using table drains.



Where such features are used, a wider road reservation would be required to accommodate the drain. Figure 15 shows a cross-section for a local access street with a table drain. The resultant road reservation will depend upon the drain requirements. The table drain does not need to be adjacent to open space as indicated by Figure 15. A table drain can be used adjacent to lots, but attention to driveway cross-overs will be required. Further, a

table drain may also be provided within a median.

6.6 Four-way Intersections

Within the structure plan area daily traffic volumes are shown to be low and the use of four-way intersections is appropriate. Figure 17 shows an extract from *Liveable Neighbourhoods* on the preferred treatment of four-way intersections.

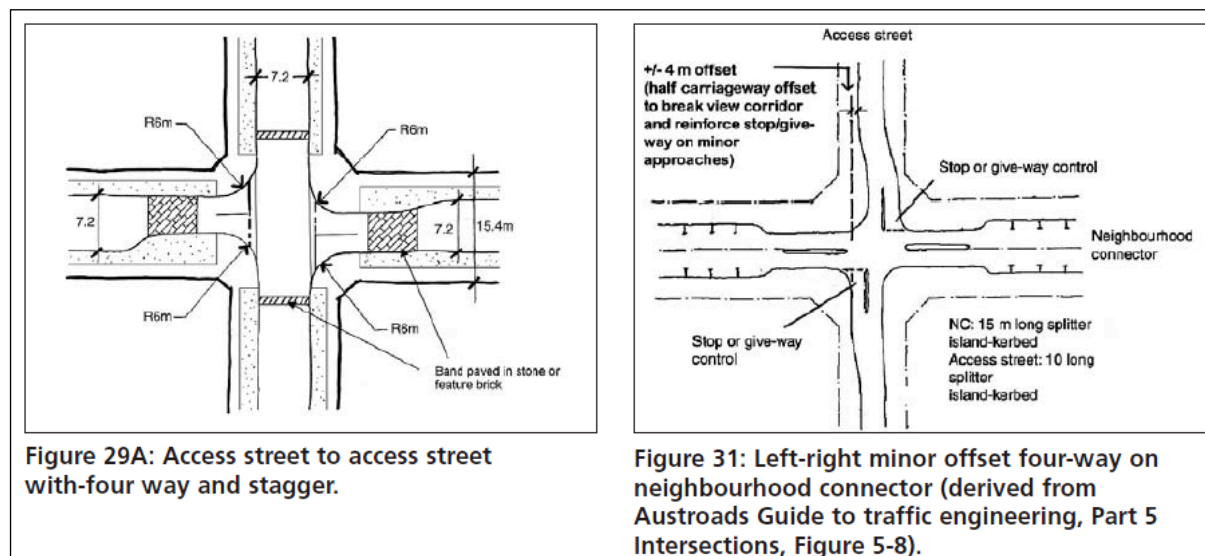


Figure 17 Liveable Neighbourhoods Four-way Intersections

Liveable Neighbourhoods suggests that four-way intersections are an appropriate treatment at the meeting of two access streets and where daily flows through the intersection are less than 2,000vpd. Approach legs should be limited to a maximum length of 160 metres with some form of speed reducing feature where the length is greater than 80 metres.

Access streets meeting neighbourhood connectors and some arterial street are considered acceptable, but will generally require a treatment as indicated in Figure 17. However, introducing four-way priority intersections on arterial streets is not recommended.

6.7 Corner Treatments

To reduce the opportunity for speeding it is recommended that corner radii advised by *Liveable Neighbourhoods* be used within the subdivision. The recommended radii are:

- 6.0 metres - access street / access street intersections
- 9.0 metres - access street / neighbourhood connector

Where larger vehicles are expected, such as buses accessing the school, larger radii may be required and should be considered at subdivision stage.

All streets are of relatively short lengths and high traffic speeds would not be expected. Further, the narrower carriageway widths proposed in low traffic residential streets will assist in reducing the attraction for speeding making a safer environment for local children.

No specific traffic management features are considered to be required within Moresby Heights.

7.0 PEDESTRIANS, CYCLISTS AND PUBLIC TRANSPORT

The structure plan provides for a primary school to the south of the main street and this is within a pleasant walking distance for the majority of households. The main street will provide for local facilities and should be provided with footpaths to both sides of the street.

Current planning guidelines suggest that all streets should be provided with a footpath where ever possible. Where traffic flows exceed 1,000 vehicles per day, a footpath to both sides of the road should be provided. Figure 18 shows those streets where a footpath is required to both sides.

7.1 Cycling

Cycling would be safe on the majority of local streets where traffic flows are less than 1,000 vehicles per day. On the neighbourhood connectors shared paths should be provided to provide a safe alternative to on-road cycling.

Off-street cycle routes are desirable to provide recreational cycling opportunities in the region.

7.2 Public Transport

The rural locality of Moresby Heights is likely to make the provision of public transport unviable. However, planning for a long term bus service should be considered. Figure 19 shows a long term route for buses and a 7.2 metre wide carriageway should be provided to these streets.

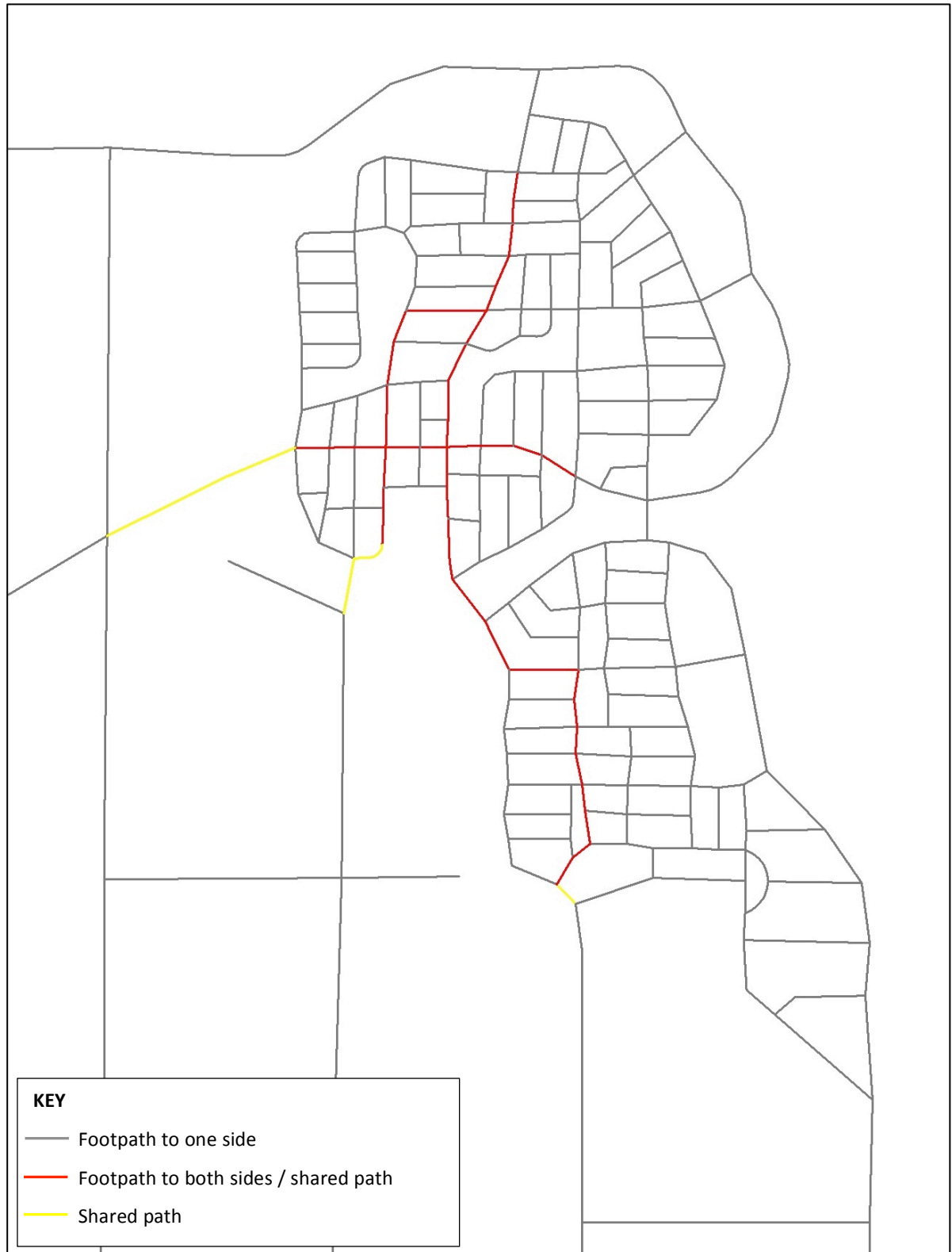


Figure 18 Footpaths and Cycle Paths

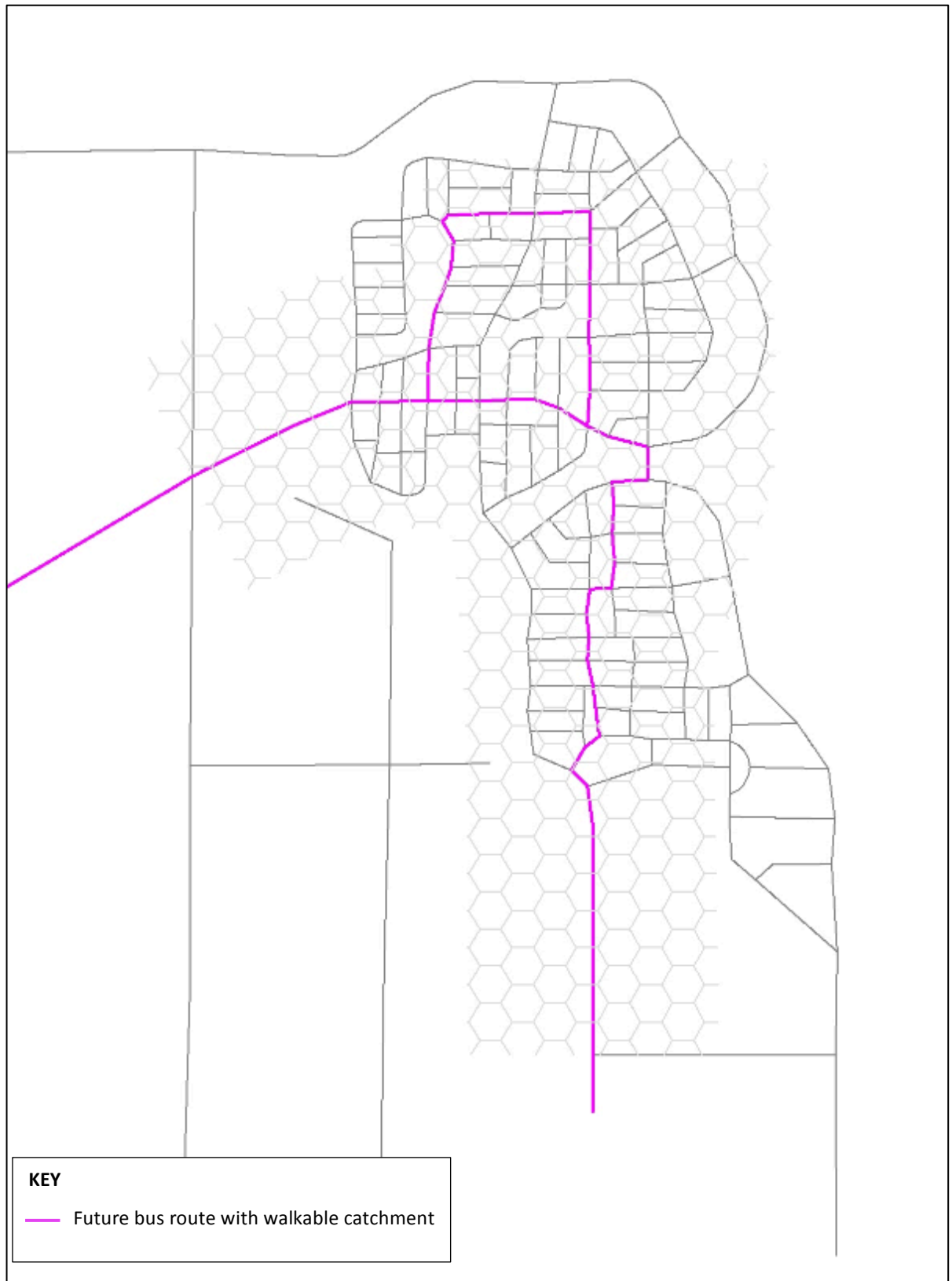


Figure 19 Roads for Future Bus Services

8.0 DEVELOPMENT STAGING

The development of Moresby Heights will occur in stages and access to existing residential streets will be required. As development progresses, the traffic demands on existing streets will increase until such time that the streets start to operate outside of their function.

It is expected that development will commence in the south and continue to the north with initial access being from Hackett Road. As a rural residential street with a carriageway of 6.5 metres, there is ample capacity to cater for quite high traffic volumes. However, from a residential amenity perspective, *Liveable Neighbourhoods* recommends limiting such streets to 3,000 vehicles per day.

Hackett Road currently has a volume of about 320vpd and obviously any increase will be noticeable. Ultimately this road is forecast to carry over 1,000vpd and can be expected to operate with a very good residential amenity.

Based on the residential trip rate of 9 trips per dwelling per day, it can be calculated that a permissible increase is 2,700 vehicles per day, which would equate to the construction of $(2700 / 9)$ 300 dwellings.

Additional access should be provided after the development of 300 lots.

Secondary access to the site can be provided from Arnold Road / Sutcliffe Road, which currently carries about 300vpd. In the long term it is expected that Sutcliffe Road will carry about 2,400vpd and will operate with good residential amenity. Again maintaining the residential amenity with a daily volume below 3,000vpd would allow the development of $(2,700 / 9)$, an additional 300 lots.

Utilisation of Hackett Road and Arnold Road / Sutcliffe Road will permit the development of just over 600 lots.

However, some interim traffic management measures may be required to limit the attraction to Sutcliffe Road as this street may provide a more convenient access to Chapman Valley Road.

A higher level of development may be achieved if local facilities such as a primary school and shops occur in the early stages of development. Such facilities will reduce the level of traffic leaving the subject land. However, such land uses may not be warranted with the development of only 600 lots.

8.1 Development of Tramway Road

Primary access to the site will occur through Tramway Road and planning for its construction will need to be commenced with early stages of development. The construction of Tramway Road can be expected to be required to support development beyond 600 lots.

Tramway Road will be required when development reaches 600 lots.

It can be expected that the existing intersection of Tramway Road / North West Coastal Highway will operate in an appropriate manner. However, with the possible future development of Oakagee port and associated industrial land, it is recommended that conditions on the North West Coastal Highway be reviewed at the time that Tramway Road is developed.

APPENDIX A

Table 1 Levels of Service by Road Type

LOS	Single Carriageway ¹	2-Lane Boulevard ²	Dual Carriageway (4-Lanes) ³	Dual Carriageway (4-lane Clearway) ³
A	2,400vpd	2,600vpd	24,000vpd	27,000vpd
B	4,800vpd	5,300vpd	28,000vpd	31,500vpd
C	7,900vpd	8,700vpd	32,000vpd	36,000vpd
D	13,500vpd	15,000vpd	36,000vpd	40,500vpd
E	22,900vpd	25,200vpd ⁴	40,000vpd	45,000vpd
F	>22,900vpd	>25,200vpd ⁴	>40,000vpd	>45,000vpd

¹ Based on Table 3.9 Austroads - Guide to Traffic Engineering Practice Part 2

² Based on single carriageway +10% (supported by Table 3.1 Austroads - Guide to Traffic Engineering Practice Part 3) – Boulevard or division by medians.

³ Based on RRR Table 3.5 - mid-block service flow rates (SF.) for urban arterial roads with interrupted flow. Using 60/40 peak split.

⁴ Note James Street Guildford passes 28,000vpd.

APPENDIX B

NORTH WEST COASTAL HIGHWAY / CHAPMAN VALLEY ROAD INTERSECTION OPERATION

North West Coastal Highway / Chapman Valley Road AM Peak Hour Existing Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c			Vehicles	Distance			
South: North West Coastal Highway South											
1	L	102	0.0	0.212	3.6	LOS A	1.6	11.0	0.18	0.31	52.9
2	T	48	0.0	0.212	2.8	LOS A	1.6	11.0	0.18	0.23	53.6
3	R	211	0.0	0.212	11.2	LOS A	1.6	11.0	0.18	0.70	47.2
Approach		361	0.0	0.212	7.9	LOS A	1.6	11.0	0.18	0.53	49.3
East: Chapman Valley Road											
4	L	372	0.0	0.200	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	11	0.0	0.036	3.3	LOS A	0.2	1.6	0.35	0.30	51.4
6	R	42	0.0	0.036	11.7	LOS A	0.2	1.6	0.35	0.65	46.4
Approach		424	0.0	0.200	4.0	LOS A	0.2	1.6	0.04	0.34	54.0
North: North West Coastal Highway North											
7	L	15	0.0	0.108	4.5	LOS A	0.7	5.1	0.43	0.43	51.5
8	T	134	0.0	0.108	3.8	LOS A	0.7	5.1	0.43	0.37	51.8
9	R	1	0.0	0.105	12.1	LOS A	0.7	5.1	0.43	0.90	47.8
Approach		149	0.0	0.108	3.9	LOS A	0.7	5.1	0.43	0.38	51.8
West: Chapman Valley Road West											
10	L	1	0.0	0.081	4.4	LOS A	0.6	3.9	0.41	0.41	50.5
11	T	25	0.0	0.083	3.6	LOS A	0.6	3.9	0.41	0.35	50.7
12	R	91	0.0	0.083	12.0	LOS A	0.6	3.9	0.41	0.68	46.3
Approach		117	0.0	0.083	10.1	LOS A	0.6	3.9	0.41	0.61	47.1
All Vehicles		1052	0.0	0.212	6.0	LOS A	1.6	11.0	0.19	0.44	51.1

North West Coastal Highway / Chapman Valley Road AM Peak Hour Future with Moresby Heights no regional growth Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c			Vehicles	Distance			
South: North West Coastal Highway South											
1	L	102	0.0	0.323	3.7	LOS A	2.9	20.4	0.26	0.32	52.0
2	T	48	0.0	0.323	2.9	LOS A	2.9	20.4	0.26	0.26	52.5
3	R	389	0.0	0.323	11.3	LOS A	2.9	20.4	0.26	0.65	46.8
Approach		540	0.0	0.323	9.1	LOS A	2.9	20.4	0.26	0.55	48.0
East: Chapman Valley Road											
4	L	542	0.0	0.292	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	28	0.0	0.066	5.0	LOS A	0.5	3.8	0.67	0.51	48.3
6	R	42	0.0	0.066	13.4	LOS A	0.5	3.8	0.67	0.73	46.2
Approach		613	0.0	0.292	4.0	LOS A	0.5	3.8	0.08	0.34	54.0
North: North West Coastal Highway North											
7	L	15	0.0	0.433	6.1	LOS A	3.9	27.4	0.69	0.57	49.7
8	T	521	0.0	0.437	5.3	LOS A	3.9	27.4	0.69	0.52	49.7
9	R	1	0.0	0.526	13.7	LOS A	3.9	27.4	0.69	0.90	47.2
Approach		537	0.0	0.437	5.3	LOS A	3.9	27.4	0.69	0.52	49.7
West: Chapman Valley Road West											
10	L	1	0.0	0.096	5.2	LOS A	0.7	5.1	0.54	0.50	49.3
11	T	33	0.0	0.099	4.4	LOS A	0.7	5.1	0.54	0.44	49.3
12	R	91	0.0	0.099	12.8	LOS A	0.7	5.1	0.54	0.72	46.0
Approach		124	0.0	0.099	10.5	LOS A	0.7	5.1	0.54	0.64	46.8
All Vehicles		1814	0.0	0.437	6.3	LOS A	3.9	27.4	0.34	0.48	50.2

**North West Coastal Highway / Chapman Valley Road
PM Peak Hour Existing Roundabout**

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles veh	Distance m		per veh	km/h
South: North West Coastal Highway South											
1	L	82	0.0	0.284	3.5	LOS A	2.2	15.5	0.15	0.30	53.2
2	T	101	0.0	0.284	2.8	LOS A	2.2	15.5	0.15	0.22	54.0
3	R	316	0.0	0.284	11.2	LOS A	2.2	15.5	0.15	0.70	47.2
Approach		499	0.0	0.284	8.2	LOS A	2.2	15.5	0.15	0.54	49.2
East: Chapman Valley Road											
4	L	229	0.0	0.124	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	11	0.0	0.023	3.0	LOS A	0.1	1.0	0.26	0.26	52.6
6	R	25	0.0	0.023	11.4	LOS A	0.1	1.0	0.26	0.67	46.9
Approach		265	0.0	0.124	3.9	LOS A	0.1	1.0	0.04	0.34	54.1
North: North West Coastal Highway North											
7	L	8	0.0	0.070	4.7	LOS A	0.5	3.3	0.46	0.45	51.3
8	T	83	0.0	0.069	4.0	LOS A	0.5	3.3	0.46	0.39	51.5
9	R	1	0.0	0.070	12.3	LOS A	0.5	3.3	0.46	0.88	47.7
Approach		93	0.0	0.069	4.1	LOS A	0.5	3.3	0.46	0.40	51.5
West: Chapman Valley Road West											
10	L	1	0.0	0.058	4.9	LOS A	0.4	2.9	0.49	0.46	49.8
11	T	21	0.0	0.059	4.2	LOS A	0.4	2.9	0.49	0.41	49.9
12	R	55	0.0	0.059	12.5	LOS A	0.4	2.9	0.49	0.70	46.2
Approach		77	0.0	0.059	10.1	LOS A	0.4	2.9	0.49	0.62	47.1
All Vehicles		934	0.0	0.284	6.8	LOS A	2.2	15.5	0.18	0.47	50.4

**North West Coastal Highway / Chapman Valley Road
PM Peak Hour
Future with Moresby Heights no regional growth Roundabout**

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles veh	Distance m		per veh	km/h
South: North West Coastal Highway South											
1	L	82	0.0	0.599	3.7	LOS A	7.3	51.1	0.27	0.32	52.2
2	T	488	0.0	0.599	2.9	LOS A	7.3	51.1	0.27	0.26	52.8
3	R	486	0.0	0.599	11.3	LOS A	7.3	51.1	0.27	0.72	47.2
Approach		1057	0.0	0.599	6.8	LOS A	7.3	51.1	0.27	0.48	49.9
East: Chapman Valley Road											
4	L	303	0.0	0.163	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	18	0.0	0.032	3.6	LOS A	0.2	1.6	0.43	0.35	50.8
6	R	25	0.0	0.032	12.0	LOS A	0.2	1.6	0.43	0.70	46.7
Approach		346	0.0	0.163	3.8	LOS A	0.2	1.6	0.05	0.34	54.2
North: North West Coastal Highway North											
7	L	8	0.0	0.222	5.9	LOS A	1.8	12.5	0.64	0.56	50.0
8	T	249	0.0	0.221	5.2	LOS A	1.8	12.5	0.64	0.51	50.0
9	R	1	0.0	0.211	13.6	LOS A	1.8	12.5	0.64	0.90	47.2
Approach		259	0.0	0.221	5.2	LOS A	1.8	12.5	0.64	0.51	50.0
West: Chapman Valley Road West											
10	L	1	0.0	0.117	9.4	LOS A	1.1	7.6	0.85	0.73	47.0
11	T	39	0.0	0.117	8.7	LOS A	1.1	7.6	0.85	0.71	46.5
12	R	55	0.0	0.117	17.0	LOS B	1.1	7.6	0.85	0.80	43.6
Approach		95	0.0	0.117	13.5	LOS B	1.1	7.6	0.85	0.77	44.7
All Vehicles		1757	0.0	0.599	6.4	LOS A	7.3	51.1	0.31	0.47	50.3

APPENDIX C

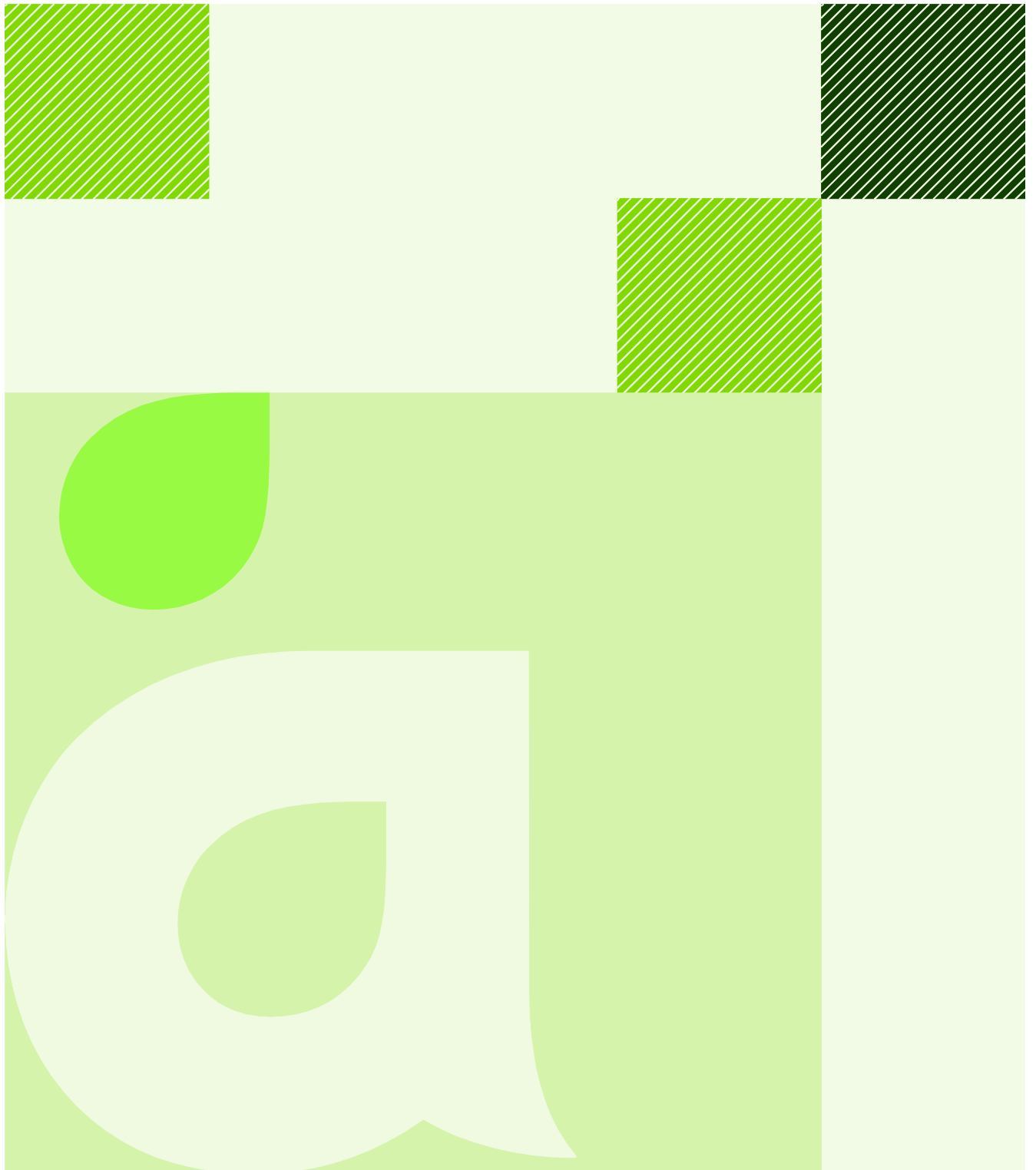
North West Coastal Highway / Tramway Road

North West Coastal Highway / Tramway Road Full Development AM Peak Hour Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
South: NWCH South											
2	T	94	0.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	191	0.0	0.156	9.0	LOS A	0.8	5.9	0.30	0.65	47.6
Approach		284	0.0	0.156	6.0	LOS A	0.8	5.9	0.20	0.43	51.1
East: Tramway Road											
4	L	445	0.0	0.438	9.5	LOS A	3.0	20.7	0.39	0.67	47.3
6	R	37	0.0	0.081	13.6	LOS A	0.4	2.6	0.55	0.80	43.7
Approach		482	0.0	0.438	9.8	LOS A	3.0	20.7	0.40	0.68	47.0
North: NWCH North											
7	L	16	0.0	0.009	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	156	0.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		172	0.0	0.080	0.8	LOS A	0.0	0.0	0.00	0.06	58.8
All Vehicles		938	0.0	0.438	7.0	NA	3.0	20.7	0.27	0.49	50.0

North West Coastal Highway / Tramway Road Full Development PM Peak Hour Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
South: NWCH South											
2	T	133	0.0	0.068	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	445	0.0	0.350	9.0	LOS A	2.3	16.1	0.31	0.64	47.5
Approach		578	0.0	0.350	6.9	LOS A	2.3	16.1	0.24	0.49	49.9
East: Tramway Road											
4	L	191	0.0	0.178	8.8	LOS A	0.9	6.3	0.24	0.64	47.9
6	R	16	0.0	0.053	18.4	LOS B	0.2	1.6	0.68	0.89	39.8
Approach		206	0.0	0.178	9.5	LOS B	0.9	6.3	0.28	0.65	47.2
North: NWCH North											
7	L	37	0.0	0.020	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	95	0.0	0.049	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		132	0.0	0.049	2.3	LOS A	0.0	0.0	0.00	0.19	56.4
All Vehicles		916	0.0	0.350	6.8	NA	2.3	16.1	0.21	0.49	50.1



**Moresby Heights Local Water
Management Strategy**

Addendum 1

Sutcliffe Road Joint Venture

27 January 2015

Revision: 1

Reference: 245485

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd

ABN 54 005 139 873

G1 219 Foreshore Drive

Geraldton WA 6530

Australia

T +61 8 6145 9991

F +61 8 9964 2053

E geraldton@aurecongroup.com

W aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

- Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
- Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control						aurecon	
Report title		Addendum 1					
Document ID		Project number		245485			
File path		P:\245485 Moreseby Heights LWMS\3.0 PROJECT DELIVERY\DESIGN\Report.docx					
Client		Sutcliffe Road Joint Venture		Client contact			
Rev	Date	Revision details/status	Prepared by	Author	Verifier	Approver	
0	27 January 2015	Final	Rhys Grant	Rhys Grant		Mark Cavaney	
Current revision		1					

Approval			
Author signature		Approver signature	
Name		Name	
Title		Title	
Rhys Grant		Mark Cavaney	
Civil Engineer		Senior Civil Engineer	

Moresby Heights Local Water Management Strategy

Date 27 January 2015
Reference 245485
Revision 1

Aurecon Australasia Pty Ltd

ABN 54 005 139 873
G1 219 Foreshore Drive
Geraldton WA 6530
Australia

T +61 8 6145 9991
F +61 8 9964 2053
E geraldton@arecongroup.com
W arecongroup.com



Table of Contents - Addendum

1	Executive Summary	3
2	Introduction	6
3	Local Water Management Strategy Checklist	7
4	Ground Water Monitoring	8
5	Minor Edits	9
6	Roles and Responsibilities	10
7	Bibliography	11

Appendices

Appendix 1

Local Water Management Strategy Checklist

Appendix 2

Proposed Monitoring Ground Water Bore Locations

Appendix 3

Moresby Heights Local Structure Plan, Waggrakine, Western Australian Planning Commission,
07/11/2014

Appendix 4

Notes from Meeting between Aurecon and DoW, 08/05/2014

Appendix 5

Amended Local Water Management Strategy document



Table of Contents – Moresby Heights: LWMS

Table of Contents

	i
1.0 Introduction	1
1.1 Background	1
1.2 Guidelines and Policies	1
1.3 Total Water Cycle Management	1
1.4 Previous Studies	3
1.5 Limitations	3
Proposed Development	4
1.6 Concept Plan	4
1.7 Proposed POS Areas	4
2.0 Design Criteria	5
2.1 Objectives	5
2.2 Topography	5
2.3 Climate	5
2.4 Vegetation and Land Use	7
2.5 Contaminated Land	7
2.6 Geotechnical	7
2.6.1 Geology	7
2.6.2 Soil Infiltration	7
2.6.3 Acid Sulfate Soils	8
2.6.3.1 Desktop Study	8
2.6.3.2 Acid Sulfate Site Investigation	10
2.7 Wetlands	11
2.8 Surface Water and Drainage	11
2.9 Groundwater	11
3.0 Water Use Sustainability Initiatives	14
3.1 Water Supply	14
3.2 Waste Water	14
3.3 Irrigation	14
4.0 Stormwater Management Strategy	15
4.1 Conceptual Stormwater System Design	15
4.2 Preliminary Sizing of Infiltration Basins	16
4.3 Potential for Additional On-site Disposal of Stormwater	17
5.0 Groundwater Management Strategy	18
6.0 Urban Water Management Plans	19
7.0 Roles and Responsibilities	20
8.0 References	21

Appendices

Appendix A – Concept Sketch	
Appendix B – Environmental Assessment Report and Geotechnical Report	
Appendix C – BME Infiltration Test Certificate	
Appendix D – Stormwater Catchments and Event Plan	
Appendix E – PC Sump Results	
Appendix F – Acid Sulfate Investigation	



1 Executive Summary

General

Sutcliffe Road Joint Venture proposes the development of approximately 1,673 lots on Lots 80 and 81 at Hackett Road Waggrakine. The Moresby Heights development site is located 10km north-east of Geraldton Town Centre in Western Australia's Mid-West region. It covers an area of 385 ha and it is bordered by rural residential properties to the south and west, agricultural land towards the north and the Moresby Ranges to the east. The site previously had been used for cattle and sheep grazing, and has therefore been predominately cleared of native vegetation.

For submission to the Western Australian Planning Commission for approval of the structure plan, a Local Water Management Strategy has been proposed to accompany the draft structure plan. This has been developed in order to support rezoning of the site to residential / rural residential developments at the local scheme amendment stage. The original LWMS is part of a larger Preliminary Engineering Services Report completed by AECOM Australia Pty Ltd in December 2012 [WAPC, 2014]. This addendum addresses the requirements of the conditions of the WAPC issued on November 2014.

The Storm Water Local Water Management Strategy ensures the best management practice for stormwater by considering governing guidelines and policies such as the Urban Water Management Plans Guidelines [DoW, 2008] and the Better Urban Water Management guideline [DoW, 2008].


The Local Water Management strategy is based on an infiltration approach for conveyance of the stormwater and utilising onsite disposal. Preliminary geotechnical investigations suggest sufficient infiltration capacities in the soil and hence the use of swales, perforated pits, soakwells and infiltration basins will be sufficient to convey and dispose the stormwater by this method.

The stormwater management system is designed using a minor and major storm mitigation approach. The runoff will be infiltrated as close to the source as practical using water sensitive urban design (WSUD) principles.

In rural residential areas of the development, the minor stormwater systems will consist of rainwater tanks and soakwells within lots, and open swales within road reserves. The site has been planned to accommodate drainage swales within road corridors, but within medium density areas of the development, traditional pit and pipe drainage networks will be required. Where applicable the runoff will drain into roadside swales which will provide initial treatment and promote infiltration at source prior to conveyance to infiltration basins in Public Open Space (POS) areas.

For the major storm event, the POS areas will be utilised to store and infiltrate the stormwater runoff, while maintaining the City of Greater Geraldton (CGG) design requirements of 300mm freeboard to the roads, as well as 500mm freeboard to house floor levels, as per the flood management guidelines for DoW. These levels will be determined during detailed design of the basins. The integrated POS areas are to be unfenced, landscaped shallow sided basins.

Upon further stages of design and subsequent subdivision applications an Urban Water Management Plan (UWMP) will be required to be created and submitted for approval. This will include progressing conceptual drainage designs to detailed design and reviewing the assumptions made within this



LWMS. The DoW publication Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions (DoW, 2008a) should be consulted for guidance on the preparation of UWMPs, which must comply with a number of items and regulatory requirements.

From existing monitoring bore data, the groundwater level has been identified as being at least 3m below the ground surface level within the site. It is proposed to provide two more monitoring bores within the site. These are to be located within POS locations to ensure minimal disruption to them will occur during the construction phase of the development and the measurements obtained can be reliable and accurate.

Roles and responsibilities between the governing authority – City of Greater Geraldton and the developer – Sutcliffe Road Joint Venture have been outlined within the LWMS and this addendum. These relate to UWMP's preparation, construction management, monitoring and maintenance arrangements, defects liability periods, asset operation and management, structural plan and layout changes, potential discovery of high water table and any changes to the waste water treatment strategy.

Two previous studies have been undertaken prior to the completion of this LWMS and the associated structures plan. These are an Environmental Assessment Report (EAA) (2011) and a geotechnical investigation (2012). The Environmental Assessment Report informed the Environmental Protection Authority and the City of Greater Geraldton of the compliance to regulatory objectives and display the environmental characteristics of the site. Similarly to the EAA, the geotechnical investigation determined that the ground type is suitable for subdivision purposes and favourable for land development.

Acid sulfate soil (ASS) locations have been assessed in this report through geological mapping. Two locations within the site have been identified as Low to Moderate and Moderate to high Risk sites. These two locations are allocated as a 'special rural development' and as a POS area.

This LWMS highlights some water use sustainability initiatives for the treatment of wastewater and for on site irrigation. For waste water treatment and disposal into the environment it is suggested that the waste water be treated through an Aerobic/anaerobic Trickling Filter that will create an acceptable water quality level.


For irrigation of POS areas it is suggested that this treated waste water could be utilised as a supply source. Alternatively, the use of the three aquifers in the vicinity of the site could be used for use as a supply source for irrigation.

It is proposed potable water supply is to be sourced from the Geraldton portable water supply scheme.

Addendum

This addendum addresses the requirements of the conditions of submission document [WAPC, 2014]. This includes the following comments to the LWMS report [AECOM 2012];

- Item 29 – Page 1
 - Include a table of contents listing appendices in the volume.
- Item 30 – Appendix 7
 - Include a checklist in accordance with DoW guidelines in the local Water Management Strategy.
- Item 31 – Appendix 7
 - Include an Executive Summary in accordance with DoW guidelines in the Local Water Management Strategy.

- 
- Item 32 – Appendix 7
 - Include a “Test Locality Plan” in Appendix C of the Local Water Management Strategy.
 - Item 33 – Appendix 7, Page 3
 - In the first sentence under section 1.5 replace the word “disposal” with “safe conveyance of”.
 - Item 34 – Appendix 7, Page 5
 - In the fourth dot point, under heading 2.1 Objectives, replace the word “disposal” with “and safe conveyance”.
 - Item 35 – Appendix 7, Page 20
 - Following section 7.0 Roles and Responsibilities add a new section which discusses when, under what circumstances and/or who will be responsible for review and/or updating the LWMS should it be found to be inadequate or insufficient following further investigations conducted in preparation of UWMP’s and detailed landscaping designs for POS.
 - The DoW recommends conducting additional groundwater level monitoring tests at the site covering the time when maximum groundwater level is expected. Given the series of infiltration basins proposed for the site, discuss whether this will cause any unacceptable groundwater level rise at the post development stages.

In addition to these requirements, discussion items have been addressed that were agreed upon in a meeting with the DoW between Mark Cavaney (Aurecon) and the DoW (8/05/2014), as can be read in Appendix 4.



2 Introduction

A Preliminary Engineering Services Report was developed by AECOM for Sutcliffe Road Joint Venture for the Moresby Heights Development project in 2012 [AECOM, 2012] as part of the structure plan submission. This included a Local Water Management Strategy (LWMS) [AECOM, 2012].

The Preliminary Engineering Services Report was submitted to the Western Australian Planning Commission (WAPC) with a schedule of modifications received on the 7th November 2014. [WAPC, 2014]. This included a requirement to update the LWMS document.

Aurecon has been engaged to provide an addendum to the LWMS. The following addendum addresses the conditions in the WAPC schedule of modifications.



3 Local Water Management Strategy Checklist

The DoW document “Interim: Developing a Local Water Management Strategy” provides a checklist summary of the items that are to be addressed in the LWMS document.

The checklist has been completed and provided in Appendix 1 and provides references to the relevant sections of the LWMS and this addendum to show compliance.



4 Ground Water Monitoring

Anecdotal evidence indicates the groundwater level is 12m below the surface and groundwater is not an issue for the area due to elevation, i.e. it is a low risk issue. As a condition of the subdivision it is proposed groundwater monitoring points be installed to a minimum of 5 meter depth (which can be completed with the geotechnical investigation). Groundwater levels are proposed to be taken quarterly for a period of two years to demonstrate groundwater is not an issue during the wet season.

The two locations proposed for the monitoring bores can be found on the diagram in Appendix 2. It can be noted that the locations are on existing road alignments for ease of access.



5 Minor Edits

The following minor edits are noted to the original LWMS [AECOM, 2012] and have been requested in the WAPC Moresby Heights Local Structure Plan, Waggrakine document [WAPC, 2014]. The amended LWMS can be found in Appendix 3.

Section 1.5 Limitations

“This LWMS addresses the treatment and ~~disposal~~ *safe conveyance* of runoff from future road reserves. It has been assumed that CGG policy will address the control of stormwater for residential lots through the building licence process.”

Section 2.1 Objectives

Fourth dot point;

- “Provides a guide for the coordinated ~~disposal~~ *and safe conveyance* of stormwater”

6 Roles and Responsibilities

As part of this addendum a new section following section 7.1 of the LWMS is provided below.

7.1 Circumstances for updating the LWMS

Subsequent to further investigation and implementation of UWMP's the following circumstances are proposed for updating the LWMS.

Table 7 below defines the Roles and Responsibilities associated with the developer and the Local Government Authority (City of Greater Geraldton).

Table 7 Changes that may require updating the LWMS

		Responsibility	
Change		Local Government	Developer
Change to Structural Plan and Layout affecting 1:100 year flow paths and stormwater management strategy		No Responsibility	Sutcliffe Road Joint Venture
High ground water table discovered and not meeting DoW guidelines and requiring groundwater management plan to be developed and implemented		No Responsibility	Sutcliffe Road Joint Venture
Changes to Waste Water treatment disposal (ie offsite compared to onsite)		No Responsibility	Sutcliffe Road Joint Venture
Significant changes to geotechnical conditions, being;	rock, requiring redesign of subdivision and storm water runoff	No Responsibility	Sutcliffe Road Joint Venture
	changes to infiltration rates affecting the proposed stormwater management strategy	No Responsibility	Sutcliffe Road Joint Venture
	Acid Sulfate Soils being discovered onsite requiring development of Acid Sulfate Soil Management Plan	No Responsibility	Sutcliffe Road Joint Venture
Significant changes to water supply i.e. alternative source to Water Corporation		No Responsibility	Sutcliffe Road Joint Venture
Significant changes to Storm Water Management Strategy, ie offsite compared to onsite safe conveyance and discharge or significant change to discharge to the wetlands identified in the LWMS		No Responsibility	Sutcliffe Road Joint Venture



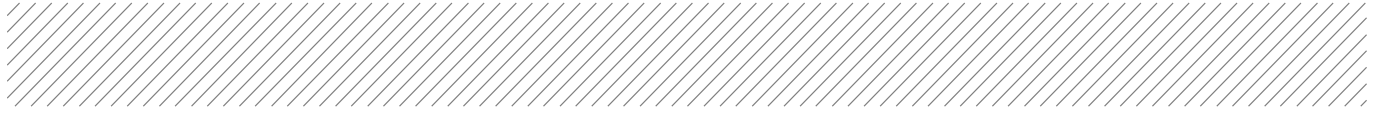
7 Bibliography

- 1.0 AECOM, 2012. Preliminary Engineering Services Report – Moresby Heights Development, Prepared for Sutcliffe Road Joint Venture, 19 December 2012.
- 2.0 AECOM, 2012. Moresby Heights Local Water Management Strategy, Prepared for Sutcliffe Road Joint Venture, 12 December 2012.
- 3.0 WAPC, 2014. Moresby Heights Local Structure Plan, Waggrakine – Western Australian Planning Commission to Sutcliffe Road Joint Venture, dated 07 November 2014.
- 4.0 DoW, 2008. Urban water management plans – Guidelines for preparing plans and for complying with subdivision conditions - Department of Water, Government of Western Australia, August 2008.
- 5.0 DoW, 2008. Better Urban Water Management – Department of Water, Government of Western Australia, October 2008.

Appendices



a

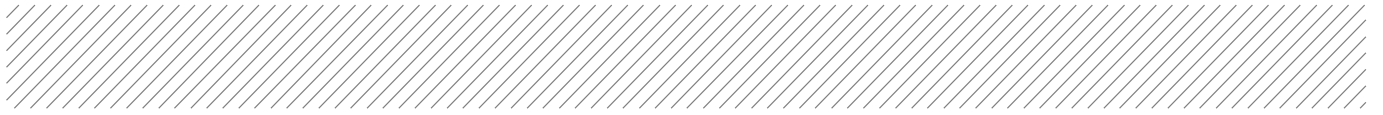


Appendix 1

Local Water Management Strategy Checklist

Local Water Management Strategy item	Deliverable	<input checked="" type="checkbox"/>	Notes
Executive Summary			
Summary of the development design strategy, outlining how the design objectives are proposed to be met	Table 1: Design elements and requirements for best management practices and critical control points	<input checked="" type="checkbox"/>	See Section 2.0 of this Addendum.
Introduction			
Total water-cycle management – principles and objectives Planning background Previous studies		<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Total Water Cycle Management - Section 1.3 of Moresby Heights LWMS [AECOM, 2012]. Previous Studies – Section 1.4 of Moresby Heights LWMS [AECOM, 2012].
Proposed development			
Structure plan, zoning and land use Key landscape features Previous land use	Site context plan Structure plan	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Land Use – Section 1.1 of Moresby Heights LWMS [AECOM, 2012] OR Appendix B – Environmental Assessment Report and Geotechnical Report – Section 1.1 Section 1.6 and 1.7 of Moresby Heights LWMS [AECOM, 2012] “Proposed Development” Structure Plan – Refer to Preliminary Engineering Services Report [AECOM, 2012].
Landscape – proposed public open space areas, public open space credits, water source, bore(s), lake details, irrigation areas (if applicable)	Landscape plan	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Section 1.7 of AECOM report “proposed POS Area” Sections 2.7 – Section 3.3 of Moresby Heights LWMS [AECOM, 2012]. “Wetlands”, “Surface Water and Drainage”, “Groundwater” & “Water Use Sustainability Initiatives” Landscape Plan Section 4.1.1 of Coterra Level 1 Flora and Vegetation Survey – Appendix B, Moresby Heights LWMS [AECOM, 2012].
Design criteria			
Agreed design objectives and source of objectives		<input checked="" type="checkbox"/>	Section 2.0 “Design Criteria” Moresby Heights LWMS [AECOM, 2012].
Pre-development environment			
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		<input checked="" type="checkbox"/>	Groundwater Monitoring Schedule – See Section 4.0 of this addendum for monitoring bore locations.
Site conditions – existing topography/contours, aerial photo underlay, major physical features	Site condition plan	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Section 2.2 of Moresby Heights LWMS [AECOM, 2012] “Topography”. Section 3.2 “Topography, Landforms and Soils”, Environmental Assessment Report, Appendix B, Moresby Heights LWMS [AECOM, 2012].
Geotechnical – topography, soils including acid sulfate soils and infiltration capacity, test pit locations	Geotechnical plan	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Section 2.0 of Moresby Heights LWMS [AECOM, 2012] “Geotechnical Investigations”. Appendix B “Investigation: Proposed Subdivision Development Moresby Heights Waggrakine – Geotechnical Report”, Moresby Heights LWMS [AECOM, 2012].
Environmental – areas of significant flora and fauna, wetlands and buffers, waterways and buffers, contaminated sites	Environmental plan plus supporting data where appropriate	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Appendix B “Investigation: Proposed Subdivision Development Moresby Heights Waggrakine – Geotechnical Report Environmental”, Moresby Heights LWMS [AECOM, 2012].
Surface water – topography, 100 - year floodways and flood fringe areas, water quality of flows entering and leaving (if applicable)	Surface-water plan	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Section 2.8 of Moresby Heights LWMS [AECOM, 2012] “Surface Water and Drainage” section & “Wetlands and Surface Water Flow Figure”. Section 4.0 of Moresby Heights LWMS [AECOM, 2012] “Stormwater Management Strategy”.
Groundwater – topography, predevelopment groundwater levels and water quality, test bore locations	Groundwater plan plus site investigations	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> Groundwater Monitoring Schedule – See Section 4 of this addendum for monitoring bore locations. Section 2.9 of Moresby Heights LWMS [AECOM, 2012] “Groundwater”.

Local Water Management Strategy item	Deliverable	☑	Notes
Water sustainability initiatives			
Water efficiency measures – private and public open spaces including method of enforcement		☑	• Section 3.0 Moresby Heights LWMS [AECOM, 2012] “Water Use Sustainability Initiatives”
Water supply (fit-for-purpose) strategy, agreed actions and implementation		☑	• Section 3.0 of Moresby Heights LWMS [AECOM, 2012] “Water Use Sustainability Initiatives”
Wastewater management		☑	• Section 3.2 of Moresby Heights LWMS [AECOM, 2012] “Waste Water”.
Stormwater management strategy			
Stormwater management strategy Flood protection – peak flow rates, volumes and top water levels at control points, 100-year flowpaths and 100-year detention storage areas	100-year-event plan Long section of critical points	☑ ☑	• Section 3.0 of Moresby Heights LWMS [AECOM, 2012] “Water Use Sustainability Initiatives”. • Appendix B “Stormwater Catchments and Event Plan” of Moresby Heights LWMS [AECOM, 2012].
Manage serviceability – storage and retention required for the critical 5- year ARI storm events Minor roads should be passable in the 5-year ARI event	5-year-event plan	☑	• Section 3.0 of Moresby Heights LWMS [AECOM, 2012] “Water Use Sustainability Initiatives”. • Appendix B “Stormwater Catchments and Event Plan” Moresby Heights LWMS [AECOM, 2012].
Protect ecology – detention areas for the 1-year 1-hour ARI event, areas for water quality treatment and types of agreed structural and non-structural best management practices and treatment trains (including indicative locations). Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1-year-event plan Typical cross sections	☑ ☑	• Section 3.0 of Moresby Heights LWMS [AECOM, 2012] “Water Use Sustainability Initiatives” • Appendix B “Stormwater Catchments and Event Plan” Moresby Heights LWMS [AECOM, 2012]. • Typical cross sections – Not Applicable
Groundwater management strategy			
Post-development groundwater levels, existing and likely final surface levels, outlet controls, and subsoil drain areas/exclusion zones	Groundwater/subsoil plan	☑	• Section 2.9 of Moresby Heights LWMS [AECOM, 2012] “Groundwater” & Figure 7 “DoW Groundwater Bores” • Section 3.0 of Moresby Heights LWMS [AECOM, 2012] “Groundwater management strategy”
Actions to address acid sulfate soils or contamination		☑	• Section 2.6.3 of Moresby Heights LWMS [AECOM, 2012] “Acid Sulfate Soils”
The next stage – subdivision and urban water management plans			
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required before detailed design.		☑	• Section 6.0 of Moresby Heights LWMS [AECOM, 2012] “Urban Water Management Plans”
Monitoring			
Recommended future monitoring plan including timing, frequency, locations and parameters, together with arrangements for ongoing actions		☑	Groundwater Monitoring Schedule – See Section 4 of this Addendum for monitoring bore locations.
Implementation			
Developer commitments		☑	Chapter 6.0 of this Addendum & Chapter 7.0 - Table 6 of Moresby Heights LWMS [AECOM, 2012].
Roles, responsibilities, funding for implementation		☑	Chapter 6.0 of this Addendum & Chapter 7.0 - Table 6 of Moresby Heights LWMS [AECOM, 2012].
Review		☑	Refer section 7.0 and 7.1 in Addendum

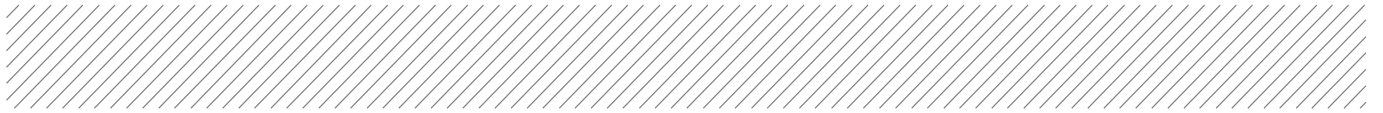


Appendix 2

Proposed Monitoring Ground Water Bore Locations



Extract from AECOM Report [AECOM, 2012] – Ground Water Monitoring Bore Locations shown as marked



Appendix 3

Moresby Heights Local Structure Plan, Waggrakine, Western Australian Planning Commission, 07/11/2014

Your Ref: LP/9/0045
Our Ref: SPN/0636/1
Enquiries: Vickie Wood (Ph 9960 6999)

Chief Executive Officer
City of Greater Geraldton
PO Box 101
GERALDTON WA 6531

Attention: Murray Connell

Dear Sir/Madam

MORESBY HEIGHTS LOCAL STRUCTURE PLAN, WAGGRAKINE

I refer to correspondence regarding the abovementioned matter.

The Western Australian Planning Commission (WAPC) has resolved to endorse the City of Greater Geraldton Moresby Heights Structure Plan (January 2014), subject to the attached Schedule of Modifications.

Following completion of these modifications, please return three copies of the Structure Plan to the WAPC for its final approval.

Should you wish to discuss this matter further, please contact the assigned planning officer listed above.

Yours faithfully



Tim Hillyard
Secretary
Western Australian Planning Commission
07 November 2014

Enclosure: Schedule of Modifications

**City of Greater Geraldton
Moresby Heights Local Structure Plan - Final Approval
Schedule of Modifications**

Item	Page	Modification	Reason
1	Throughout document	Consistently refer to the "commercial centre" as "neighbourhood centre" and correct syntax if required.	Consistent use of terminology and clarification of the intended size of the centre.
2	Executive Summary	In the second column of the table, in the Estimated Retail Floor Space row, change the figure 6,500m ² to 6,000m ² .	Correction.
Part 1 - Statutory Section			
3	5	In section 2.0 Structure Plan Content, review the text as follows: <i>"Part 1 includes the Structure Plan Map and provisions. which require statutory effect.</i> <i>Part 2 (and its appendices) justifies and explains the provisions contained in Part 1 and should be used as a reference guide to interpret and implement Part 1. It does not hold statutory effect.</i>	References to statutory effect are unnecessary, do not add value to the document and are questionable in terms of accuracy.
4	7	In the second sentence in section 5.3 delete the words, "in any event"	Clarifies requirement.
5	7	In the third sentence in section 5.3 change reference to "Detailed Area Plan" to "Local Development Plan"	Consistency with terminology used in Model Conditions
6	7	Correct the spelling of "Siting" in the second dot point under section 5.3.	Correction.
7	7	Revise the first sentence in the paragraph before the last five dot points as follows: <i>"'Conservation Lots' nominated on the Structure Plan Map shall also be subject to a conservation- restricted covenant."</i>	Avoids potential for confusion with 'conservation covenants' that usually apply to much larger landholdings and are administered by a State Government agency.
8	8	Revise the sentence under heading 5.6 Reports/Strategies Required Prior to Subdivision to read as follows: <i>"Any subdivision or development proposal to progress the establishment of the eastern most Tourist site shall include information that demonstrates suitable access arrangements. Any such proposal will also be accompanied by a Visual Landscape</i>	The current wording pre-empts subdivision will be required to create the eastern most tourist site. This may not be required for example if a lease arrangement (<20years) is proposed. How access to the tourist site is to be achieved requires additional information and further consideration.

City of Greater Geraldton
Moresby Heights Local Structure Plan - Final Approval
Schedule of Modifications

Item	Page	Modification	Reason
		<i>Assessment and Management Plan, demonstrating to the satisfaction of the relevant authority, visual integration and appropriate siting of all aspects of the subdivision and/or development."</i>	
9	8	<p>Insert the following at the end of section 5.6 Reports/Strategies Required Prior to Subdivision:</p> <p><i>"Prior to any subdivision, an updated Traffic Report shall be prepared which addresses the following:</i></p> <ul style="list-style-type: none"> • <i>Through traffic counts on Tramway, Hall, David, Sutcliffe, Hackett and Chapman Valley Roads;</i> • <i>Turning movement counts on the following intersections: North West Coastal Highway – Tramway Rd, Sutcliffe Rd – Chapman Valley Rd and Hackett Rd – Chapman Valley Rd;</i> • <i>Intersection assessment and recommendations for the following intersections: Tramway Road – Hall Road, Tramway Road – David Road and Arnold Road – Sutcliffe Road;</i> • <i>Sidra analysis (or similar) and recommendations for the following intersections: North West Coastal Highway – Tramway Road, Sutcliffe Road-Chapman Valley Road, Hackett Road – Chapman Valley Road; and</i> • <i>Local area traffic management device proposals to address long straight road alignments and four-way intersections within the development area.</i> <p><i>Prior to any subdivision application being lodged in excess of 4 years from the operation date of the structure plan (as defined in</i></p> 	<p>The City's engineers, on further assessment of the Structure Plan have indicated that additional requirements would need to be addressed prior to subdivision in the medium to long term.</p>

**City of Greater Geraldton
Moresby Heights Local Structure Plan - Final Approval
Schedule of Modifications**

Item	Page	Modification	Reason
		<i>section 4.0), an updated Traffic Report shall be prepared. Thereafter, any further subdivision application shall be accompanied by a Traffic Report not greater than 4 years old."</i>	
10	9	At point b) under heading 5.7 Conditions of Subdivision Approval, revise the wording as follows: <i>"b) Bushfire Management Plan in general accordance with relevant State Planning Policy and associated Guidelines. (City of Greater Geraldton / Department of Fire and Emergency Services)"</i>	Allows for changes in policy and approach to bushfire management.
11	9	In the first sentence under section 6.1 Design Guidelines replace the word "shall" with "may".	Avoids pre-empting conditions to be recommended following detailed assessment of subdivision proposals.
12	9	Change title at 6.2 from "Detailed Area Plans (DAP's) to "Local Development Plans"	Consistency with terminology in model conditions.
13	9	In the first sentence under heading 6.2 change the reference to "Detailed Area Plans" to "Local Development Plans"	Consistency with terminology in model conditions.
14	Map 1	Change the reference to "local centre" in the legend to "neighbourhood centre."	Consistent use of terminology and clarification of the intended size of the centre.
15	Map 1	Remove the Road (possible access road) from the map and legend and notate the southern tourist site as follows: <i>Access route to tourist site - subject to further investigation.</i>	How access to the tourist site is to be achieved requires additional information and further consideration.
Part 2 - Explanatory Report			
Item	Page	Modification	Reason
16	2	In the second sentence of the paragraph under heading 3.1 change the reference to "Amendment 6" to "Amendment 5".	Accuracy.
17	3	Delete the sentence at the end of the paragraph immediately before section 3.3 which reads: <i>"The proposal is consequently consistent with the Region Plan."</i>	Improved flow / legibility.

**City of Greater Geraldton
Moresby Heights Local Structure Plan - Final Approval
Schedule of Modifications**

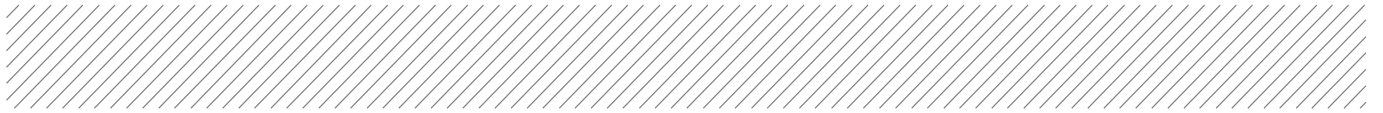
Item	Page	Modification	Reason
18	7	Delete the last sentence of the first paragraph under heading 4.1 Landform, Topography and Soils.	The Moresby Range Management Strategy identifies that preferred access to the top of the range is from the east. There is insufficient information currently available to support an access way / road on the western face of the range.
19	6	Delete the first sentence under section 3.4 Other Approval and Decisions and revise the following sentence as follows, <i>"Advice provided by the EPA in relation to the rezoning <u>the land to 'Development'</u> (provided in Appendix 4) indicated that:"</i>	Legibility.
20	9	At section 4.4 Heritage of Part 2 of the Structure Plan delete the last sentence and replace with <i>"The State Heritage Office has indicated that P12059 – Geraldton-Northampton Railway Precinct is on the Heritage Council's Assessment Program and adjoins the Plan area on its western boundary. As a direct consequence of this Assessment Program P12059 may, at a future date, become a State Registered Place."</i>	The Structure Plan does not currently recognise the heritage value of the Geraldton-Northampton Railway spur line that ran along the alignment of Tramway Road.
21	10	At section 5.1 Transport and Access of Part 2 of the Structure Plan, revise the first paragraph to include the additional sentence underlined below: <i>"... A further link is proposed through extension of Tramway Road, subject to the agreement of Council. <u>Consideration will need to be given to any impacts the extension of Tramway Road may have on the heritage significance of the Geraldton - Northampton Railway Precinct adjoining the Structure Plan area on its western boundary.</u> Some upgrading of local roads intersections is likely to be required..."</i>	The Structure Plan does not currently recognise the heritage value of the Geraldton-Northampton Railway spur line that ran along the alignment of Tramway Road.

**City of Greater Geraldton
Moresby Heights Local Structure Plan - Final Approval
Schedule of Modifications**

Item	Page	Modification	Reason
22	11	Revise the first sentence of the second paragraph under heading 5.4 Regional and District Open Space and Community Infrastructure, as follows, <i>"The City of Greater Geraldton Greenough staff have has identified a need..."</i>	Accuracy.
23	13	In the first sentence under heading 6.2 Commercial Centres, change the reference to 6,500m ² to 6,000m ² .	Correction.
24	17	In the third paragraph, change the figure 54,963 people to 4963 people.	Correction.
25	Figure 7	Remove the Road (possible access road) designation from the map and legend of Figure 7 - Acid Sulphate Soil Overlay.	How access to the tourist site is to be achieved requires additional information and further consideration.
26	Figure 10	Identify the Geraldton-Northampton Railway Precinct and the spurline running up Tramway Road on Figure 10 Context and Constraints	The State Heritage Office has indicated that P12059 – Geraldton-Northampton Railway Precinct is on the Heritage Council's Assessment Program and adjoins the Plan area on its western boundary. As a direct consequence of this Assessment Program P12059 may, at a future date, become a State Registered Place.
27	Figure 15	Remove the Road (possible access road) designation from the map and legend of Figure 15 - Public Open Space Plan.	How access to the tourist site is to be achieved requires additional information and further consideration.
28	Figure 16	Remove the extension of Waggrakine Road into the Structure Plan area.	Consistency with proposed internal road layout of structure plan.
Appendices			
Item	Page	Modification	Reason
29	1	Include a table of contents listing appendices in the volume.	Improved useability
30	Appendix 7	Include a checklist in accordance with DoW guidelines in the Local Water Management Strategy.	Improved legibility


**City of Greater Geraldton
Moresby Heights Local Structure Plan - Final Approval
Schedule of Modifications**

Item	Page	Modification	Reason
31	Appendix 7	Include an Executive Summary in accordance with DoW guidelines in the Local Water Management Strategy.	Improved legibility
32	Appendix 7	Include a clear "Test Locality Plan" in Appendix C of the Local Water Management Strategy.	Improved legibility
33	Appendix 7, p.3.	In the first sentence under section 1.5 replace the word " <i>disposal</i> " with " <i>safe conveyance of</i> "	The use of the word "disposal" in relation to water is at odds with contemporary ways of thinking about water in urban environments and total water cycle management as espoused by Better Urban Water Management.
34	Appendix 7, p.5.	In the fourth dot point under heading 2.1 Objectives replace the word " <i>disposal</i> " with " <i>and safe conveyance</i> "	The use of the word "disposal" in relation to water is at odds with contemporary ways of thinking about water in urban environments and total water cycle management as espoused by Better Urban Water Management.
35	Appendix 7, p.20	Following section 7.0 Roles and Responsibilities add a new section which discusses when, under what circumstances and/or who will be responsible for review and/or updating the LWMS should it be found to be inadequate or insufficient following further investigations conducted in preparation of UWMP's and detailed landscaping designs for POS.	This would improve consistency with DoW guidelines and is considered important because if, through additional information provided by LWMP's, the LWMS may be discovered to be deficient in some way. Review and updating of the LWMS will ensure new information is available and any deficiencies addressed for future stages of subdivision and will be particularly important should land change ownership or staff in relevant agencies with exposure to the development move on.



Appendix 4

Notes from Meeting between Aurecon and DoW, 08/05/2014



From: Mark Cavaney
Sent: Thursday, 8 May 2014 7:23 AM
To: phillida@cleplan.com.au
Cc: Joe Reilly
Subject: Moresby Heights meeting with DOW

Phillida,

Further to our meeting with DOW, below are my notes on the meeting with DOW. Please review as you may be more up on the correspondence and past history.

Suggest placing a summary of the proposed conditions and commitments in your correspondence.

Regards,

Mark

Comments on DOW notes are as follows:

- The LWMS should be prepared consistent with the DoW's guideline *Interim: Developing a local water management strategy 2008*. Please use the check list provided on this document and present all information that is required at the LWMS stage.

On discussion of this point it was noted that not all components had been provided to the DOW (ie Appendices, which included the PC Sump calculations, landscaping plans and 100 year flow paths were not included). See below on more specific comments and recommended actions.

- No Executive Summary is provided, in either the Structure Plan (SP) report or the LWMS. Key points and findings, and further work to be done prior to UWMP, need to be included as a summary.

On discussion this was not identified as a key issue to hold up the Structure Plan.

- A LWMS document should address all elements of the total water cycle that are relevant to the development area and associated catchment. It should provide a "proof of concept" (method or ideas to demonstrate its feasibility with conceptual designs) for how water related issues will be addressed. While the document has included the design criteria, overall information is broad, this is generally submitted at the District Water Management Strategy (DWMS) stage.

We agree the objective at this stage is to provide proof of concept and feasibility to enable the structure plan to proceed. The does not have significant regional issues (ie in a major floodplain, have a major river running through it, or high water tables (See discussion below on water table below)). The approach taken has been very conservative eg all stormwater to a 100 year event be contained on site in infiltration basins. Design criteria will comply with Council standards and have been agreed in discussion with the Council. Specific items raised are discussed below.

- Proposed Development – A site location plan is included in the LWMS however the bulk of information listed under the LWMS checklist section for this component, is included in the SP report. Conceptual landscape 'plans' are included in the SP report (Figures 11, 15, 16, 17 & 18), and stated in the report that detailed Landscape and POS plans will be developed pending endorsement of the Structure Plan. In accordance with Better Urban Water Management (WAPC 2008) these plans should supplement and inform the LWMS and should not be deferred.

A key area of discussion was the ability of the allocated areas for drainage do not compromise the allocated POS spaces. The design approach of 100% containment on the site is conservative, and there is the opportunity to optimise later. Further, if this is a concern it is possible to place storage, or infiltration basins, underground in "milk crate" or equivalent storage systems, which would not compromise the POS or landscaping place (ie there is engineering or technical solution to deal with this in detail design). It is further noted that a significant portion of the subdivision is POS, significantly higher than a typical subdivision.

The Recommended action proceeding forward is a condition be placed that prior to subdivision being submitted, further engineering calculations be completed and landscaping layout plans be submitted to council for approval to demonstrate the 1:100 year stormwater levels, ground levels, and allocated space for stormwater does not materially impact on the POS recreational areas.

- Pre-development Environment – Limited information in LWMS, however it is noted that more detailed information is provided in Section 4 of the SP Report.

As noted at the meeting several of the Appendices had not been provided. See discussion below.

- Geotechnical – Plan showing test pit locations is unclear, it is requested this be revised. Section 2.3 of App 7 to the SP Report, Preliminary Engineering Services Report should include a discussion of potential infiltration problems with the Moresby soil type i.e. 1-8 m of silty sand over mottled clay (duplex soil type). Stormwater infiltration may be inhibited, and limited. Infiltration testing has not been adequately conducted. Appropriate hydrological and hydraulic investigation/modelling should be provided at the LWMS stage to support the development. It has been noted that only six infiltration tests up to 300mm below ground surface had been carried out. Please be advised that this level of investigation is not sufficient to conduct required hydrologic and hydraulic investigation/modelling of the site and to conduct conceptual design of stormwater management systems (page 7, 2.6.2, 1st para).

We consider the Geotechnical is adequate for confirming concept for this stage of obtaining Structure plan approval. It has already been recognised that geotechnical conditions are a risk by council for the development and it is proposed that a condition be placed on the Structure plan that further geotechnical investigation be completed to the approval of council, prior to submission of subdivision.

Acid Sulphate Soils (ASS) – While there is seemingly contradictory information throughout the submitted documents on if or when the investigation has been done, Section 2.6.3.2 of App 7 states that an ASS investigation was conducted by BCE in 2012, and it is stated that ASS levels are below DEC threshold levels. Appendix F to LWMS (p357 of App 7 Prelim Eng Serv Report) provides a brief discussion and raw data however the identified areas of potential ASS according to DEC mapping have not been adequately investigated i.e. test pits 3 and 12 are adjacent to wetland areas, where disturbance for 'integrated drainage' locations are proposed to be located i.e. POS basins for stormwater management (Figure 7 in SP report). ASS testing was not conducted for these sites (i.e. only sites 2, 17, 19 and 22 were tested, and none of these are in potential ASS risk areas). Sites 3 and 12 adjacent to wetland areas should be tested for ASS. In addition borelogs for these sites have not been provided for review and are requested.

The areas of ASS risk identified in the site are very minor and in POS. We consider this would not be a basis for holding up the structure plan. If this area is to be disturbed, further assessment would be undertaken as per standard process and if required placed as a condition on the structure plan.

- Information provided on the LWMS is not sufficient to satisfy the DoW that "management of superficial groundwater would not require monitoring" as indicated by the LWMS. The DoW recommends conducting additional groundwater level monitoring tests at the site covering the time when maximum groundwater level is expected. Given the series of infiltration basins proposed for the site, discuss whether this will cause any unacceptable groundwater level rise at the post development stages. If management of superficial groundwater is required, it should be managed consistent with the DoW's publication "*Water resource considerations when controlling groundwater levels in urban development, DoW, April 2013*" which is available from the department's website (page 11, 2.9 & page 18, 5.0). It is

advised that monitoring activities are to be conducted consistent with the DoW's "Water monitoring guidelines for better urban water management strategies and plans 2012" which is available on our website.

Anecdotal evidence is indicating the groundwater level is 12 m below the surface and groundwater is not an issue for the area due to its elevation, ie it is a low risk issue. It is proposed that as a condition of the subdivision that Groundwater monitoring points be installed to a minimum of 5 m depth (which can be completed with the geotechnical investigation and groundwater levels taken quarterly for a period of two years to demonstrate groundwater is not an issue during the wet season.

- Water sustainability initiatives

- Public Open Spaces - Stated in Section 3.3 that landscape plans and irrigation strategies will be developed in the next planning phase. This is not in accordance with BUWM. However, preliminary consultation with DoW WRL has occurred, with sufficient groundwater identified as available for irrigation purposes. In Section 1.7, stated that planned POS areas will be multi-function, designed to DoW guidelines. It is stated that water efficiency measures will be in accordance with BCA requirements, and water conservation requirements of Water Corporation, however no details have been provided.

The landscape areas will be planted with low maintenance and water use plants to comply with council requirements. As a worst case scenario irrigation can be provided from potable water, which is typically irrigated at night and not a load on the infrastructure. We consider this not to be a critical issue that comprises the feasibility of the Structure plan and will be addressed as design progresses.

- If treated waste water is proposed for irrigation, quality of water should be fit for purpose and acceptable to the receiving water (e.g. groundwater/downstream water bodies) noting the fact that the site is proclaimed under the RIWI Act (page 14, 3.3, last paragraph). In addition, any proposal for the use of treated effluent for irrigation needs to address the DoW's *Guideline for the approval of non-drinking water systems in Western Australia* (Dec 2013).

Refer study completed by GHD.

- Stormwater management strategy

- Please be advised that the locations and area required for stormwater management infrastructures and approximate sizes of these infrastructures are to be determined at LWMS stage. Detailed design of these systems occurs at the UWMP stage (page 17, 4.2, last para). A stormwater catchment plan is provided in the SP report (Figure 19) however there are no plans for the 100 yr or 5 yr events. Flowpaths have not been indicated. These plans need to be provided before the LWMS can be endorsed. Feasibility of storing stormwater on site is to be determined at the LWMS stage. The UWMP stage covers the detailed design of the systems (page 17, 4.3, last sentence). The document assumes that post-development hydrological condition will be at post-development stage by using soakwells and/or rainwater tanks within the residential lots using council's policy and building codes. Proof of concept/conceptual design with examples is to be included in the LWMS (page 3, 1.5, 2nd paragraph)

The 100 year flow paths are shown in Appendix D. The 5 year flow paths will be the same. The calculation for the storage basin from PC sump are provided in Appendix E. A significantly conservative approach of retaining stormwater up to the 100 year event has been proposed. We consider this to be very conservative, but adequate to demonstrate proof of concept for allocation of areas for drainage. Discussions have occurred with council on allocation of stormwater that can be retained on site, depending on size of lot.

As noted above we propose a condition be placed on the Structure plan that prior to submission of the subdivision, further engineering calculations be completed and landscaping layout plans be

submitted to council for approval to demonstrate the 1:100 year stormwater levels, ground levels, and allocated space for stormwater does not materially impact on the POS recreational areas

- Generally, the DoW does not prefer a particular modelling or approach over another. However, please discuss the suitability of the use of the Rational Method for these catchments. A recent ARR review workshop in the Hydrology and Water Resources Symposium 2014 - Perth discussed the potential discontinuity of this method or limiting the method to lot scale stormwater modelling (page 16, 4.2, second para). In addition, it is recommended to use the terminology "Onsite stormwater management" rather than "On site disposal of stormwater" (page 17, 4.3). It is suggested to use the terminology "safe conveyance of runoff" rather than "disposal of runoff" (page3, 1.5, first para).

It is noted that the Rational method is a conservative approach and adequate for demonstrating proof of concept. As the subdivision development is progressed further modelling can be completed to optimise the design, however, this will only provide a positive benefit in identifying opportunities to downsizing the needs for storage. We do not see this as a basis for holding up the Structure plan.

- Groundwater management strategy – Although it is stated that no groundwater was encountered in test pits, the vegetation associated with the wetland areas, and other vegetation in nearby areas with recognised conservation value, may be groundwater-dependent. It is required this be investigated prior to development to ensure that any groundwater abstraction for irrigation purposes does not impact upon the remaining good vegetation. Installation of monitoring bores adjacent to wetland areas should occur prior to UWMP stage, in line with DoW guidelines.

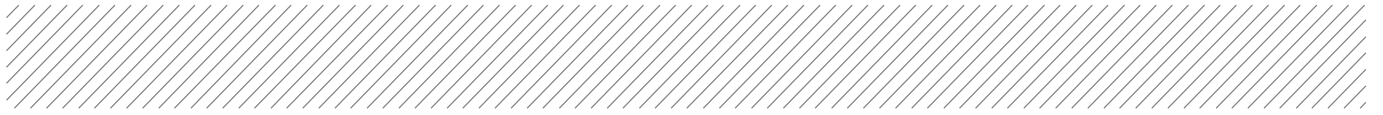
As noted above anecdotal evidence is indicating the groundwater level is 12 m below the surface and groundwater is not an issue for the area due to its elevation, ie it is a low risk issue. It is further noted that the "wetlands" are considered to be degraded. However, it is proposed that as a condition of the subdivision that Groundwater monitoring points be installed to a minimum of 5 m depth (which can be completed with the geotechnical investigation and groundwater levels taken quarterly for a period of two years to demonstrate groundwater is not an issue during the wet season).

- Implementation – The roles and responsibilities of the LGA and developer have been briefly outlined, however there is no discussion of Review of the LWMS and no funding schedule for monitoring (for evaluation of LWMS) and maintenance. These should be included. Please refer to Better Urban Water Management, and DoW's document *Interim : Developing a local water management strategy (2008)*.

The only monitoring that is identified is groundwater monitoring for a period of two years to confirm raised or perched water levels do not occur in winter. It is proposed this will be completed by the developer and can be included in the Condition for Groundwater Monitoring.

Mark Cavaney | Water | Aurecon
Ph: +61 8 6145 9352 | Fax: +61 8 9223 1606 | Mob: +61 0427 349304
Email: mark.cavaney@riotinto.com
mark.cavaney@aurecongroup.com
Level 6, 108 St Georges Tce | WA 6000 | Australia
<http://www.aurecongroup.com>
<http://www.aurecongroup.com/en/Markets/Water.aspx>
<http://www.aurecongroup.com/apac/groupentity/>

Please consider the environment before printing this e-mail.



Appendix 5

Amended Local Water Management Strategy document

Appendix D

Local Water Management Strategy

Moresby Heights

Local Water Management Strategy



Moresby Heights

Local Water Management Strategy

Prepared for

Sutcliffe Road Joint Venture

Prepared by

AECOM Australia Pty Ltd

Unit 8/273 Foreshore Drive, Geraldton WA 6530, PO Box 263, Geraldton WA 6531, Australia

T +61 8 9920 4800 F +61 8 9921 7265 www.aecom.com

ABN 20 093 846 925

12 December 2012

60225287-RPCI-0001_D

AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document Moresby Heights

Ref 60225287-RPCI-0001_D

Date 12 December 2012

Prepared by Karan Bhalla, Natalie Horsfield & Martin Boshoff

Reviewed by Ross Perrigo

Revision History


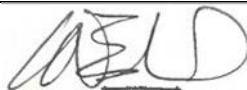
Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	26-Mar-2012	Issued to Client	Chris Lee Office Manager - Geraldton	<i>See Rully</i> pp.
B	17-Jul-2012	Issued to Client	Chris Edwards Office Manager - Geraldton	<i>See Rully</i> pp.
C	09-Nov-2012	Issued to Client	Chris Edwards Office Manager - Geraldton	
D	12-Dec-2012	Issued to Client	Chris Edwards Office Manager - Geraldton	

Table of Contents

1.0	Introduction	1
1.1	Background	1
1.2	Guidelines and Policies	1
1.3	Total Water Cycle Management	1
1.4	Previous Studies	3
1.5	Limitations	3
	Proposed Development	4
1.6	Concept Plan	4
1.7	Proposed POS Areas	4
2.0	Design Criteria	5
2.1	Objectives	5
2.2	Topography	5
2.3	Climate	5
2.4	Vegetation and Land Use	7
2.5	Contaminated Land	7
2.6	Geotechnical	7
2.6.1	Geology	7
2.6.2	Soil Infiltration	7
2.6.3	Acid Sulfate Soils	8
2.7	Wetlands	11
2.8	Surface Water and Drainage	11
2.9	Groundwater	11
3.0	Water Use Sustainability Initiatives	14
3.1	Water Supply	14
3.2	Waste Water	14
3.3	Irrigation	14
4.0	Stormwater Management Strategy	15
4.1	Conceptual Stormwater System Design	15
4.2	Preliminary Sizing of Infiltration Basins	16
4.3	Potential for Additional On-site Disposal of Stormwater	17
5.0	Groundwater Management Strategy	18
6.0	Urban Water Management Plans	19
7.0	Roles and Responsibilities	20
8.0	References	21
	Appendix A	A
	Concept Sketch	A
	Appendix B	B
	Environmental Assessment Report and Geotechnical Report	B
	Appendix C	C
	BME Infiltration Test Certificate	C
	Appendix D	D
	Stormwater Catchments and Event Plan	D
	Appendix E	
	PC Sump Results	A
	Appendix F	
	Acid Sulfate Investigation	D

1.0 Introduction

1.1 Background

AECOM was commissioned by Sutcliffe Road Joint Venture to develop a Local Water Management Strategy (LWMS) in support of the Local Structure Plan for Lots 80 & 81 Hackett Road, Waggrakine (the site), shown on **Figure 1**.

The site is located within the regional boundaries of the City of Greater Geraldton (CGG) and is approximately 10 km north-east of the Geraldton town centre. It covers an area of 385 ha and it is bordered by rural residential properties to the south and west, agricultural land towards the north and the Moresby Ranges to the east. The site previously had been used for cattle and sheep grazing, and has therefore been predominately cleared of native vegetation. The roads that lead to the site are Cooper Street, Sutcliffe Road, Arnold Road and Hackett Road.

The proposed Concept Plan prepared by project planning consultants Chappell Lambert Everett (**Appendix A**) includes a town centre, primary school and approximately 1,673 lots. These consist of rural residential, special residential, low density residential and medium residential lots totalling an overall development yield of between 1,500 and 2,000 lots; staged development is proposed due to the size of the site. The site is currently zoned as 'Development' under CGG Town Planning Scheme No. 5 and so is to be subject to an approved structure plan.

In accordance with the state government planning framework as outlined in *Better Urban Water Management* (BUWM) (WAPC, 2008), a LWMS is required to accompany the draft structure plan. An Urban Water Management Plans (UWMP) will be required to accompany the subsequent subdivision applications.

1.2 Guidelines and Policies

This LWMS has been prepared with consideration for the following guidelines and policy documents:

- State Planning Policy 2.9 Water Resources (WAPC, 2006)
- City of Greater Geraldton Land Development Specifications (CGG, 2011)
- Stormwater Management Manual for Western Australia (DoW, 2004-2007)
- Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions (DoW, 2008a)
- Better Urban Water Management (DoW, 2008b)
- *Liveable Neighbourhoods: a Western Australian Government sustainable cities initiative* (WAPC, 2007)

1.3 Total Water Cycle Management

This LWMS defines how development of the site will adhere to the Integrated Water Cycle Management (IWCM) described in BUWM. The IWCM 'recognises that water supply, stormwater and sewage services are interrelated components of catchment systems and therefore must be dealt with using a holistic water management approach that reflects the principles of ecological sustainability' (DoW, 2008b). State Planning Policy 2.9 Water Resources (WAPC, 2006) defines the principles of IWCM as:

- Consideration of all water resources, including wastewater, in water planning
- Integration of water and land use planning
- The sustainable and equitable use of all water sources, having consideration of the needs of all water users, including the community, industry and the environment
- Integration of human water use and natural water processes
- A whole of catchment integration of natural resource use and management

Figure 1 Location plan



FIGURE 1 - SITE LOCATION PLAN

1.4 Previous Studies

Coterra Environment (2011), under the direction of the Client, produced an Environmental Assessment Report (EAR) for the site (**Appendix B**). The purpose of the report was to facilitate the site's rezoning from Rural to Development in order to inform the Environmental Protection Authority (EPA) and the CGG of the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives.

Blacktop Consulting Engineers (BCE) completed a geotechnical investigation of the proposed subdivision in October 2012. The aim of the report was to determine that the ground type is suitable for subdivision purposes, and the material was identified as favourable for land development.

1.5 Limitations

safe conveyance

This LWMS addresses the treatment and ~~disposal~~^{safe conveyance} of runoff from future road reserves. It has been assumed that CGG policy will address the control of stormwater for residential lots through the building licensing process. It is also assumed that post-development conditions will meet predevelopment conditions through the use of soakwells and/or rain water tanks within the residential lots using council policy and building codes. Recommendations on areas to be allocated for use as stormwater attenuation are based on estimates derived from simplified calculations. Further investigations to confirm assumptions are required prior to the development of UWMPs.

The recommendations made in this LWMS have been developed using the best available data at the time of writing. Groundwater information was taken from regional data available from DoW and publicly available reports.

Proposed Development

1.6 Concept Plan

The site structure plan has been based on an early concept development plan (**Appendix A**) and provides for the urban development of the site. It caters for provision of approximately 1,600 residential lots, 100 larger Rural Residential (1 ha +) or Special Residential (2,000-4,000 m²) lots, serviced by extensive areas (over 100 ha) of public open space, a local primary school and small village centre. Precise lot yields will be determined at subdivision. Two potential tourism sites are also proposed on the eastern side of the lot.

1.7 Proposed POS Areas

The Concept Plan (**Appendix A**) shows approximately 120 ha of public open space, incorporating around 14 ha of district recreation area, nearly 100 ha of Moresby Range reserve along the east of the site, and a further 15 or so hectares of local open space within and running through the development area. Many of the local POS areas have been located at the downstream of catchments to cater for an integrated water management function as well as recreational, social and environmental purposes. These can cater for flood storage during events with an Annual Exceedance Probability (AEP) greater than 20% and would be designed in accordance with DOW guidelines and WAPC policy.

2.0 Design Criteria

2.1 Objectives

Stormwater controls adopted for the site involve integrating land and water planning, implementing Water Sensitive Urban Design (WSUD) and planning to manage the total water cycle. An appropriate level of consideration needs to be given to TWCM at each stage of the planning process.

The overall objective of this report, in accordance with the scope of work, is to prepare an LWMS that:

- Considers the principles, objectives and requirements for TWCM as outlined in *State Planning Policy 2.9 Water Resources, Liveable Neighbourhoods* (WAPC, 2007), and the *Stormwater Management Manual for WA* (DoW, 2004-2007)
- Characterises the pre-development hydrology
- Identifies appropriate methods to integrate future stormwater attenuation areas into the design of POS *and safe conveyance*
- Provides a guide for the coordinated ~~disposal~~[^] of stormwater
- Protects infrastructure and assets from inundation and flooding
- Pre-development Environment

The environmental conditions of the pre-development site provide an important context for planning future water management strategies. This section describes the pre-development details.

2.2 Topography

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009). The topography across the site, as shown on the Concept Plan (**Appendix A**), rises from approximately 75 mAHD (Australian Height Datum) in the west to 210 mAHD at the highest point of the ranges on the eastern boundary. The steepest section of the site is located within 100 to 200 m of the eastern boundary, where the scarp of the Moresby Ranges descends to the foothills (Coterra Environment, 2011).

2.3 Climate

The climate of the area is Dry Warm Mediterranean, characterised by warm to hot, dry summers and mild, wet winters. Annual and monthly rainfall data from the Bureau of Meteorology station at Geraldton Airport (Site No. 008051) are presented in **Figure 2** and **Figure 3** respectively.

The long term mean annual rainfall is 444 mm (1941-2011). This average has decreased since 1988, to an average annual rainfall of 411 mm, reflecting a 7% reduction compared to the long term mean (**Figure 2**). The total rainfall distribution has also changed since 1988, with a reduction in monthly average rainfall, particularly during the winter months (**Figure 3**).

Mean maximum daily temperatures range from 19.5°C in July to 32.5°C in February. The mean annual evaporation is approximately 2,400 mm.

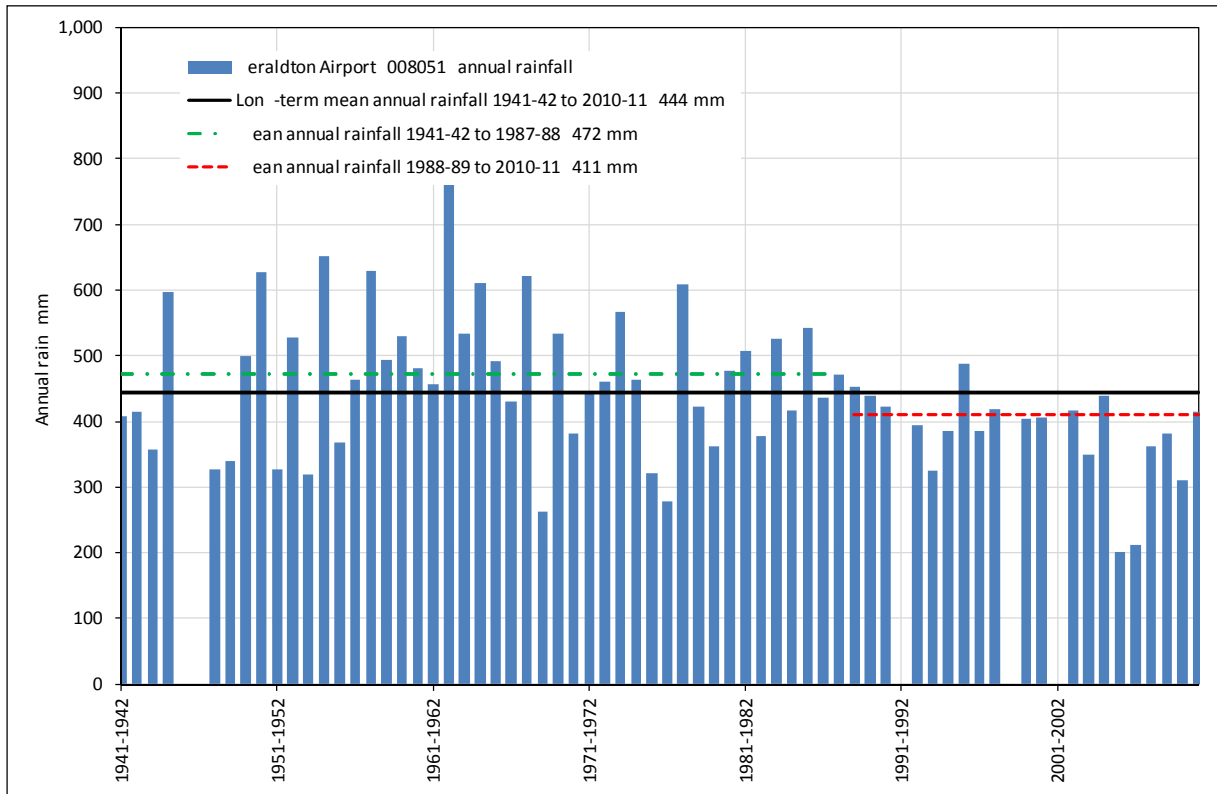


Figure 2 Annual rainfall recorded at Geraldton Airport (008051)

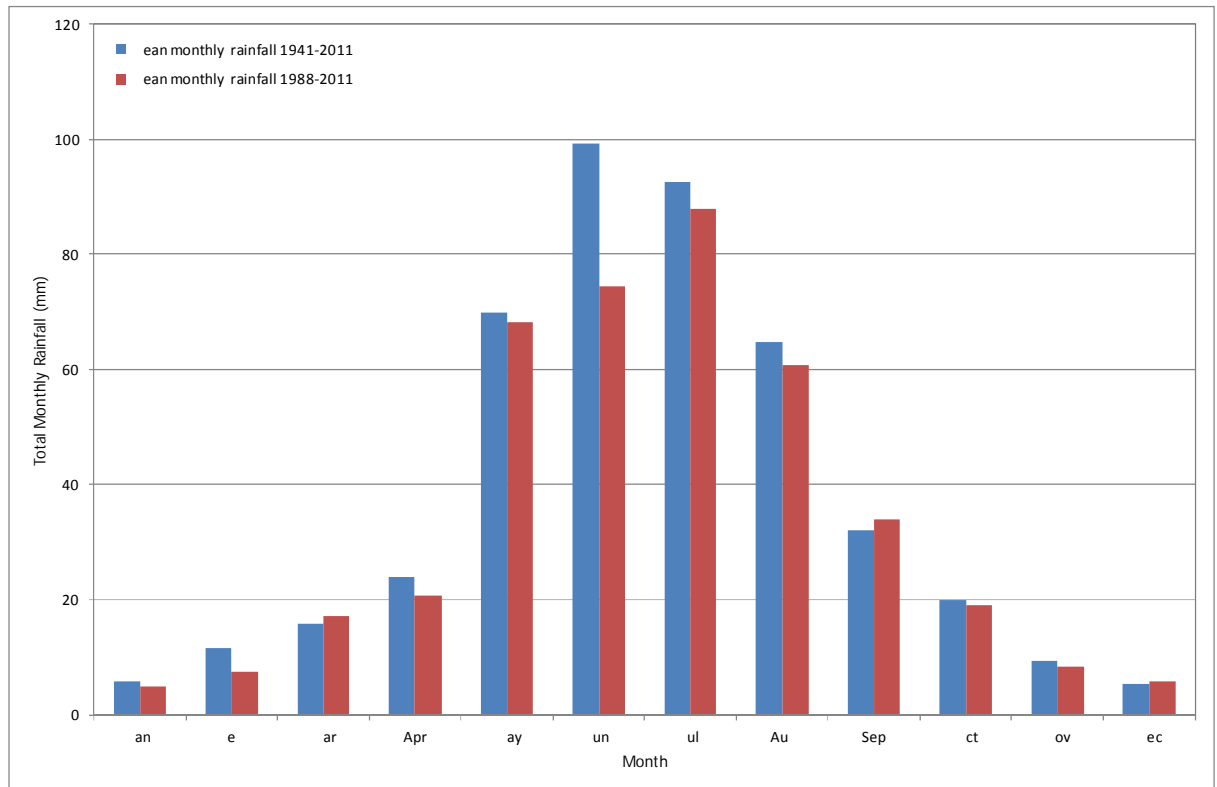


Figure 3 Mean monthly rainfall recorded at Geraldton Airport (008051)

2.4 Vegetation and Land Use

The site has previously been used for cattle and sheep grazing, and has therefore been predominately cleared of native vegetation, although some pockets still remain. These pockets have however mostly had their vegetation degraded due to weed invasion and general human use (Coterra Environment, 2011).

Coterra Environment (2011) reported that two priority flora species (*Melaleuca huttensis* and *Grevillea triloba*) were previously identified as being located within the site. No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) were found to occur within the site, but a PEC does exist within 10 km of the site on the Moresby Range. A number of Rare or Threatened fauna species were also identified as having the potential to occur within the site.

2.5 Contaminated Land

Agricultural and pastoral land use is not viewed as intensive; therefore Coterra Environment (2011) advised that it is unlikely the land across the site has become contaminated. The site is also not listed as containing potentially contaminated sites when viewed online in the Department of Environment's (DEC's) Contaminated Sites Database (DEC, 2011). The Unexploded Ordnances (UXO) Section of FESA determined that a previously identified UXO threat 2 km north-east of the site poses a minimal risk and that further searching for UXOs is unnecessary (Coterra Environment, 2011).

2.6 Geotechnical

2.6.1 Geology

As described in **Section 1.4**, a Geotechnical Investigation, including a site investigation, was undertaken by BCE (2012). The site was identified as being contained in the Geraldton Geological sheet, covering both the Moresby and Spearwood regolith-landform land systems. The report found the existence of colluvial deposits of sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled clay to highly weathered silty sandstone. Deep layers of residual yellow sand, which is generally used for the building industry, were identified in the western side of the site.

2.6.2 Soil Infiltration

Blacktop Materials Engineering (BME) was engaged to conduct infiltration testing at six locations across the site that are close to the proposed POS areas and playing fields (**Appendix C**). These tests were conducted at 300 mm below the ground surface level. The results of the testing, along with a general soil description, are summarised in **Table 1**, with the full results presented in **Appendix C**. Test sites 1-3 and 6 demonstrated higher infiltration rates than sites 4 and 5, however all rates are sufficient to allow infiltration as a means of drainage.

Table 1 Soil Infiltration Results

Test Site Location	Soil Description	Calculated Infiltration Rate (m/d)
1	Yellow Quartz Sand	27.04
2	Yellow Quartz Sand	36.03
3	Red Quartz Sand	13.13
4	Red Quartz Sand	7.58
5	Grey Silty Quartz Sand	4.80
6	Pale Orange Quartz Sand	43.20

It should be noted that these infiltration test results were taken close to the surface and less permeable soils may be encountered further down when the ground is excavated for the construction of infiltration basins. Further infiltration testing and a detailed geotechnical investigation should be conducted to inform the UWMPs and the design and treatment of proposed drainage basins.

2.6.3 Acid Sulfate Soils

2.6.3.1 Desktop Study

The acid sulfate soils (ASS) risk map for the site provided by DEC (**Figure 5**) indicates the potential ASS risks (within 3 m depth from the natural surface), which can be summarised as:

- *No Known Risk to Low Risk* - for the majority of the site;
- *Low to Moderate Risk* – an area less than 0.3 ha in the south west corner of the site. The Structure Plan (**Appendix A**) allocates this area for 'special rural' development; and
- *Moderate to High Risk* – an area less than 2.5 ha near the western boundary of the site. The Structure Plan (**Appendix A**) allocates this area for POS

The risk maps are based on 1:50,000 geological mapping and are not intended to provide the precise location of ASS, but to provide a broad scale indication of areas where ASS are most likely to exist and trigger site-specific investigations and management strategies. It is therefore important to consider the likely existence of areas with ASS potential within the site and the immediate surrounding areas.

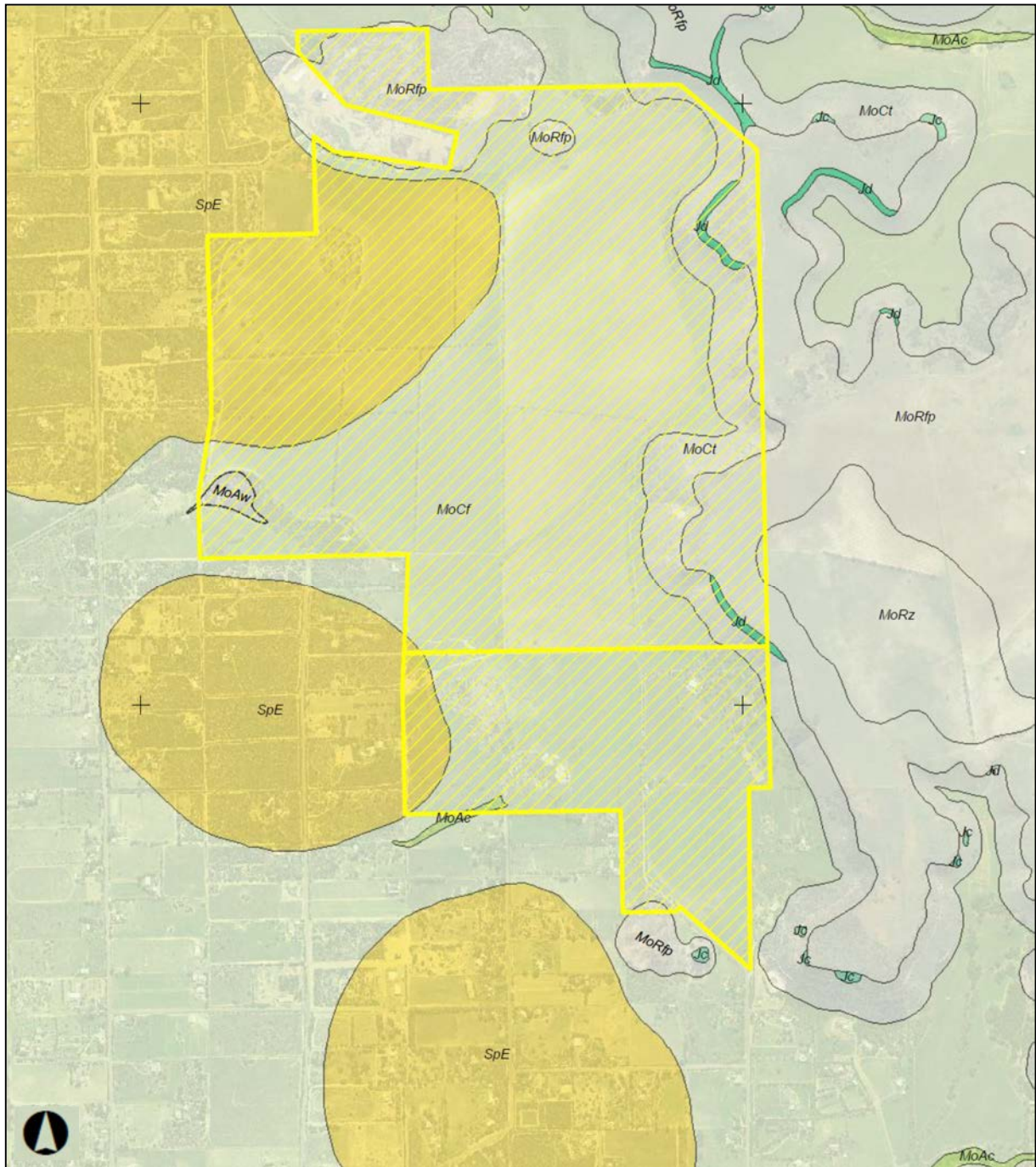


Figure 4 Geological mapping (Regolith-landform resources of the Howatharra 1:50 000 sheet)

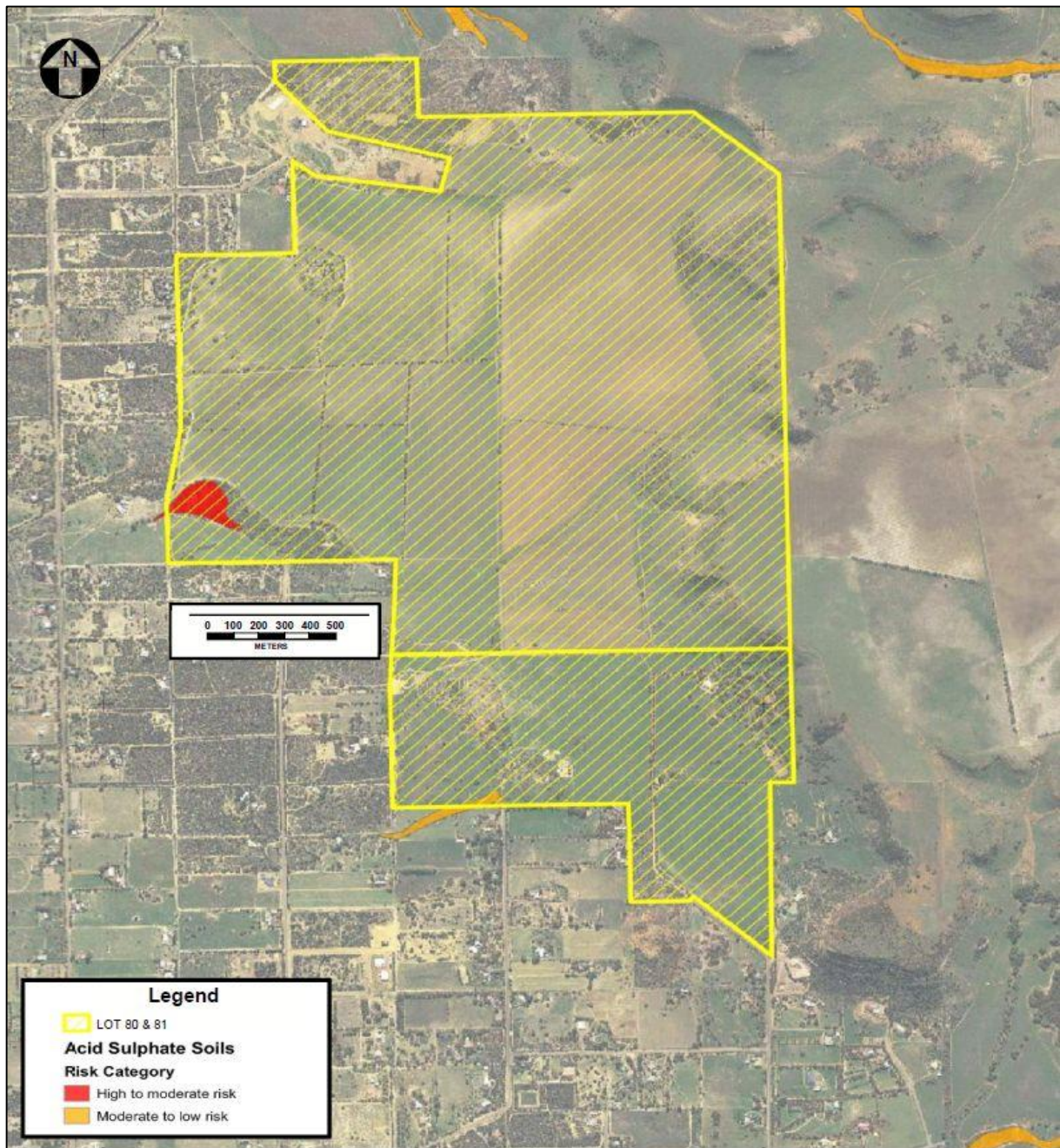


Figure 5 ASS Mapping

2.6.3.2 Acid Sulfate Site Investigation

An Acid Sulfate Investigation was commissioned and carried out by Blacktop Consulting Engineers during September 2012 in accordance with DEC guidelines. The study has found that actual or potential acid sulfate conditions are below threshold levels for which the DEC require the development of an acid sulfate management plan. These results indicate that there should not be any concern related to the disturbance of these soils during development. A copy of the report is presented in **Appendix F**.

2.7 Wetlands

Coterra Environment (2011) reports that two seasonal wetlands located within the site (**Figure 6**) are not recognised as regionally significant in the *Environment Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention. A botanical assessment (Coterra Environment, 2011) found the vegetation condition of these wetlands, located to the south-west and near the western edge of the site, to be between 'Good to Degraded' and 'Degraded'. Environmentally sensitive area mapping conducted by AECOM confirms no protected environmental reserves are present within the site.

2.8 Surface Water and Drainage

Coterra Environment (2011) report that three natural drainage lines run through the site (**Figure 6**). These drainage lines are highly modified due to vegetation clearing and appear to channel overland flow from the scarp, although they remain dry for the majority of the time and have experienced limited flows in recent years. Discussions with DoW indicated these drainage lines are not mapped in their data.

2.9 Groundwater

DoW managed groundwater bores in the immediate vicinity of the site are shown on **Figure 7**. The only data available from these on groundwater levels is a single undated reading of approximately 6 mbgl (below ground level) at bore 70111107. Data on groundwater quality across the site is limited to undated Total Dissolved Solids (TDS) measurements of 715 mg/L at bore 70111107 and 321 mg/L at bore 70111108, which are indicative of freshwater (<1500 mg/L).

The geotechnical investigation (BCE, 2012) encountered no groundwater across the 30 test pits at the site in September 2012. Test pits were excavated to a depth of 3mbgl, supporting the inference that groundwater is sufficiently deep to allow infiltration across the site.

The site is located within the proclaimed Arrowsmith Groundwater Area. DoW (2010) has prepared a groundwater allocation plan to define broad management requirements and guide the assessment of groundwater licence applications with respect to allocation entitlements (Coterra Environment, 2011).

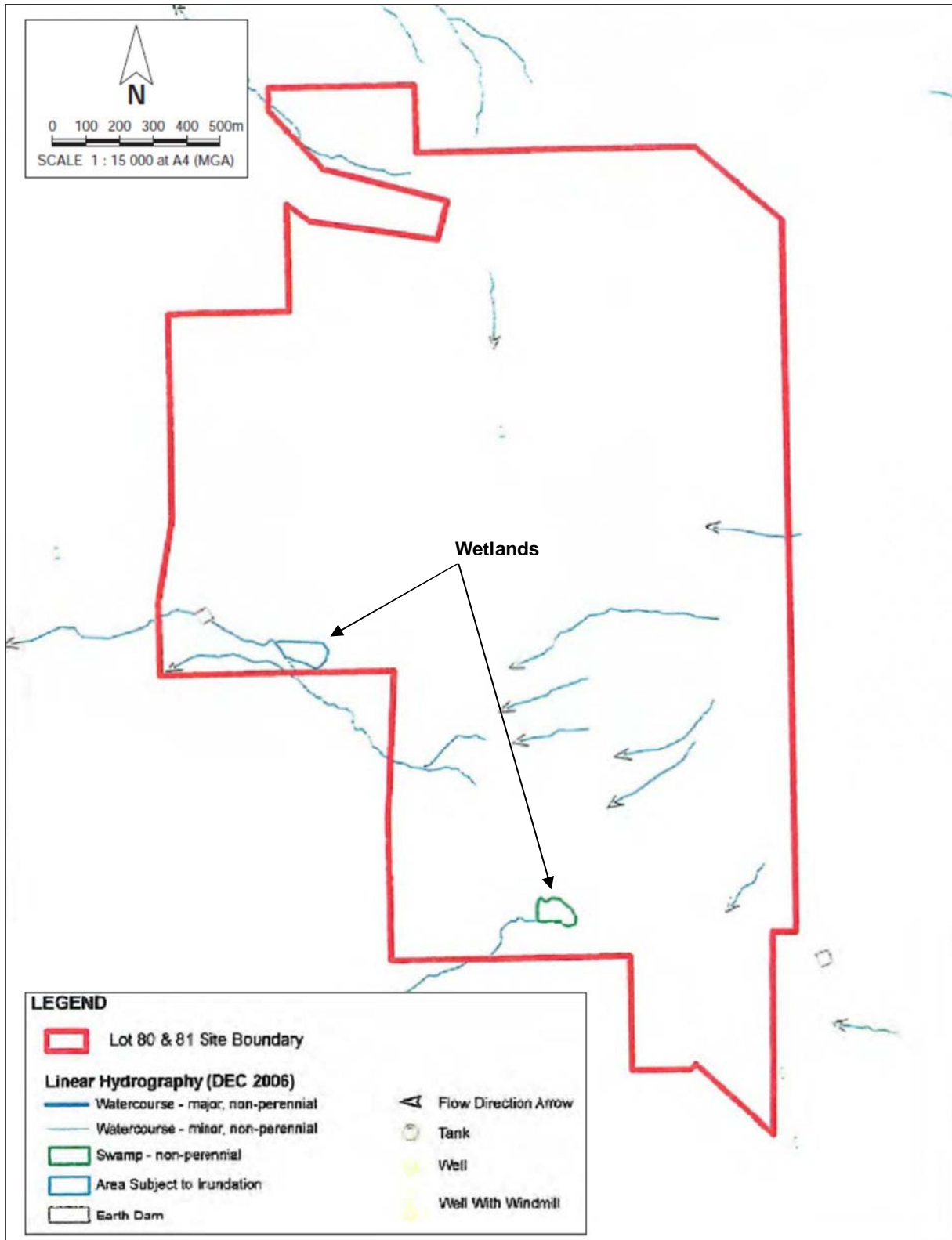


Figure 6 Wetlands and Surface Water Flow (Coterra Environment, 2011)

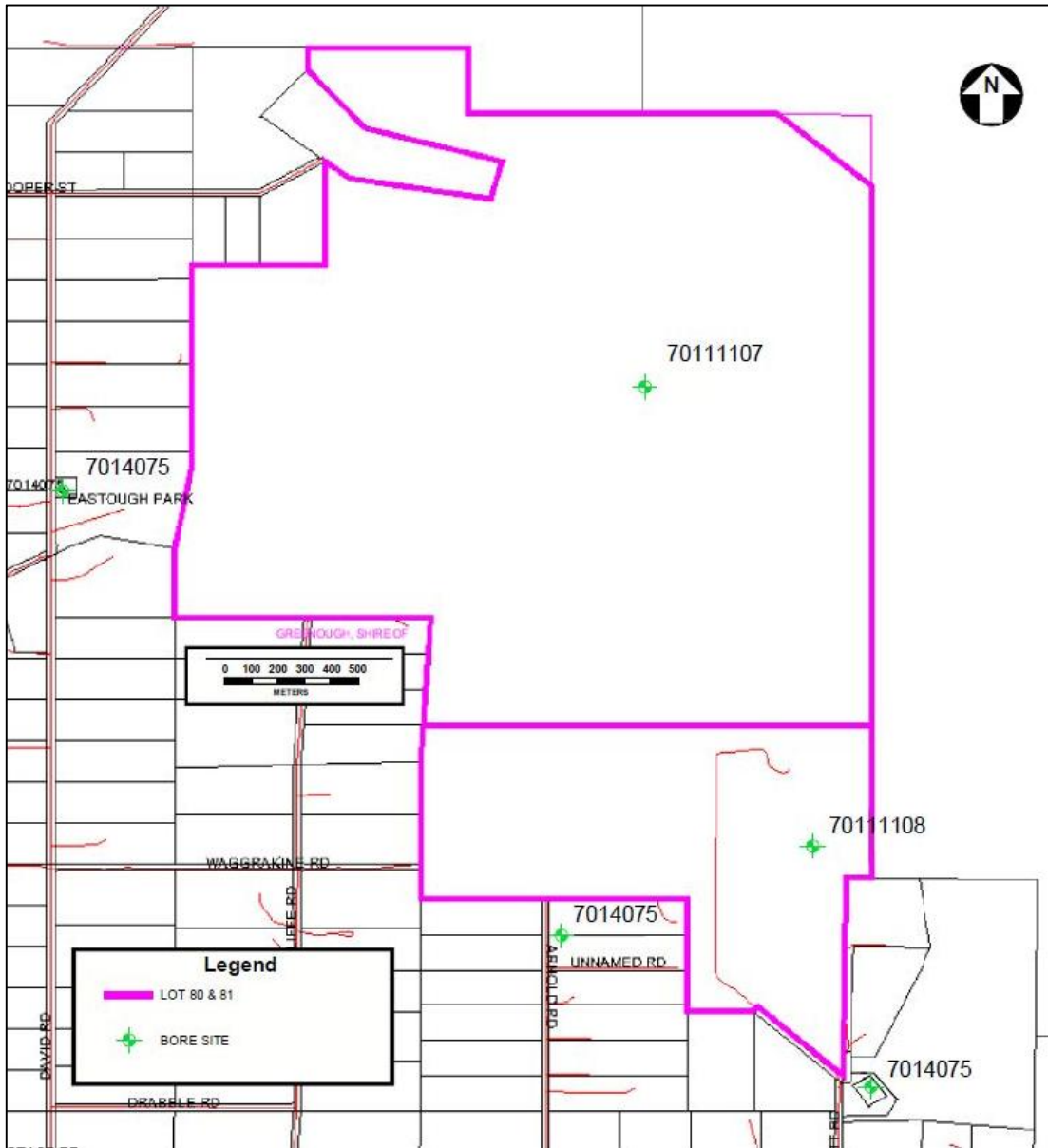


Figure 7 DoW Groundwater Bores

3.0 Water Use Sustainability Initiatives

3.1 Water Supply

The Water Corporation has not yet completed water planning for the proposed development of the site. They do however advise that water reservoir tanks and booster pumps may be required to service the development and subsequently, water design will be in accordance with the Water Corporation's design guidelines. All lots will be subject to any water conservation requirements as outlined by Water Corporation, and for water sustainability initiatives, dwellings are to be constructed as per the Building Code of Australia (BCA), which incorporates water efficient fittings and fixtures requirements.

3.2 Waste Water

It is proposed that waste water from the development could be treated in two proposed alternative waste water treatment plants (WWTPs) via an Aerobic/Anaerobic Trickling Filter that treats the effluent to an acceptable water quality level for discharge into the environment. The alternative WWTP requires licenses in place for the discharge of effluent, and these applications are in train.

3.3 Irrigation

Landscape plans and irrigation strategies will be developed in the next planning phase of the development, in consultation with the City of Greater Geraldton. Use of drought tolerant species and other water demand reduction strategies are likely to be pursued.

Two possible sources of water supply for irrigation have however been identified: extraction from nearby aquifers and treated effluent from proposed alternative WWTPs.

DoW has confirmed that there are three aquifers in the vicinity of the site with capacity within their licence limits to supply additional water to potentially service the irrigation requirements. The locations, licences and capacities of these aquifers are presented in **Table 2**. Based on a recommended POS irrigation supply rate of 7500 kL/ha/year (DoW), the site will require 181,125 kL per year of water, which could be catered for by any of the three identified aquifers.

Table 2 Licensing Database Resource Allocation Resource (DoW 12 March 2012)

Groundwater Area	Groundwater Aquifer	Allocation Limit (kL)	Licensed Allocation (kL)	Total Allocated, Committed and Requested (kL)	% Committed + Additional Allocations	Available Capacity (kL)
Gascoyne	Northampton - Fractured Rock	4,950,000	1,201,450	1,201,450	24%	3,762,000
Gascoyne	Northampton - Sedimentary	2,000,000	657,825	659,700	33%	1,340,000
Gascoyne	Northampton - Surficial	5,000,000	506,025	506,475	10%	4,500,000

The treatment and reuse of effluent from the WWTPs would be a more sustainable supply of water for irrigation than extracting clean water from the aquifers. It is also more cost effective and the preferred option.

4.0 Stormwater Management Strategy

4.1 Conceptual Stormwater System Design

Management of stormwater following the development of the site requires a suitable stormwater system that provides protection of property and infrastructure through infiltration at source as far as practicable and then safe conveyance of excess runoff from minor and major storm events. The stormwater management design outlined below is provided for assessment of the concepts and is consistent with WSUD principles. Detailed design, including basin invert levels, will be provided in the successive UWMPs.

The stormwater management system is designed using a minor (>20% AEP) and major (<20% AEP) storm approach. In rural residential areas the minor stormwater systems will consist of rainwater tanks and soakwells within lots and open swales within road reserves. The site has been planned to accommodate drainage swales within road corridors, but within medium density areas of the development, traditional pit and pipe drainage networks will be required.

The CGG requires the stormwater management strategy to manage the 1% AEP event within the site via either detention or safe conveyance as controlled overland flow to a discharge point into a natural watercourse. The major stormwater system will use the road network (for flow conveyance), and POS areas containing infiltration basins to manage major storm events that exceed the capacity of the minor system. The proposed drainage catchments and infiltration basins are shown in **Appendix D**.

Shallow infiltration testing conducted at six locations within close proximity to the proposed POS locations (**Section 2.6.2**) reported infiltration rates ranging from 4.8 m/day to 43.2 m/day. These infiltration rates indicate that this may be an effective approach for managing stormwater.

The specific principles for the 100% AEP, 20% AEP and 1% AEP events are outlined below:

100% AEP

- To retain and treat onsite the 1 hour duration 100% AEP event (e.g. roofs will be connected to soakwells and, where appropriate, to rainwater tanks)
- All stormwater will be contained within each lot through infiltration prior to conveyance
- Road runoff will be infiltrated as close to source as practical using WSUD measures including roadside swales, perforated manholes or soakwells

20% AEP

- Road runoff will be infiltrated as close to source as practical using WSUD measures including roadside swales, perforated manholes or soakwells draining into flood storage areas adjacent to POS
- Road side swales will provide initial treatment of stormwater and promote infiltration at source prior to conveyance (only in particular sections of the development)
- Flood storage will be within unfenced, landscaped, shallow-sided basins

1% AEP

- Provision via overland flow paths to enable conveyance of runoff to integrated infiltration basins that are sized for a 1% AEP storm event and are located within the POS areas
- Flood storage areas (infiltration basins) will be within unfenced, landscaped, shallow-sided basins to allow for optimum retention

Event plans for 20% AEP and 1% AEP storm events outlining the flow paths towards the POS storage areas are presented in **Appendix D**. The drawing shows the event plan for the 1 in 5 year and the 1 in 100 year plan. The flow paths shall be the same for the piped system and the swales.

Consistent with DoW guidelines, habitable floor levels will be located 0.5 m above the peak water levels in the infiltration basins. These levels will be determined during detailed design of the basins.

4.2 Preliminary Sizing of Infiltration Basins

The stormwater management system (**Appendix D**) has been designed so that the majority of catchments drain internally along natural grades to infiltration basins at low points within POS areas.

The flood storage requirement for each catchment has been calculated using the Rational Method outlined in Australian Rainfall and Runoff (Pilgrim, 1998) for the 1% AEP storm event. Land use within the catchments consists of various types of lots, POS areas, reserve areas and road reserves.

Runoff coefficients adopted for the various post-development land uses are shown in **Table 3**. For multiple zoned catchments, the relative areas of the different land uses were considered in calculating the overall runoff coefficient. **Table 4** summarises the storage volumes required within each catchment during a 1% AEP event.

Table 3 Adopted runoff coefficients for a 1% AEP event

Land Use	Runoff Coefficient
Rural Residential Lots (1 Ha+)	10%
Special Residential (2,000 – 4,000 m ²)	10%
Low Density (R20)	50%
Medium Density	70%
Town Centre	100%
School	50%
Proposed Reserve (Moresby Range Reserve)	10%
Road Reserve	100%
POS (only those areas to be occupied by basins)	100%

Table 4 Indicative catchment storage requirements during a 1% AEP event

Catchment	Indicative Storage Requirement (m ³)
1	8,300
1A	9,500
1B	4,400
2	17,500
2A	9,900
3	26,700
4	22,500
5	5,800
6	12,500
7	8,300
7A	4,800
8	4,400
9	15,500

PC Sump has been used to calculate the infiltration basin sizes required in order to store the volumes presented in **Table 4**. The basins are sized to provide storage for a 1% AEP rainfall event as per the CGG Land Development Guidelines. The results of the PC Sump analysis are presented in **Appendix E**.

The following design criteria have been used in the basin design, in accordance with the CGG Land Development Guidelines:

- All basin side batter slopes are 1 in 6
- Maximum water depth is 1.2 m
- Minimum freeboard to adjacent carriageways is 300 mm
- Minimum freeboard to Western Power pad mount sites is 1 m freeboard to within the overall development

The basins were sized with consideration for runoff inflows and infiltration outflows. As the infiltration tests discussed in **Section 2.6.2** were conducted at shallow depths (300 mmbgl), the recorded infiltration rates were adjusted to equal one third the value of the test results, with a maximum upper value of 4.8 m/d. This is to account for the possible reduction of permeability at the invert level of the basin.

As shown in the catchment drawing in **Appendix D**, the POS areas allocated in the draft structure plan is sufficient to accommodate the required areas of the basins. The final infiltration basin dimensions and locations will be documented in the UWMPs and will be dependent on final earthworks, drainage and road design levels for the development. The delineation of drainage catchments may need refining as detailed design proceeds.

4.3 Potential for Additional On-site Disposal of Stormwater

Preliminary geotechnical information suggests that storm events in excess of the 100% AEP event could potentially be treated and stored onsite successfully and eventually disposed of via infiltration. Such an approach will ensure a greater disposal of stormwater at source therefore providing a more efficient land use and infrastructure outcome, whilst in the process also limiting the impact on remnant vegetation.

Initial calculations, using the approach outlined in **Section 4.2** suggest that storm events up to a 20% AEP event could successfully be treated, stored and disposed of onsite. Achieving this is likely to reduce the estimated basin sizes as outlined in **Table 4** by between 5 and 22%. The potential reductions are summarised in **Table 5** below (note that the reductions are catchment-specific as it's a factor of the proposed land use). The ultimate feasibility of storing and disposing stormwater generated by storms up to the 20% AEP event on an individual site basis should be confirmed at detailed design stage (UWMP).

Table 5 Comparison of Basin sizes

Catchment	Indicative Basin Storage Requirement (m ³)		% Reduction
	Scenario 1: 100% AEP Storm Event Stored Onsite	Scenario 2: 20% AEP Storm Event Stored Onsite	
1	8,300	7,450	10
1A	9,500	9,020	5
1B	4,400	3,650	17
2	17,500	13,700	22
2A	9,900	8,000	19
3	26,700	21,900	18
4	22,500	20,200	10
5	5,800	5,020	13
6	12,500	10,500	16
7	8,300	6,700	19
7A	4,800	3,800	21
8	4,400	4,200	5
9	15,500	13,200	15

5.0 Groundwater Management Strategy

Groundwater information from the geotechnical information and Department of Water bores outlined in **Section 2.9**, indicates there is at least 3 m of clearance to groundwater across the site. Specific measures to manage groundwater levels, including the importation of fill material or use of subsoil drainage, are not considered to be necessary for this site. Other factors identified through detail design may lead to the requirement for fill for some lots, and this will be reported in the UWMP.

6.0 Urban Water Management Plans

The next stage of subdivision planning will require the development of UWMPs. This will include progressing conceptual drainage designs to detailed design and reviewing the assumptions made within this LWMS. The DoW publication *Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions* (DoW, 2008a) should be consulted for guidance on the preparation of UWMPs, which must comply with, or include, the following:

- Objectives and criteria stated in this LWMS
- Regulatory requirements, including required licences and approvals, the Building code of Australia and Plumbing code of Australia
- Infrastructure requirements, including stormwater drainage, and the land required to accommodate these
- Detailed designs for the major/minor stormwater management system
- Floor level heights
- Detailed geotechnical and groundwater assessments
- Recommendations for construction management, including dust and sediment control

UWMPs should be developed in liaison with the CGG to include operational and maintenance responsibilities and liabilities.

7.0 Roles and Responsibilities

Implementation of this LWMS involves defining the roles and responsibilities of the developer and local authority, which are presented in **Table 6**.

Table 6 Implementation roles and responsibilities

Implementation Action	Responsibility	
	Local Government	Developer
Preparation of UWMPs, including management of construction works, monitoring and maintenance arrangements	No Responsibility	Sutcliffe Road Joint Venture
Post construction defects liability period	No Responsibility	Sutcliffe Road Joint Venture
Stormwater management system operation and management	CGG	No Responsibility

The CGG Land Development Guidelines (2011) require that the Defects Liability Period for all drainage and associated work shall be for a duration of 12 months and is to include at least one full rain season and cannot commence prior to the date of certified Practical Completion by the CGG. These guidelines also stipulate that “It is through the monitoring of constructed basins during storm events that the predicted infiltration modelling can be verified and whether the basin is performing as per design. The Developer will be required to undertake a monitoring program over a minimum two full winter periods.” (CGG, 2011)

The developer’s responsibility post construction is likely to be a minimum of 1.5 years. While within the 1.5 year post construction period, the developer is responsible for the maintenance and operation of the stormwater management system. Once it is determined that the stormwater management system meets the performance requirements as per the design, it is anticipated that the CGG shall be the new custodian of the system and its associated assets. As the new custodian, the CGG will be responsible for the operation and maintenance of the system.

8.0 References

Blacktop Consulting Engineers 2012, *Investigation: Proposed Subdivision Development Moresby Heights Waggrakine Geotechnical Report* (Ref 12BCE226) Draft for Comment, October 2012.

Coterra Environment 2011, *Environmental Assessment Report Lots 80 & 81 Hackett Road, Waggrakine* (Ref HUMMOR01) Rev 0, June 2011.

Department of Environment and Conservation 2011, *Contaminated Sites Database*, <https://secure.dec.wa.gov.au/idelve/css/>.

Department of Water 2004-2007, *Stormwater Management Manual for Western Australia*, Department of Water, Perth.

Department of Water 2008a, *Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions*, Department of Water, Perth.

Department of Water 2008b, *Better Urban Water Management*, Western Australia Planning Commission, Perth.

Department of Water 2010, *Arrowsmith groundwater allocation plan*, Water resource allocation planning series Report no 28, August 2010, Department of Water, Perth.

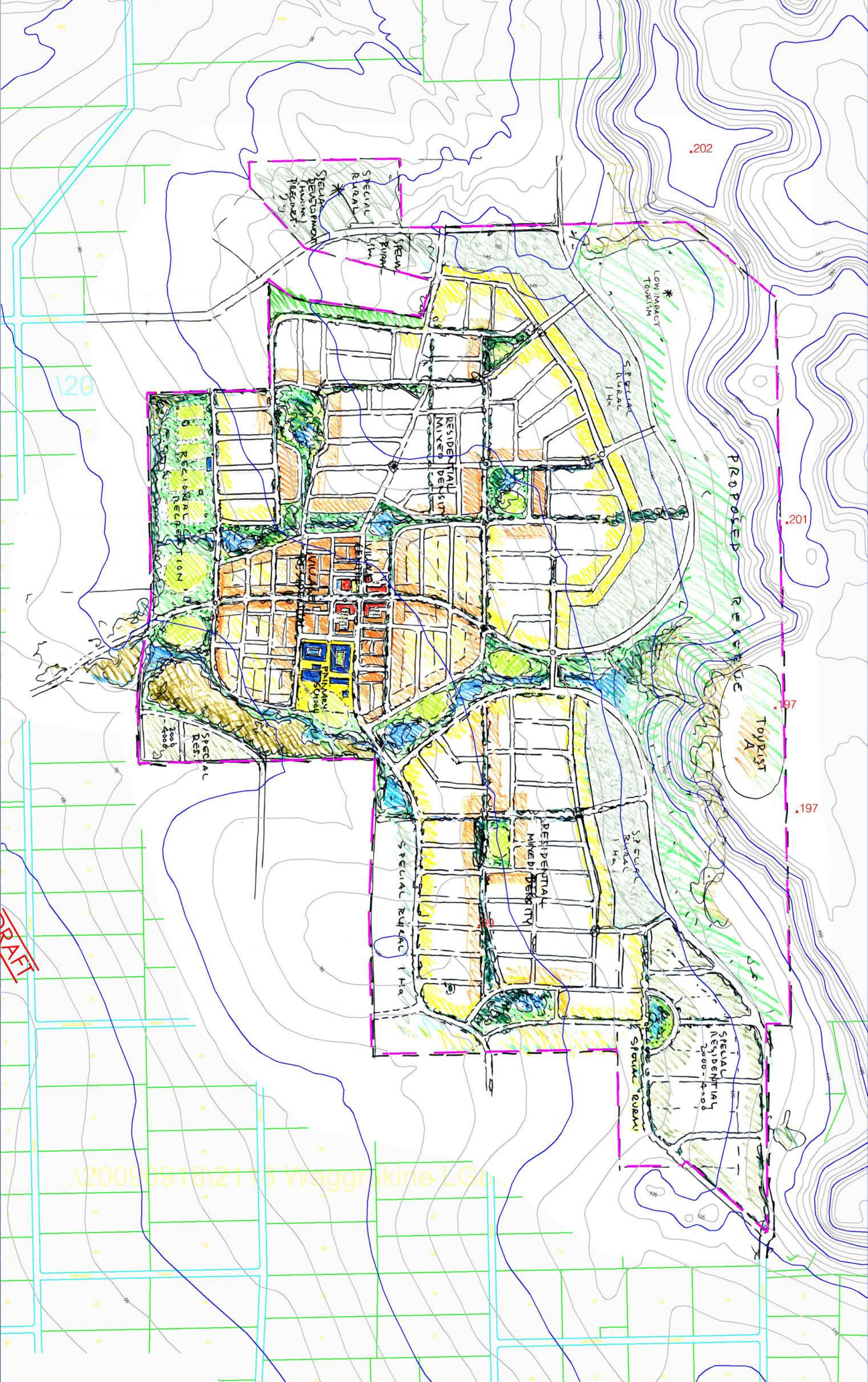
Pilgrim, D.H. (ed.) 1998, *Australian Rainfall & Runoff – A Guide to Flood Estimation*, Institution of Engineers, Australia.

Western Australia Planning Commission 2007, *Liveable Neighbourhoods: a Western Australian Government sustainable cities initiative* January 2009 Update 02, Western Australian Planning Commission, 2007.

Western Australia Planning Commission 2009, *Moresby Range Management Strategy*, WAPC, Perth.

Appendix A

Concept Sketch



CONCEPT SKETCH
 Lots 80 & 81 Hackett Road
 Moresby Heights, Waggrakine

City of Geraldton-Greenough

DRAFT

12009 09 16/21 15 Waggrakine LG

plan no: 2118-68B-01

scale: 1:10,000 @ A3

date: 18.05.2011



**CHAPPELL
 LAMBERT
 EVERETT**

Appendix B

Environmental Assessment Report and Geotechnical Report

COTERRA
ENVIRONMENT

ENVIRONMENTAL ASSESSMENT REPORT

Lots 80 & 81 Hackett Road, Waggrakine

Rev 0, June 2011

This report was prepared by:

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): Luke Rogers
Report Version: Revision 0
Date: June 2011

This report was prepared for:

Humfrey Land Developments
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre.

The site is currently zoned 'Rural' under the City of Geraldton-Greenough Local Planning Scheme (LPS) No. 5 (Figure 3). The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009), and is bordered by Rural Residential development to the south and west.

In order to facilitate development of the site, the site must be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5. Under Section 48A of the Environmental Protection Act (1986), the proposed scheme amendment must be referred to the Environmental Protection Authority (EPA) for assessment.

This Environmental Assessment Report (EAR) has been prepared to inform the EPA and the CoGG of the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives through detailing proposed management measures to minimise, avoid or mitigate potential environmental impacts.

The site is elevated and rises from 75m AHD on the western edge of the property, up to 210m AHD at the commencement of the Moresby Ranges to the east. The site has been previously used for agricultural purposes and is therefore mostly cleared, however some small pockets of vegetation remain scattered across the site (Figure 2).

The site's vegetation condition and type has been assessed and mapped (Figure 9). The majority of the site can be broadly classified as cleared paddocks in 'Degraded' to 'Completely Degraded' condition, mainly consisting of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives.

Remnant vegetation in the north to northwest portion of the site was in 'Excellent' condition, with only small patches of cleared vegetation (Figure 9).

Remaining patches of vegetation were assessed as being in 'Good' to 'Completely Degraded' condition.

Regional vegetation mapping by Beard et. al. (1976) indicates the following vegetation complexes as occurring within the site:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The site contains two seasonally inundated wetlands, which have been historically grazed and are subsequently degraded. The wetlands are not recognised as regionally significant in the *Environmental Protection (South*

Western Agricultural Region Wetlands) Policy 2004, or listed under the Ramsar Convention (1971).

A proposed concept plan has been prepared by project planning consultants Chappell Lambert Everett, proposing a mixture of Residential, Special Rural, Town Centre and Tourism land uses.

No environmental issues have been identified that are considered to prevent rezoning and controlled development of the subject land, subject to appropriate design and management.

TABLE OF CONTENTS		Page
1.0	INTRODUCTION	1
1.1	Project Description and Planning Context.....	1
1.2	Scope of Report.....	1
2.0	KEY ENVIRONMENTAL POLICIES	3
2.1.1	Environmental Protection Act 1986	3
2.1.2	Moresby Range Management Strategy.....	3
2.1.3	Moresby Range Management Plan.....	4
2.1.4	Geraldton Regional Flora Survey 2010	4
2.1.5	EPA Bulletin 891 – Geraldton Region Plan	4
2.1.6	Guidance Statement No. 33 – Environmental Guidance for Land Development.....	5
3.0	EXISTING ENVIRONMENT.....	6
3.1	Site Location and Land Use.....	6
3.2	Topography, Landforms and Soils.....	6
3.2.1	Topography	6
3.2.2	Landforms and Soils.....	6
3.2.3	Acid Sulfate Soils	7
3.3	Hydrology.....	7
3.3.1	Groundwater	7
3.3.2	Wetlands	8
3.3.3	Surface Water and Drainage.....	8
3.4	Vegetation and Flora	8
3.4.1	Interim Biogeographical Regionalisation of Australia	8
3.4.2	Beard Vegetation Associations	9
3.4.3	Geraldton Regional Flora and Vegetation Survey	9
3.4.4	Vegetation Type and Condition	10
3.4.5	Flora	12
3.5	Fauna and Habitat.....	13
3.6	Cultural Heritage.....	14
3.7	Potential Contamination.....	14

4.0	IMPACTS AND MANAGEMENT	15
4.1	Vegetation and Flora	15
4.1.1	Development Design Measures.....	15
4.1.2	Other Management Measures	16
4.2	Fauna and Habitat.....	16
4.2.1	Development Design Measures.....	17
4.2.2	Other Management Measures	17
4.3	Wetlands.....	18
4.4	Moresby Ranges	18
4.5	Acid Sulfate Soils.....	19
4.6	Contamination	19
4.7	Construction Impacts.....	19
4.8	Water Management.....	20
5.0	IMPLEMENTATION STRATEGY	21
5.1	Vegetation	21
5.2	Fauna and Habitat.....	21
5.3	Additional Environmental Management Items	22
6.0	REFERENCES	23

TABLES (Compiled within the report)	Page
Table 1: Vegetation Complex Statistics.....	9
Table 2: GRFVS Plant Communities.....	10
Table 3: Explanation of Vegetation Condition Rating.....	11
Table 4: List of Threatened Fauna Species.....	13

FIGURES (Compiled at the end of the report)

Figure 1: Site Location
Figure 2: Aerial Photo
Figure 3: City of Geraldton-Greenough Local Planning Scheme Zoning
Figure 4: Topography and Geology
Figure 5: Acid Sulfate Soils
Figure 6: Wetlands and Surface Water Flow
Figure 7: Regional Vegetation Complexes
Figure 8: Site Assessed Vegetation Complexes
Figure 9: Vegetation Condition and Locations of Priority Flora
Figure 10: Draft Development Concept

APPENDICES

Appendix A: Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007)
Appendix B: Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011)
Appendix C: DEC Threatened Fauna database search results
Appendix D: Protected Matters Search Result – EPBC ACT
Appendix E: Department of Indigenous Affairs – Registered Sites Search Results
Appendix F: Results of UXO Search and FESA Confirmation
Appendix G: Proposed draft Local Planning Scheme text provisions

1.0 INTRODUCTION

1.1 Project Description and Planning Context

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. An aerial photograph of the site is shown as Figure 2.

The site is currently zoned 'Rural' under the City of Geraldton-Greenough Local Planning Scheme (LPS) No. 5 (Figure 3).

A proposed Concept Plan has been prepared by project planning consultants Chappell Lambert Everett, proposing a mixture of Residential, Special Rural, Town Centre and Tourism land uses.

In order to facilitate development of the site in accordance with this Concept Plan, the site is proposed be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5. This Environmental Assessment Report (EAR) is to be read in conjunction with the proposed scheme amendment documentation prepared by Chappell Lambert Everett.

The Development Concept has been prepared to respond to the site's key opportunities and constraints and provides for an intergrated planning outcome, complementing the site's context between Waggrakine Rural Residential area and the Moresby Range, whilst making best use of its strategic attributes (CLE, 2011).

The development Concept provides for:

- Development of a residential community of between 1500-2000 lots, centring around a main-street style village centre;
- Provision of a local primary school adjoining the village centre;
- Retention of the majority of existing vegetation on site within open space or as covenanted vegetation on large lots;
- Provision of an integrated network of public open space including:
 - Preservation of the Moresby Range 'tops' as regional park land;
 - District Open Space (playing fields and the like);
 - A variety of local open spaces, to service the local community, allow retention and enhancement of remnant vegetation and wetlands, and to provide recreation linkages to the Range;
- Integrated urban water management; and
- Establishment of a tourist facility on top of the Range to enhance public access to the range and provide a genuine tourist destination for both regional and local visitors.

1.2 Scope of Report

In accordance with Section 48A of the Environmental Protection (EP) Act (1986), any proposed change to a town planning scheme must be referred to the Environmental Protection Authority (EPA) for consideration.

This Environmental Assessment Report (EAR) has been prepared to inform the EPA and the CoGG on the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives by detailing proposed management measures to minimise, avoid or mitigate potential environmental impacts.

2.0 KEY ENVIRONMENTAL POLICIES

2.1.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* ('the Act') is the pre-eminent environmental legislation in Western Australia. Development projects are regulated under Part IV of the Act.

Assessment opportunities under the Act occur at the rezoning stage (Region Scheme and/or Town Planning Scheme) under Section 48A of the Act and the subdivision/ development stage under Section 38 of the Act.

The proposed rezoning of Lots 80 and 81 will require referral to the EPA under Section 48A of the Act.

2.1.2 Moresby Range Management Strategy

The Moresby Range Management Strategy was prepared by the Western Australian Planning Commission and adopted in 2009. It recognises the high landscape significance of the Range, and seeks to:

- Protect, conserve and enhance its natural values;
- Protect the indigenous and non-indigenous cultural values;
- Improve public access and recreation opportunities;
- Manage the risk of erosion and bushfire; and
- Ensure a consistent and coordinated policy approach to the areas planning.

To achieve these objectives, the WAPC makes a range of recommendations, of which the following are relevant to this site:

- Opportunities to retain biodiversity through the eradication and control of weeds and feral animals, and the protection and rehabilitation of remnant vegetation;
- Revegetation around areas of conservation significance with key target corridors identified. A small patch of remnant vegetation is identified in the south-west corner of the subject site;
- To ensure that development proposals maintain and enhance conservation values;
- Incorporation of public access to watercourses in development proposals;
- To incorporate linkages and walk trails through the area;
- To limit and manage erosion and bushfire risk;
- Minimisation of intensive development on the flat tops and side slopes, and in key view corridors and ensuring that that which occurs is consistent with the Strategy objectives; and
- To ensure that the landscape value of the area is taken into account in any development proposal and appropriate management responses are incorporated.

2.1.3 Moresby Range Management Plan

The Moresby Range Management Plan was prepared for the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range (closest to Geraldton).

It states that any development proposal should, address the objectives stipulated for the area west of the Range, namely:

- Ensuring that the ecological dynamics of the landscape are protected and enhanced;
- Placing larger lots closer to the Range Precinct and in areas of high visibility;
- Ensuring that the transport network minimises trip distances, allows for walking, bicycling and other forms of transport, provides easy linkages to commonly used facilities and the Range, and provides the basis for strategic tree plantings and ecological linkages between the foothills and the Range;
- Creating a visually smooth transition from the obvious dominance of buildings in the centre of the City to the bushy and green appearance of the Range;
- Ensuring that buildings sit in with the landscape and create the overall impression that buildings become more sensitive and integrated into the landscape the closer the observer is to the Range.

2.1.4 Geraldton Regional Flora Survey 2010

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed in 2010 by the WAPC. The objective was to provide a regional context for land use planning and environmental impact assessment of proposals affecting native vegetation in the Geraldton region.

Information collected through the GRFVS is intended to assist land use planning by the Department of Planning (DoP) and local governments, environmental impact assessments by the Environmental Protection Authority (EPA), and conservation planning by DEC.

The report, associated maps and data provide useful information for landowners and developers, but does not preclude the requirement for site-based ecological assessments of areas likely to be impacted by development. Importantly, the GRFVS will inform conservation and regional planning in the Geraldton region, including the preparation of a local biodiversity strategy that will identify priority natural areas for consideration in future land use planning.

2.1.5 EPA Bulletin 891 – Geraldton Region Plan

The Geraldton Region Plan was prepared by the WAPC in 1997, to provide a regional framework for planning decisions and to recognise the regional centre for the mid-west.

The stated objective of the EPA for native vegetation is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation types and communities. In assessing the Geraldton Region Plan under Section 16 of the *Environmental Protection Act 1986* (EPA Bulletin 891, 1998), the EPA supported the

development of a remnant vegetation inventory in the Geraldton region and the conservation of regionally significant vegetation in both private and government ownership. A list of recommendations were also made by the EPA in respect to the Regional Plan. Those recommendations that are potentially applicable for the site are listed below:

- *“Areas supporting regionally significant vegetation should be identified and appropriately designated for conservation”.*
- *“The regional landscape values of the Moresby Ranges should be appropriately protected in the Region Plan”.*

2.1.6 Guidance Statement No. 33 – Environmental Guidance for Land Development

Guidance Statement No. 33 (EPA, 2005) outlines the environmental protection process and provides the EPA’s advice on a range of environmental factors in order to assist in the protection, conservation and enhancement of the environment during the land planning and development process.

3.0 EXISTING ENVIRONMENT

3.1 Site Location and Land Use

The site is located within the City of Geraldton-Greenough (CoGG), and is bordered by Rural Residential development to the south and west, agricultural land to the north, and the Moresby Ranges to the east.

The site has been historically, and currently still is, used for cattle and sheep grazing. The site has therefore mostly been cleared for pasture, with some pockets of remnant vegetation scattered across landholding. A single residence is located at the base of the Moresby Ranges, near the south eastern corner which is occupied by the current farming caretaker of the property.

A gravel pit which is no longer in operation is located outside the north western tip of the site.

3.2 Topography, Landforms and Soils

3.2.1 Topography

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009). The site is therefore elevated with the topography rising from approximately 75 metres Australian Height Datum (mAHD) on the western edge, up to 210 mAHD at the highest point of the ranges on the eastern edge (Figure 4).

Within 100m to 200m of the eastern boundary is the steepest section of the site, where the Moresby Ranges scarp descends to the foothills.

3.2.2 Landforms and Soils

Regional geological mapping (WA Geological Survey, 1971) identifies the main geological unit over the site as being the Chapman Group, which is characterised as exhibiting Moonyonooka Sandstone (yellow feldspathic sandstone and arkose) and Greenough Sandstone (variegated clayey sandstone) (Figure 4).

The lower slopes and the top of the ranges are classified as being Laterite with overlying quartz sand and underlying highly weathered rock. The steep portions along the scarp along the eastern side of the site are classified as either Champion Bay Group or Yarragadee Formation (Figure 4), characterised by non-marine fluvialite feldspathic, poorly sorted sandstones which are porous and poorly cemented, hence allowing for considerable groundwater reserves.

The Western Australian Geological Survey (2001) regional mapping provided in Figure 4 indicates that the project site contains primarily colluvial foot slopes, with silty sand over mottled sandy clay soils. The other less prevalent soil units occurring in the site are outlined below:

- Alluvial stream channels (including stream beds and banks; seasonally active, silty sand clay, slope deposits and weathered bedrock).

- Alluvial swamps, having waterlogged organic soil over silty sandy clay.
- Eolian formed, deflated dunes of residual quartz sand over calcarenite.
- Residual ferruginous pisolitic duricrust and mottled soil (weathered bedrock).
- Colluvial formed, talus slope to the escarpement, consisting of weathered rock debris, gravel and boulders and the Cadda Formation of shale, siltstone and sandstone with shelly sandy limestone.

3.2.3 Acid Sulfate Soils

The Department of Environment and Conservation Acid Sulfate Soils risk mapping (WA Atlas, 2011), indicates that there is a small area (approximately 2ha) at the western boundary of the site which is mapped as having a high risk of encountering ASS within 3m of the natural surface (Figure 5). The remainder of the site is mapped as having a low to no risk of encountering ASS within 3 m of natural surface level.

3.3 Hydrology

3.3.1 Groundwater

The Department of Water has approximately 40 bores located within a 5 km radius of the centre of the landholding, including one bore which is located within the site. This bore (bore no. 20002923) indicated that the depth to groundwater at this location was at 6 metres below ground level. This depth however is not necessarily indicative of the average depth to groundwater across the entire site given the variability in the topographic levels. Depth to groundwater is therefore likely to vary considerably at different points. Data obtained from the nearby Department of Water (DoW) bores indicates a range in groundwater depths of between 1.8 m to 36.5 m below ground level (GHD, 2006). However based on the data obtained from the DoW, the depth to groundwater is likely to be on average greater than 6 metres below ground level across the site.

The site is situated within the proclaimed Arrowsmith Groundwater Area, which covers the northern-most extent of the Northern Perth Basin, from Geraldton to Green Head and east to Coorow, in the state's Mid West region. A groundwater allocation plan has been prepared by the Department of Water (2010) which details the objectives of the proclaimed Arrowsmith Groundwater Area and broad management requirements. These include:

- A guideline for the allocation and licencing of groundwater in the Arrowsmith Groundwater Area.
- Details on the effects of abstraction on groundwater quality and groundwater-dependent ecosystems.

This plan will guide the assessment of groundwater licence applications in respect to allocations entitlements in the Arrowsmith Groundwater Area.

3.3.2 Wetlands

There are two seasonal wetlands within the site, located in the south-west and near the western edge (Figure 6). These wetlands are not recognised as regionally significant in the *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention (1971).

The vegetation condition for both wetland areas was noted as being between ‘Good to Degraded’ and ‘Degraded’ as determined through the botanical assessment (detailed in Section 3.4 below).

3.3.3 Surface Water and Drainage

Three natural drainage lines are present through the site, which have been highly modified due to clearing of vegetation (Figure 6). The drainage lines appear to be natural drainage channels for rainwater flowing off the scarp, however they remain dry most of the year, with limited flow reported from the last few years (GHD, 2006).

3.4 Vegetation and Flora

The vegetation and flora data relevant to this site has been obtained from the following sources:

- Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007) – Attached as Appendix 1.
- Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011) – Attached as Appendix 2.
- Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).

Where overlap on the assessments exists, the more recent data obtained in the Level 1 Flora and Vegetation survey (Coterra, 2011) supersedes the results of the previous Priority Flora Survey (GHD, 2007).

Based on review of the above documents a summary of the vegetation and flora on the site is outlined below.

3.4.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway and Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2,242,033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-

sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

3.4.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The remaining extent of these two vegetation associations’ within WA and the Geraldton Regional Flora and Vegetation Survey area (GRFVS), are presented in Table 1 below (WAPC, 2010).

Table 1 Vegetation Complex Statistics

Area	Beard vegetation association 675	Beard vegetation association 359
Pre-European extent in GRFVS	3, 148 ha	17, 805 ha
Current (remaining) extent within GRFVS	240 ha (7.62%)	3, 077 ha (17.3%)
Area protected within GRFVS	79.4 ha	1.4 ha
Pre-European extent in WA	51, 850 ha	44, 493 ha
Current (remaining) extent in WA	10, 992 ha (21%)	8, 366 ha (19%)
Area protected in WA	328 ha	1.25 ha

The EPA conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) is 30% retention of pre-European vegetation complex extent outside of constrained areas (i.e. Perth Metropolitan Area is a constrained area). This retention target has therefore not been met for the above vegetation complexes that are located within the site, for both the Geraldton region and in WA generally.

The locations of each of these vegetation complexes are outlined in Figure 7.

3.4.3 Geraldton Regional Flora and Vegetation Survey

The Geraldton Regional Flora and Vegetation Survey (GRFVS) aims to provide information to assist in the assessment of proposals that may affect the native vegetation within the Geraldton region (GRFVS, 2010).

Using Beard’s (1976) regional vegetation associations, the GRFVS maps vegetation at a local scale which are referred to as GRFVS plant communities. The original vegetation of study area, is likely to have consisted of three GRFVS plant communities, these are detailed in Table 2.

Table 2 GRFVS Plant Communities

Plant Community	Description	Beard Vegetation Association
10	Near Coastal: <i>Acacia rostellifera</i> shrubland	359
13	Sandplain: <i>Banksia prionotes/ Acacia rostellifera</i>	359
15	Thicket: <i>Melaleuca</i> spp. /mixed spp.	675

The GRVFS outlines the following in respect to the local conservation significance of each of the recognised plant communities occurring within the site:

“Plant community 10 is more widespread than the other identified communities in the GRFVS area; however better condition representatives have local conservation significance” (WAPC, 2010).

“Plant community 13 occupies 754.39 ha in the GRVFS area, however much of this area is degraded. The better representatives of this plant community occur in the Glenfield and Waggrakine areas. A low heath variant of this plant community occurs in Karloo and Utakarra. This plant community is considered to have conservation significance because, although it has a greater natural extent than most the other communities, it is largely degraded or threatened” (WAPC, 2010).

“Plant community 15 includes the area which matches the description of the ‘natural value’ ecosystem ‘Moresby Ranges’ (Australian Natural Resources Atlas 2009) and the P1 priority ecological community ‘Plant assemblages of the Moresby Range system’ (DEC 2009a). Consequently, this area is considered to have conservation significance (WAPC, 2010)”.

The GRVFS recognises the local significance of the these plant communities due to the lack of original pre-European extent and due to ongoing degradation and clearing of the vegetation within the GRVFS study area.

The locations of the beard vegetation complexes across the site are shown in Figure 7.

3.4.4 Vegetation Type and Condition

The majority of the site has been cleared due to historical agricultural uses, however there are some small pockets of vegetation remaining across the site. In most of these areas, the vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these remnants.

The dominant remnant vegetation complexes across the site were noted as being the following (Coterra, 2011):

- Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.

- *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladus asper*, **Avena barbata* and Poaceae sp.? Open Herbland/Grassland.
- *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
- Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, *?Austrostipa* sp. and *Desmocladus asper* Herbland/ Grassland.

The vegetation complexes and their locations across the site are presented in Figure 8.

The condition of the vegetation present across the site was mapped during the Level 1 Flora and Vegetation survey undertaken in 2011 (Figure 9), and is described further below.

- The site can be broadly classified as cleared paddocks in ‘Degraded’ to ‘Completely Degraded’ condition (Figure 9). The vegetation that is present in the ‘Degraded’ to ‘Completely Degraded’ (cleared paddocks) areas consisted of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives.
- The remnant vegetation in the north to northwest portion of the site was in ‘Excellent’ condition, with only small patches of cleared vegetation (Figure 9).
- Remaining patches of vegetation were assessed as being in ‘Good’ to ‘Completely Degraded’ condition.

The condition ratings have been rated in accordance the vegetation condition scale used in Keighery (1994) outlined below:

Table 3 Explanation of Vegetation Condition Rating (Keighery, 1994)

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive specie
3	Very Good	Vegetation structure altered, obvious signs of disturbance
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species

Some of the results of the assessment of the vegetation condition in April 2011, vary from the vegetation condition results determined in 2007. This is likely due to continued degrading land uses (predominantly grazing activities) and could also be partly attributed to a regional reduction in rainfall (Bureau of Meteorology, 2011).

3.4.5 Flora

A search of the Department of Environment and Conservation (DEC) Threatened (Declared Rare) Flora Database and the Western Australian Herbarium Specimen database for species of rare and priority flora located within the vicinity of the site was undertaken by GHD in 2007. Of the rare or priority species that were identified by the DEC as potentially occurring within the area, two priority flora species were confirmed as being located within the site as determined through the Level 1 Flora and Vegetation survey completed in April 2011. These species are:

- *Melaleuca huttensis* (Priority 1 Flora), and;
- *Grevillea triloba* (Priority 3 Flora).

A description of the significance of the priority species classification by the DEC is outlined below:

- *Priority 1 species are species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes (DEC, 2011).*
- *Priority 3 species are species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them (DEC, 2011).*

One individual *M. huttensis* was recorded within the northwest corner of the site. *G. triloba* was recorded in the northern and northwest corners of the site, in the areas classified as being in 'Good' to 'Excellent' condition, at densities of 20%, 5% and patches of 20% respectively. The location of these species across the site is shown in Figure 9.

A search of the DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database indicated that there was no previously known TECs or PECs identified as occurring within the site area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca magecephala* and *Hakea pycnoneura* thickets on the Morseby Range.

3.5 Fauna and Habitat

As the majority of the site is cleared and used for grazing of livestock, the fauna habitat value of the site is limited. However, pockets of remnant vegetation will provide islands of habitat for some species.

Vegetation condition is often used as an indicator of fauna habitat value. The majority of the remnants were rated as being in 'Good' to 'Completely Degraded' condition (Section 3.4.3), thereby offering varying habitat value for native fauna. The portion of vegetation in the very north-west tip, which has been assessed as being in 'Excellent' condition, is likely to contain greater fauna habitat value and viability (Figure 9).

A search of the DEC's Threatened Fauna database, and the federal Department of Sustainability, Environment, Water, Populations and Community's (DoSEWPC) database of listed matters of National Environmental Significance protected under the Environmental Protection and Biodiversity Conservation Act (EPBC Act) (1999) was undertaken. The search indicated that the following Rare or Threatened fauna species could potentially occur within the site. This has been determined based on a comparison between the available fauna habitats within the site, and the information provided on the habitat requirements of each of the listed species:

Table 3 – List of Threatened Fauna Species

Fauna Species	Conservation Status	Likelihood of Being on-site
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)	Threatened	Possible – Limited foraging habitat available
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)	Threatened	Possible – Limited foraging habitat available
<i>Cyclodomorphus branchialis</i> (Slender Blue Tongue Skink)	Threatened	Possible, though unlikely due to lack of suitable habitat
<i>Falco peregrinus</i> (Peregrine Falcon)	Specially Protected Fauna	Unlikely – lack of suitable habitat
<i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)	Threatened	Possible, though unlikely due to disturbed nature of site
<i>Lerista lineata</i>	Priority 3	Possible, though unlikely due to disturbed nature of site
<i>Macropus irma</i> (Western Brush Wallaby)	Priority 4	Unlikely – habitat disturbed onsite
<i>Morelia spilota subsp. imbricata</i> (Carpet Python)	Specially Protected Fauna	Possible, though unlikely due to disturbed nature of site
<i>Pomatostomus superciliosus subsp. ashbyi</i> (White-browed Babbler (western wheatbelt))	Priority 4	Possible, though unlikely due to disturbed nature of site
<i>Psacadonotus seriatus</i> (Cricket)	Priority 1	Possible, though unlikely due to disturbed nature of site
<i>Tyto novaehollandiae subsp. Novaehollandiae</i>	Priority 3	Unlikely – lack of suitable habitat

The DEC database search results are presented in Appendix C, with the results of a protected matters search under the EPBC Act presented in Appendix D.

Whilst some of the habitats present within the site are considered suitable for a number of the Rare or Priority species listed above, the likelihood that these species can sustain viable populations within the site is low due to the fragmented and disturbed nature of the remnant habitats available.

Some of these species are listed as possibly occurring within the site, primarily due to the area of intact vegetation in the northwest corner. Ground dwelling species such as reptiles and insects may inhabit this portion of the site.

Foraging habitat for Carnaby's and Baudin's Cockatoo is present in some areas of existing vegetation across the site.

The level of impact on these species will need to be determined following final planning design, when the area of foraging habitat required to be cleared can be fully assessed in consideration of the significant impact thresholds under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act), 1999.

3.6 Cultural Heritage

A search of the Department of Indigenous Affairs website determined that there are no sites of Aboriginal significance which have been recorded on the site (Appendix E) (DIA, 2011). The closest registered site is located approximately 3km north-west of the northern edge of the site.

All contractors working on the development need to be made aware of their responsibilities under the Aboriginal Heritage Act with regard to finding potential archaeological sites. In the event a site is discovered, all work in the area is required to cease and the Department of Indigenous Affairs is to be contacted.

3.7 Potential Contamination

The use of the site for agricultural and pastoral purposes is not viewed historically as intensive, therefore it is unlikely that contamination has occurred. Additionally, the site is not listed on the Department of Water, Water Information (WIN) information database for potentially contaminated sites, nor under the DEC's Contaminated Sites Database (DEC, 2011).

A former Shire of Greenough landfill was once located immediately west of the site, however operations ceased approximately 15 years ago and no contamination has been identified. Additionally groundwater flows in a westerly direction under the former landfill, away from the site.

A threat of UXO's (Unexploded Ordinances) from an area 2km north east of the site called Red Peak has previously been identified. A subsequent UXO threat analysis has, however, resulted in the Unexploded Ordinance Services section of FESA concluding that this area poses a minimal risk as, and that further searching for UXO is unnecessary (refer Appendix F). FESA advise that an Advice Note only will be recommended to be placed upon any subdivision approvals issued for the site.

4.0 IMPACTS AND MANAGEMENT

4.1 Vegetation and Flora

The site contains limited pockets of vegetation due to historical agricultural uses that have resulted in the majority of the site being cleared. Most of the remaining vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these vegetation remnants.

However, the vegetation in the very north to northwest portion of the site is the exception, assessed as being in 'Excellent' condition, with only small patches of cleared vegetation. This area also sustains populations of Priority 1 and 3 species.

The EPA's conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) of 30% retention of pre-European vegetation complex extent has not been met for the vegetation complexes present within the site, for both the Geraldton region and in WA generally.

In addition, both the Moresby Range Management Strategy, the EPA's assessment of the Geraldton Region Plan, and the GRVFS refer to the significance of remnant vegetation and the need to ensure that development proposals maintain and enhance conservation values.

Therefore, despite the condition of the remnant vegetation, it is considered appropriate to retain existing vegetation wherever possible in an effort to preserve and enhance the ecological integrity of the site, and to increase amenity for prospective residents.

4.1.1 Development Design Measures

The draft concept plan is attached as Figure 10, and outlines the areas of vegetation proposed for retention within the development. The proposed development will allow for the retention of the majority of currently vegetated areas. In addition, all areas with Priority Flora located in them will be retained in Public Open Space (POS) and in large covenanted lots.

Two pockets of remnant vegetation located near the central western edge of the site and within the south western corner, are proposed to be reserved for POS. A long linear section of POS will also be provided on the eastern portion of the site to protect this section of the Moresby Range and associated vegetation.

Large covenanted lots are proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will be designed and conditioned for minimal clearing. Building envelopes will be designated in this portion of the site where vegetation is degraded or already cleared.

Revegetation with native species will be undertaken following development, predominantly within selected areas of the open space and in streetscape landscaping. The proposed species list for revegetation will be approved by the CoGG prior to development occurring.

Approximately 30% of the site is proposed for open space under the current Development Concept Plan. Further detail on precise areas, design, species to be used and management will be developed and submitted to approval agencies as part of the structure planning and subdivision processes.

The proposed reservation of these areas in POS and the covenanted large lot designs in the north-west of the site, will be designed to ensure an ecological corridor runs between the vegetated larger semi-rural blocks to the west of the site, to the Moresby Ranges in the eastern portion of the site.

This corridor will include the area of existing vegetation within the western portion of the site, with the objective of retaining this vegetation and enhancing its ecological integrity through revegetation and proposing a link to other areas of vegetation in open space.

4.1.2 Other Management Measures

To ensure the future viability of retained vegetated and revegetated areas the following management strategies are proposed:

- Delineate POS areas containing retained vegetation and revegetation zones from the development by separating them by a road or significant pedestrian accessways.
- Preparation of a POS Management Plan, to be signed off by the Local Authority in consultation with the DEC, which will provide details on the following:
 - minimisation of clearing and vegetation disturbance during construction,
 - access control (during construction and post-construction),
 - revegetation species and establishment,
 - weed control,
 - dieback control and management,
 - stormwater management,
 - ongoing maintenance and management of the vegetated areas,
 - protection of wetlands,
 - fire management, and
 - interface management.

This will ensure the long term protection and viability of the vegetation and associated vegetation retained in POS

4.2 Fauna and Habitat

Habitat is generally limited due to the fragmented and degraded nature of the existing vegetation across the site. Key species of conservation significance which have been identified as potentially utilising habitat present at the site include Carnaby's Black Cockatoo and Baudin's Black Cockatoo.

Black Cockatoo's typically utilise areas of Banksia, Allocasuarina and Eucalyptus woodland, which can be found intermittently amongst the remnant vegetation areas

across the site. The northwest corner of the site also contains potential habitat for some species of conservation significance, as well as other fauna species.

4.2.1 Development Design Measures

The draft concept plan is attached as Figure 10, and outlines the areas of vegetation and fauna habitat proposed for retention within the development. As is evident in this plan, the majority of the vegetation and habitat currently existing on the site will be retained in open space.

One of the key design initiatives, which underpins the environmental and aesthetic objectives of this project, is the retention and development of an ecological corridor, between the vegetated larger semi-rural blocks to the west, to the Moresby Ranges in the eastern portion of the site. This corridor will include the area of existing vegetation within the western portion of the development, with the objective of retaining this vegetation and enhancing the ecological integrity through revegetation and linking it with other areas of vegetation in open space.

This corridor will allow for the safe movement of fauna across the site, ensuring a continuous link between fauna habitats that are currently separated by agricultural land and increasing the overall fauna habitat viability of the landholding.

Large covenanted lots are also proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will ensure minimal clearing. Building envelopes will be strategically located in this portion of the site where vegetation is degraded or already cleared.

Overall, the majority of the existing vegetation is proposed for retention in Public Open Space, in large covenanted lots or as part of the Moresby Ranges open space. In addition individual and small clusters of trees will be retained where possible.

4.2.2 Other Management Measures

A POS Management Plan will be prepared prior to development, to be signed off by Local Authority in consultation with the DEC, which will provide details regarding:

- minimisation of clearing and vegetation disturbance during construction,
- access control (during construction and post-construction),
- revegetation species and establishment,
- weed control,
- dieback control and management,
- stormwater management,
- ongoing maintenance and management of the vegetated areas,
- protection of wetlands,
- fire management, and
- interface management.

This will ensure the long term protection and viability of the vegetation and associated fauna habitats retained in POS.

4.3 Wetlands

There are two seasonal wetlands located within the site, situated in the southwest and the western edge of the site (Figure 6). Both wetland areas will be retained in Public Open Space.

Management of these wetlands will be included in the POS Management Plan, which will be prepared prior to development occurring. The POS Management Plan which will provide details regarding:

- revegetation species and establishment,
- weed control,
- access control (during construction and post-construction),
- dieback control and management,
- stormwater management,
- fire management, and
- interface management.

4.4 Moresby Ranges

The WAPC prepared the *Moresby Range Management Strategy* in 2009 with the aim of protecting, enhancing and promoting the regional significance of the Moresby Range over the next 25 years.

In addition to this, the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning prepared the Moresby Range Management Plan in 2010, to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range.

The visual and landscape significance of the Range as a backdrop to Geraldton, and icon to the region, is recognised and discussed throughout both documents. Recognition of the biodiversity values and retention of these values within the Moresby Ranges is also recommended in these plans.

A specific set of recommendations applying to the site is outlined in Section 2 above. These recommendations in respect to environmental management are generalised and have been addressed through incorporation of the key objectives of this plan into the Development Concept Design. The Moresby Ranges will remain in POS as part of this development, and will be retained and managed in perpetuity. Therefore the biodiversity values of the range will not be compromised. Further, management recommendations for the foothills, in which the development portion of this site is part of, have been considered into the design concept, and in this document.

In addition a specific visual and landscape assessment has been prepared for the site by EPCAD (2011) to determine limitations to development and to guide the preparation of the concept and structure plans. This was not based on any particular development plan, but provided a framework for the development of one. This assessment concluded that:

“The development area of the site... will not be prominent in the landscape from contextual views, therefore the regionally important landscape of the scarp is not adversely affected from public viewpoints.” (EPCAD, 2011).

4.5 Acid Sulfate Soils

WAPC mapping indicates that the site contains a small area near the western edge of the site mapped as having a high risk of ASS (Figure 5).

In accordance with DEC guidelines, a Preliminary Site Assessment will be undertaken to assess the presence and extent of ASS prior to subdivision. Depending upon the results of the preliminary assessment, an Acid Sulfate Soil Assessment and Dewatering Management Plan will be prepared if required. This plan will be approved for implementation by the DEC prior to any ground disturbing works being undertaken.

4.6 Contamination

The site is not registered on the DEC's contaminated sites database. However agricultural activity involves the use of substances which can potentially be pollutants. These include the use of toxic chemicals such as pesticides and herbicides, and hydrocarbons such as fuels and lubricants.

As such, a desktop Preliminary Site Investigation will be undertaken to assess the likelihood of contamination being present on the site. Depending upon the results of the preliminary investigation, further investigation and on-site sampling may be required. This sampling and subsequent report will need be approved by a registered contaminated sites auditor to the satisfaction of the DEC prior to any works being undertaken.

4.7 Construction Impacts

Construction activities need to be managed to minimise the impact to adjacent residents, retained vegetation and wetlands. Impacts can include:

- Nuisance dust generation during bulk earthworks.
- Disturbance of Acid Sulfate Soils during earthworks and/or installation of services.
- Silt and sediment run-off from uncontrolled run-off during site works.
- Inadvertent damage to trees and other vegetation earmarked for retention.
- Inappropriate disposal of waste building material and poor housekeeping on building sites leading to wind blown litter.

All of these potential impacts are manageable through appropriate engineering design and appropriate site management practices. Management of these potential

impacts will be detailed in the POS Management plan for the protection of existing vegetation during construction, and through the provision of standard subdivision conditions on the subdivision approval.

4.8 Water Management

Infiltration within the site appears good with little current surface runoff. All additional runoff generated by the development will be contained within the site and disposed of through a network of infiltration basins integrated into POS.

Detailed water management is not required to be addressed at this stage of the planning and approvals process primarily due to the reported and expected depth to groundwater (Section 3.3.1).

Water management will be adequately addressed for the site, in consideration of the proposed development at Local Structure Planning Stage, and prior to subdivision, through the production of a Local Water Management Strategy and Urban Water Management Plans to the satisfaction of the DoW and the CoGG.

5.0 IMPLEMENTATION STRATEGY

The key environmental considerations for the site relate to vegetation and fauna and habitat. The findings and conclusions from this assessment are presented below.

Detailed management strategies will be determined through the POS Management Plan identified above, prepared through an appropriate schedule in the Local Structure Plan, to be approved by the Local Authority. This will provide statutory assurance that this plan will be completed in accordance with the objectives outlined above, as the CoGG Local Planning Scheme states that development must be in accordance with an approved Structure Plan. Therefore Proposed draft Local Structure Plan provisions are included in Appendix G.

No environmental issues have been identified that are considered to prevent rezoning and controlled development of the subject land, subject to appropriate design and management.

5.1 Vegetation

Approximately 30% of the site is proposed for retention in Public Open Space, which includes almost all existing remnant vegetation located across the site.

Degraded land at the site which is identified as POS is proposed to be rehabilitated through the planting of locally endemic species.

To ensure the future viability of retained vegetated and revegetated areas, the management strategies which will be implemented will include delineation of retained vegetation, management of stormwater flow and preparation of a POS Management Plan.

5.2 Fauna and Habitat

Viability of fauna habitat is directly linked to the viability of the remnant vegetation across the site. Therefore the management measures pertaining to the retention and rehabilitation of the remnant vegetation across the site will ensure the long term sustainability of the existing fauna habitat.

Approximately 30% of the site is proposed for retention in Public Open Space, which includes almost all existing remnant vegetation located across the site, and also includes the formation of an ecological corridor between the vegetated larger semi-rural blocks to the west and the Moresby Ranges in the eastern portion of the site.

To ensure the future viability of retained habitat a POS Management Plan will detail specific management strategies to the satisfaction of the Local Authority in consultation with the DEC.

5.3 Additional Environmental Management Items

An Acid Sulfate Soil Management Plan will also be prepared if AASS or PASS is found to be present at the site. This plan would be prepared in accordance with the DEC ASS guidelines and approved by the DEC prior to implementation.

6.0 REFERENCES

Bureau of Meteorology, (2011) *Climate of Geraldton*, Overview [Online] <http://www.bom.gov.au/wa/geraldton/climate.shtml>

Coterra Environment (2011) *Level 1 Flora and Vegetation Survey of Moresby Heights*. Coterra, Perth

Department of Agriculture and Food, (2011) *Declared Plants Database* [Online] http://agspsrv95.agric.wa.gov.au/dps/version02/01_plantsearch.asp

Department of Environment and Conservation and the West Australian Herbarium (2006) *FloraBase*. [Online] <http://florabase.calm.wa.gov.au>

Department of Environment and Conservation. (2001-2010). *Contaminated Sites Management Series*. DEC, Perth.

Department of Environment and Conservation, Contaminated Sites Database [Online] <https://secure.dec.wa.gov.au/idelve/css/>

Department of Indigenous Affairs. (2001) [Online] <http://www.dia.wa.gov.au/>

Department of Sustainability, Environment, Water, Population and Communities (2010) *Environment Protection and Biodiversity Conservation Act 1999*, Overview [Online] <http://www.environment.gov.au/epbc/about/index.html> (Accessed 02/09/2010).

Department of Minerals and Energy (1986). *Serpentine sheet (Jordan JE 1986b Serpentine Sheet part of Sheets 2033 II and 2133 III. Environmental Geology Series. Geological Survey of Western Australia, Perth, Western Australia.)*

Desmond & Chant (2001) *Geraldton Sandplains 2 (GS2 Geraldton Hills Subregion)* DEC, Perth.

Environmental Protection Act 1986 Environmental Protection Authority (1998) *EPA Bulletin 891 – Geraldton Region Plan*, EPA, Perth

Environmental Protection Authority (2004) *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*. Environmental Protection Authority, Perth.

Environmental Protection Authority (2005) - *Guidance Statement No. 3 for the separation distances between industrial and sensitive land uses*. Final Guidance No. 3. Environmental Protection Authority, Perth.

Environmental Protection Authority (2008) - *Guidance Statement No. 33: Environmental Guidance for Planning and Development*. Environmental Protection Authority, Perth.

Geological Survey of Western Australia (1971) *Geraldton – Houtman Abrolhos 1:250,000 Geological Series, Sheet SH 50-1 and Part of Sheet SH 49-4*.

Geological Survey of Western Australia (2001) *Howatharra 1:50000 Regolith – Landform Resource Series Sheet 1840 – IV First Edition*

GHD (2006) *Humphrey Land Developments: 80 & 81 Hackett Road, Waggrakine, Environmental Assessment*. GHD, Perth

GHD (2007) *Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine*. GHD, Perth

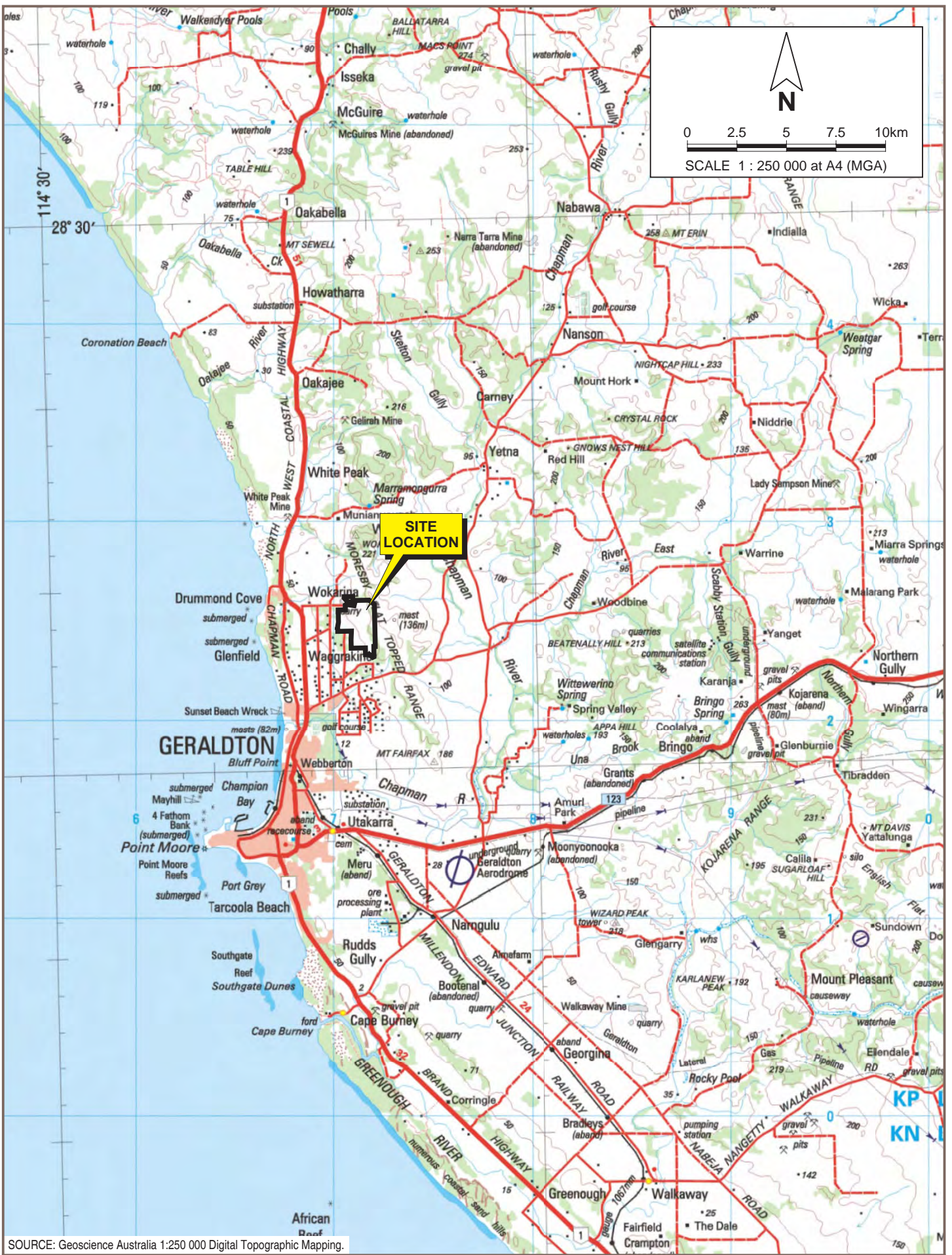
Keighery, B.J. (1994). *Bushland Plant Survey: a Guide to Plant Community Surveys for the Community*. Wildflower Society of Western Australia (Inc.) Nedlands, Western Australia

Thackway, R. & Cresswell I. D. 1995, *An Interim Biogeographical Regionalisation for Australia: a Framework for Setting Priorities in the National Reserves System Cooperative Program*, Australian Nature Conservation Agency, Canberra, ACT.

Western Australian Planning Commission (2010) *Geraldton Regional Flora and Vegetation Survey*. WAPC, Perth

Western Australian Planning Commission (2009) *Moresby Range Management Strategy*, WAPC, Perth

FIGURES



SOURCE: Geoscience Australia 1:250 000 Digital Topographic Mapping.

COTERRA
ENVIRONMENT

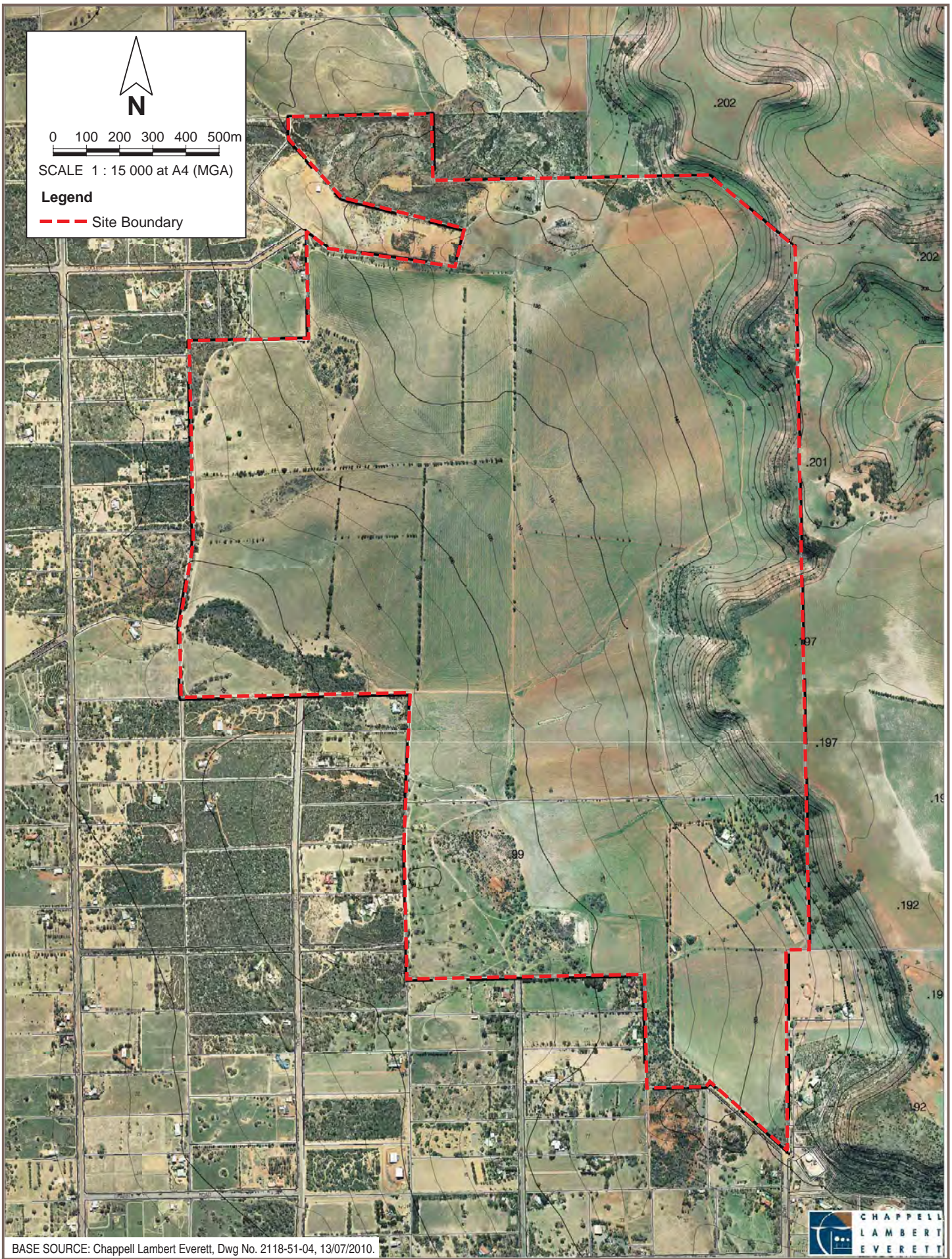
Humfry Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

SITE LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-401.dgn



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f02.dgn

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



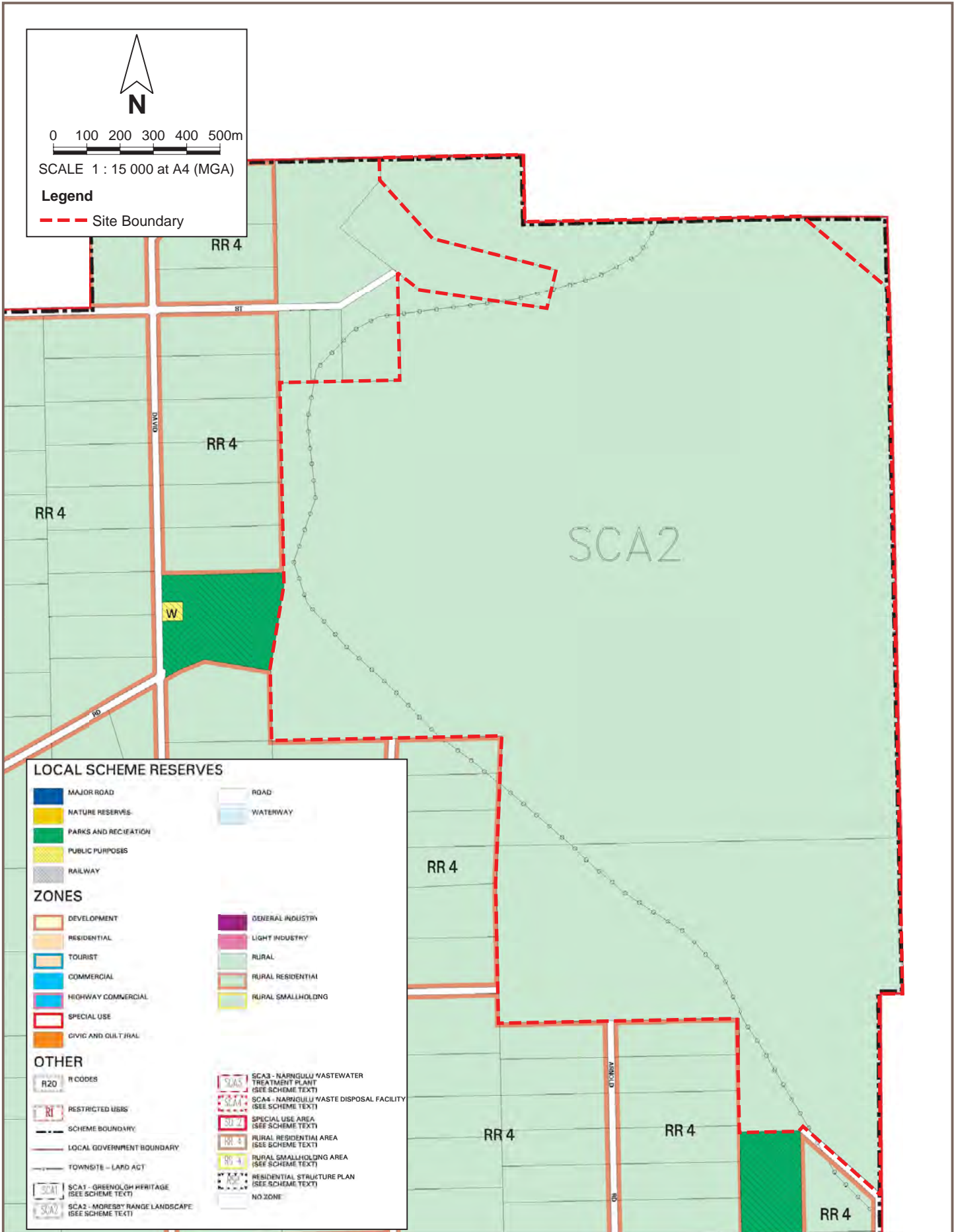
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

AERIAL PHOTOGRAPH

Figure 2



SOURCE: Department of Planning, February 2011.

COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers

Date: 11 May 2011

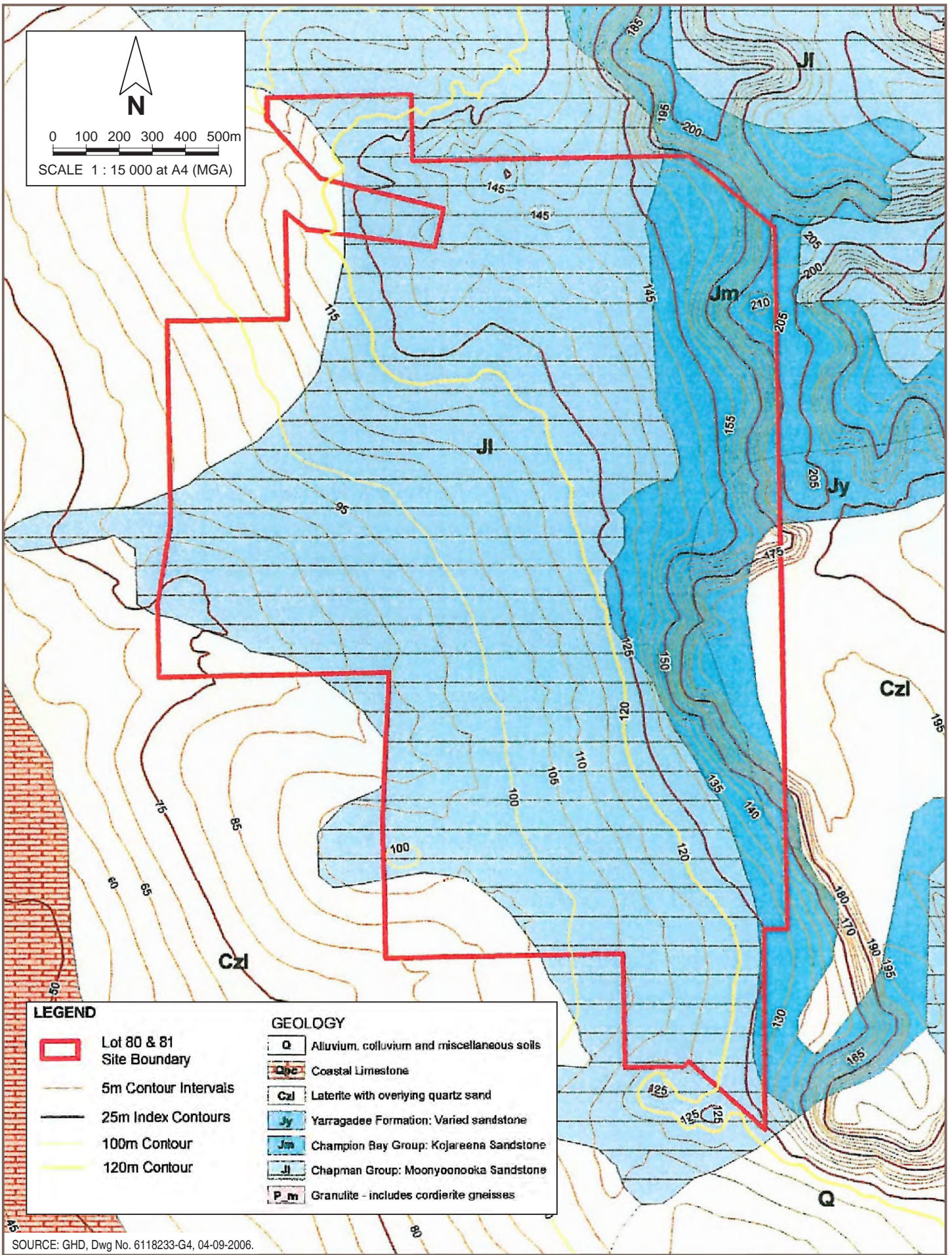
Job: HUMMOR01

Revision: A

**CITY OF GERALDTON-GREENOUGH
LOCAL PLANNING SCHEME ZONING**

Figure 3

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f03.dgn



SOURCE: GHD, Dwg No. 6118233-G4, 04-09-2006.

COTERRA
ENVIRONMENT

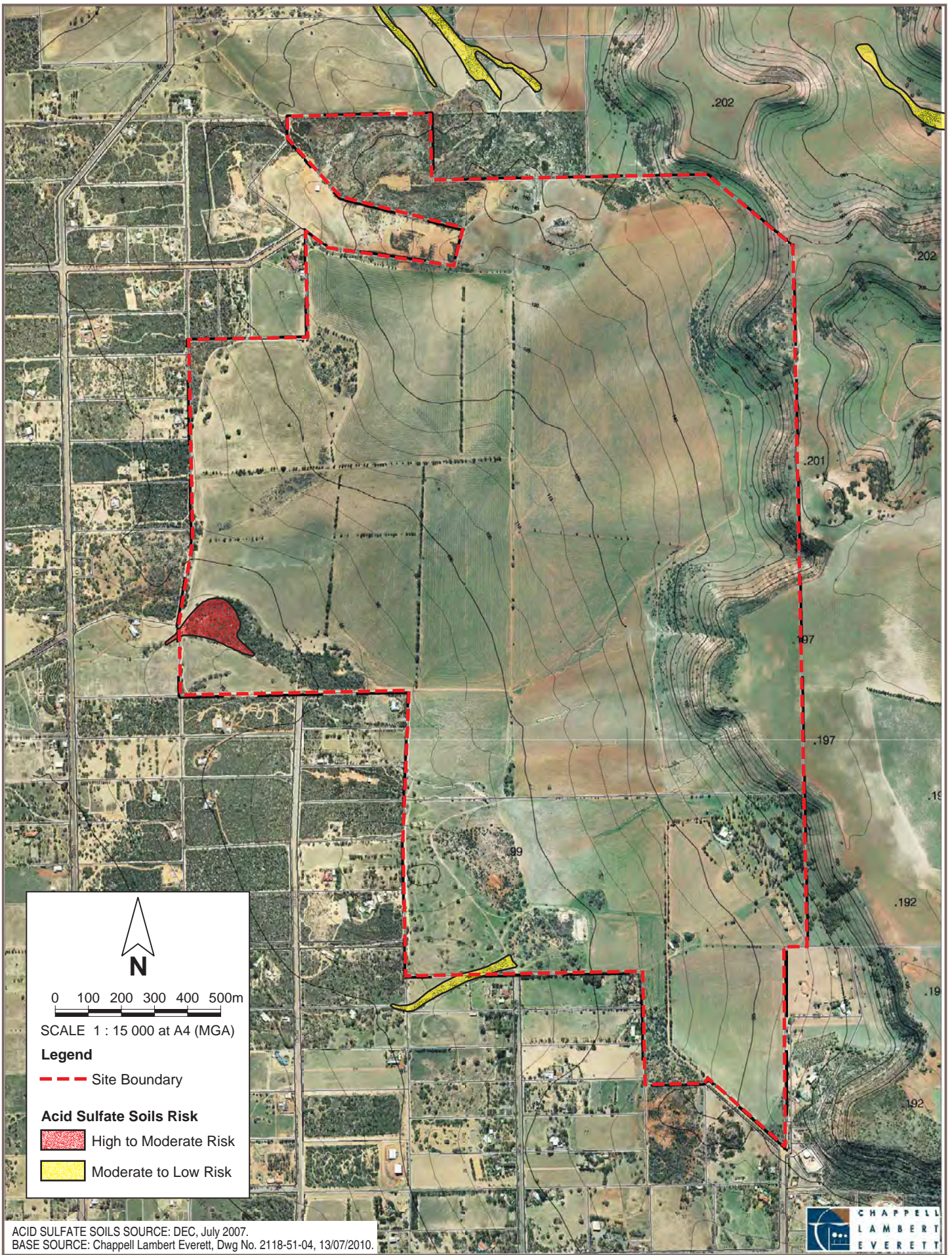
Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers Date: 11 May 2011
Job: HUMMOR01 Revision: A


TOPOGRAPHY AND GEOLOGY

Figure 4

HUMMOR01-f04.dgn
PINPOINT CARTOGRAPHICS (08) 9562 7136



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f05.dgn


N

0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend

- Site Boundary

Acid Sulfate Soils Risk

- High to Moderate Risk
- Moderate to Low Risk

ACID SULFATE SOILS SOURCE: DEC, July 2007.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



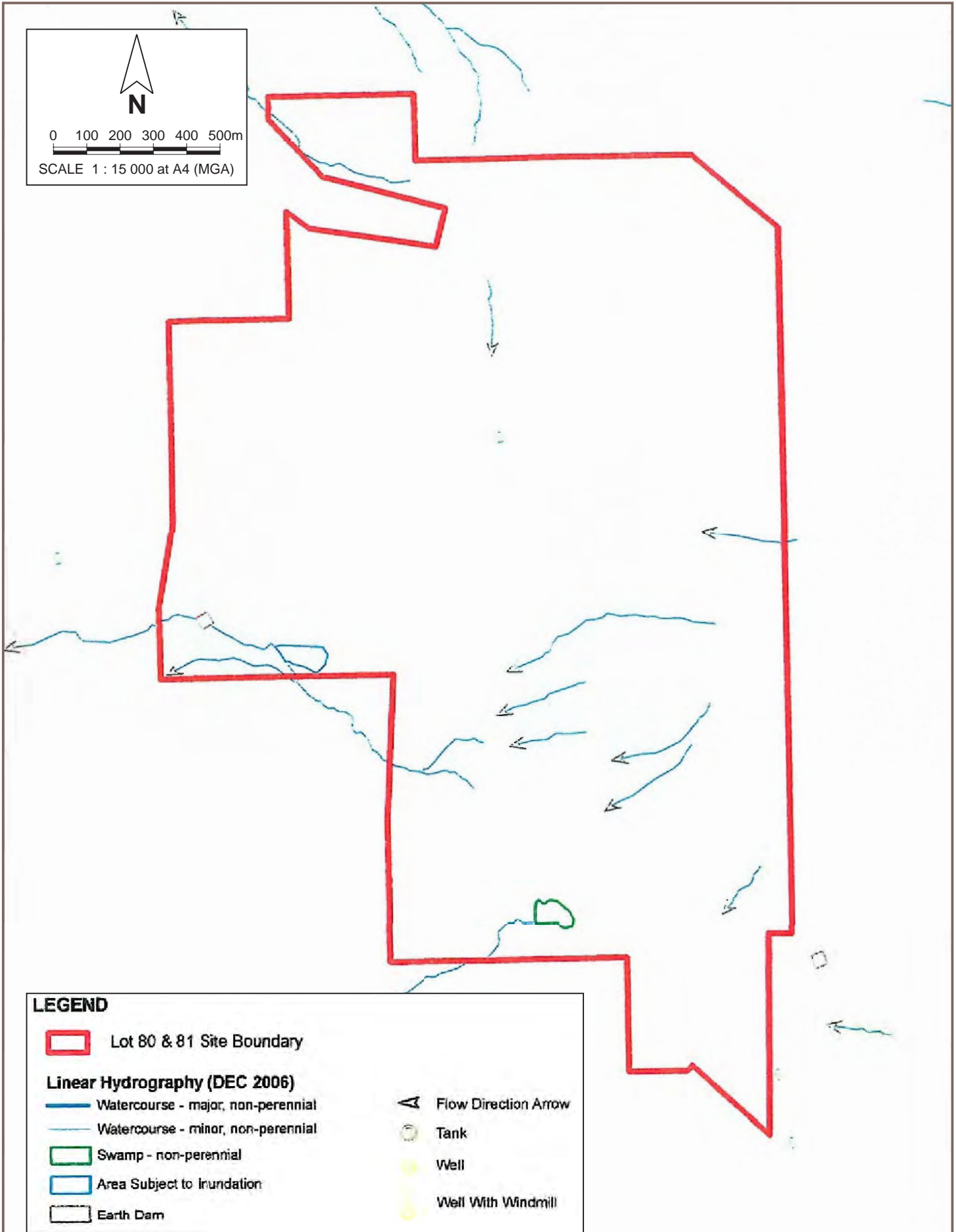
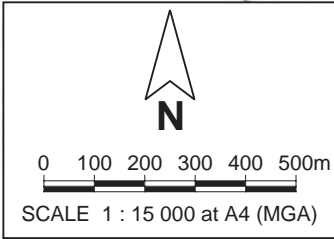
COTERRA
 ENVIRONMENT

Humfrey Land Developments
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
 GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

ACID SULFATE SOILS

Figure 5



LEGEND

- Lot 80 & 81 Site Boundary
- Linear Hydrography (DEC 2006)**
- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to Inundation
- Earth Dam
- Flow Direction Arrow
- Tank
- Well
- A Well With Windmill

SOURCE: GHD, Dwg No. 6118233-G5, 04-09-2006.

COTERRA
ENVIRONMENT

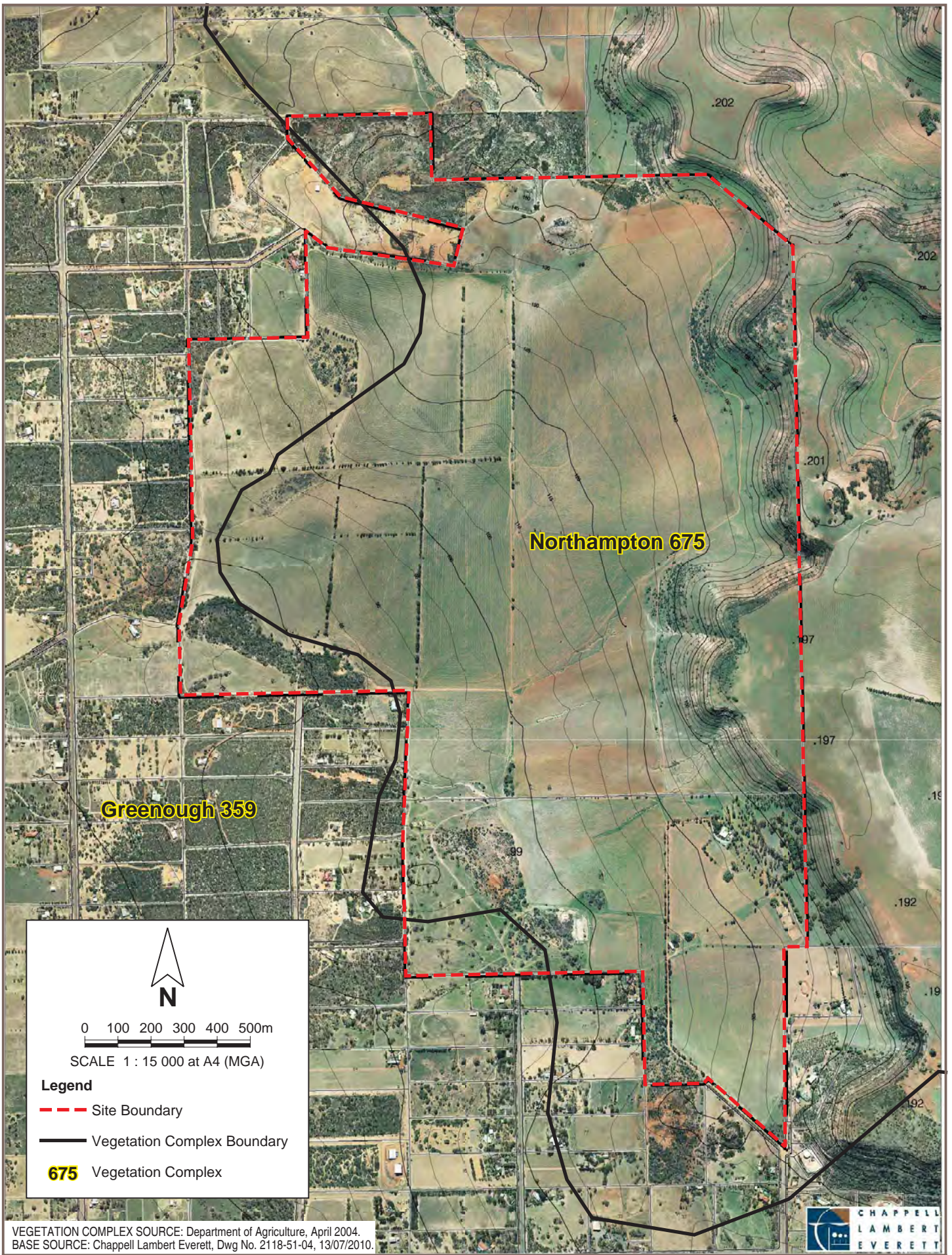
Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

WETLANDS AND SURFACE WATER FLOW

Figure 6

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f06.dgn



N

0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend

- - - Site Boundary
- Vegetation Complex Boundary
- 675 Vegetation Complex

VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



HUMMOR01-07.dgn

 PINPOINT CARTOGRAPHICS (08) 9562 7136

		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON	Figure 7
Drawn: L. Rogers	Date: 11 May 2011	REGIONAL VEGETATION COMPLEXES	
Job: HUMMOR01	Revision: A		

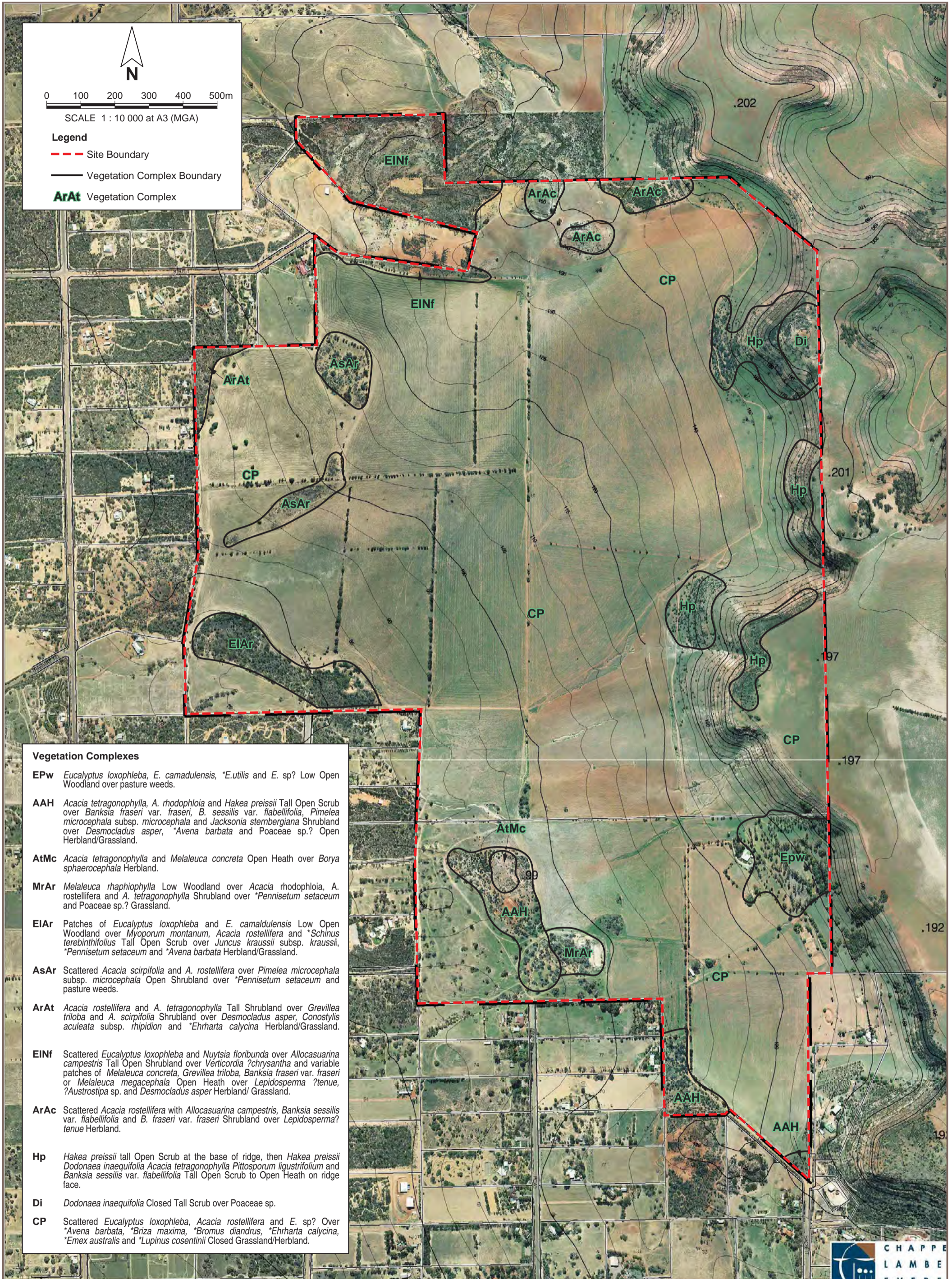
N

0 100 200 300 400 500m

SCALE 1 : 10 000 at A3 (MGA)

Legend

- - - Site Boundary
- Vegetation Complex Boundary
- ArAt Vegetation Complex



- Vegetation Complexes**
- EPw** *Eucalyptus loxophleba*, *E. camadulensis*, **E. utilis* and *E. sp?* Low Open Woodland over pasture weeds.
 - AAH** *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia stembergiana* Shrubland over *Desmocladius asper*, **Avena barbata* and *Poaceae sp?* Open Herbland/Grassland.
 - AtMc** *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland.
 - MrAr** *Melaleuca rhapsiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostellifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and *Poaceae sp?* Grassland.
 - EIAr** Patches of *Eucalyptus loxophleba* and *E. camadulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.
 - AsAr** Scattered *Acacia scirpifolia* and *A. rostellifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds.
 - ArAt** *Acacia rostellifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmocladius asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
 - EINF** Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenua*, **Austrostipa sp.* and *Desmocladius asper* Herbland/Grassland.
 - ArAc** Scattered *Acacia rostellifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland.
 - Hp** *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
 - Di** *Dodonaea inaequifolia* Closed Tall Scrub over *Poaceae sp.*
 - CP** Scattered *Eucalyptus loxophleba*, *Acacia rostellifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland.

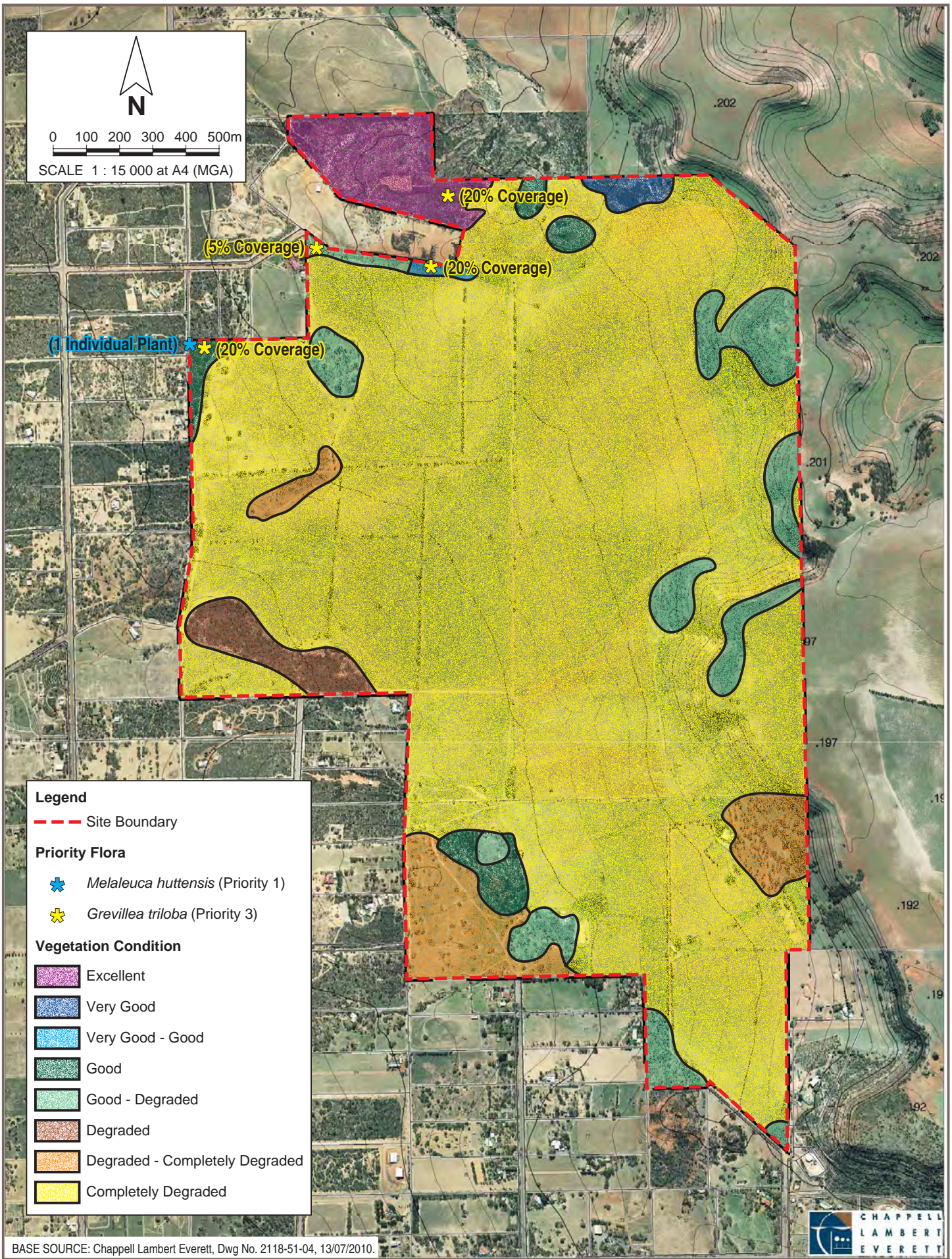


COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers Date: 11 May 2011
Job: HUMMOR01 Revision: A

SITE ASSESSED VEGETATION COMPLEXES



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f09.dgn



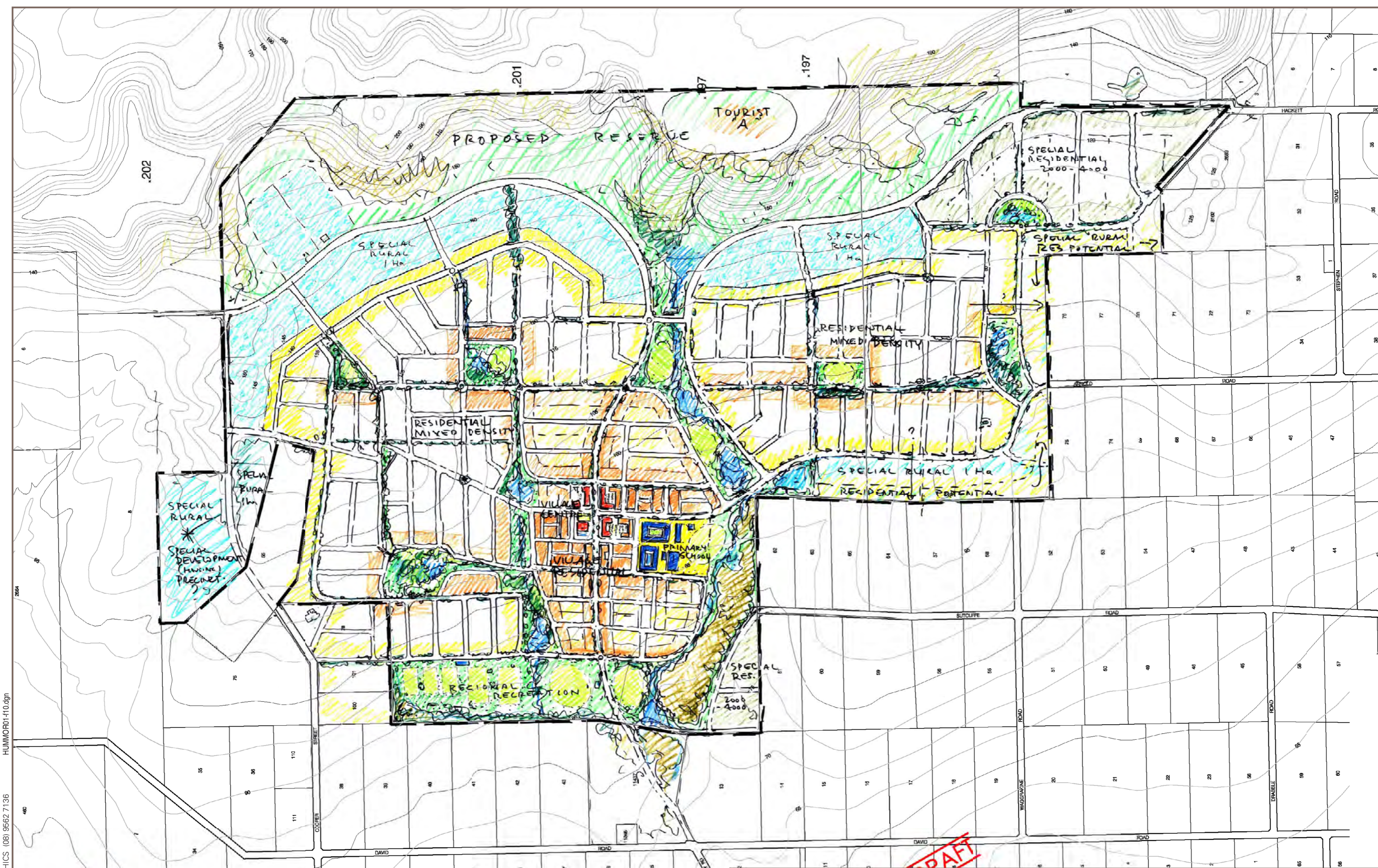
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA

Figure 9



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f10.dgn



**CHAPPELL
LAMBERT
EVERETT**

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-68-01, 08/04/2011.

COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers Date: 11 May 2011
Job: HUMMOR01 Revision: A

DRAFT DEVELOPMENT CONCEPT

Figure 10

**APPENDIX A - Priority Flora Survey for Lots 80 & 81 Hackett Road (GHD,
2007)**

**Humfrey Land
Developments**

**Report for Lots 80 & 81 Hackett
Road, Waggrakine Priority Flora
Survey**

**Addendum to September 2006
Environmental Assessment**

February 2007

Contents

1.	Introduction	1
1.1	Background	1
1.2	Scope of Works	1
2.	Desktop Review	2
2.1	Vegetation Composition	2
2.2	Priority Flora In the Vicinity	2
2.3	Threatened Ecological Communities In the Vicinity	4
3.	Targeted Flora Survey	5
3.1	Methodology	5
3.2	Site Vegetation Condition	5
3.3	Site Flora	6
4.	Conclusions	8
5.	Limitations of this Report	9
5.1	Survey Limitations	9
5.2	Report Limitations	9
6.	References	10

Table Index

Table 1	Regional Assessment of Vegetation Extent	2
Table 2	Threatened and Priority Flora	3
Table 3	Government of Western Australia (2000) Vegetation Condition Scale	8
Table 4	Priority Species Located on Site	6

Figure Index

Figure 1	Location Map
Figure 2	Site Aerial and Proposed Lot Layouts
Figure 3	Priority Flora
Figure 4	Vegetation Condition

Appendices

- A DEC Priority Flora Search Results**
- B Site Photos**
- C Flora Species Recorded on Site**

1. Introduction

1.1 Background

Hunfrey Land Developments (HLD) are proposing to develop a rural residential subdivision on Lots 80 and 81 Hackett Road, Waggrakine (the Site). The Site comprises two separate parcels of land, totalling an area of approximately 380 hectares (refer to Figure 1).

HLD previously requested GHD Pty Ltd (GHD) to undertake an environmental appraisal of the site in relation to the proposed development. GHD issued a report to HLD in September 2006 entitled "Lots 80 and 81 Hackett Road: Environmental Assessment", with the following recommendation for further work:

The following additional issues will require further assessment prior to finalising a development concept, and managed where the assessment suggest management is required:

- ▶ *Effluent disposal;*
- ▶ *Rare flora;*
- ▶ *Acid sulfate soils – only if excavation near wetlands is required; and*
- ▶ *Unexploded Ordnance.*

1.2 Scope of Works

In response to the recommendations of the September 2006 Environmental Assessment, HLD requested GHD to undertake a Priority Flora survey on the Site.

The scope of works involved:

- ▶ A desktop review, in particular a search of the DEC Threatened (Declared Rare) Flora (TFD) and the *Western Australian Herbarium Specimen (WAHERB)*, as well as the *Declared Rare and Priority Flora (DR&PF)* list. This information is attached at *Appendix A*;
- ▶ Targeted Priority Flora Survey;
- ▶ Herbarium verification of actual and potential Priority Flora; and
- ▶ Reporting.

The September 2006 report provides some comments regarding the likelihood of priority flora existing on the Site, but this addendum provides a more full response. This addendum should now form part of the existing September 2006 Environmental Assessment Report.

2. Desktop Review

2.1 Vegetation Composition

The composition of remnant native vegetation in the project area was interpreted from mapping conducted by Beard (1976). According to this mapping, the project area was originally likely to contain two vegetation communities being: Shrublands; mixed thicket (*Melaleuca* and *Hakea*) and Shrublands on the higher ground; and *Acacia* and *Banksia* scrub on the western portion of the Site.

The relative importance of conserving remnant native vegetation in the project area at a regional scale was determined via the analysis of aerial photos by Shepherd (*pers comm*, 2006), the dataset has been archived as the 2005 vegetation extent. The results of the Vegetation Association assessment for the Geraldton Sandplains IBRA (Interim Biogeographic Regionalisation for Australia) area are summarised in Table 1.

Table 1 Regional Assessment of Vegetation Extent

Vegetation Association	Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining (2005)
675	Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51,854	10,888	21.2
359	Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub.	44,412	8,383	18.9

The Environmental Protection Authority (EPA), has established through Position Statement No. 2, (*Environmental Protection of Native Vegetation in Western Australia*), the "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level. This is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type (EPA, 2000).

In the case of those Vegetation System Associations detailed in Table 1 above, less than 30% of the original regional extent remained intact as at 2005. Clearing of such vegetation may be considered contradictory to the EPA's recommendations stated in Position Statement No. 2. However, much of the Site proposed to be developed has been historically cleared of native vegetation for agricultural purposes, also several areas of remnant bushland (also degraded by past agricultural activities) are proposed to be set aside in Public Open Space (POS), as identified in Figure 2.

2.2 Priority Flora in the Vicinity

A search was undertaken through the Department of Environment and Conservation (DEC) Threatened (Declared Rare) Flora Database (TFD) and the *Western Australian Herbarium Specimen* (WAHERB) database for species of rare and priority flora located within the vicinity of the Site. Species found have been listed and described in Table 2.

Table 2 Threatened and Priority Flora

Species	Conservation Category	Database	Description (FloraBase, 2006)
<i>Drummondia ericoides</i>	DRF	TFD	Divaricately branched shrub, 0.3–1 m high. Fl. yellow, white, violet, purple, Sep–Oct. Rocky places.
<i>Verticordia penicillaris</i>	P4	TFD WAHERB	Low spreading shrub, 0.15–0.3 m high, to 1 m wide. Fl. cream, yellow, Sep–Oct. Shallow gritty soils. Granite outcrops.
<i>Eucalyptus bleasdelii</i>	DRF	TFD WAHERB	Mallee, 1–4 m high, bark smooth. Fl. white, cream, Aug–Nov. Grey sand, clay. Rocky hillsides, creek flats.
<i>Acacia guiretli</i>	P4	WAHERB	Spreading to straggling or erect & spindly shrub, 0.3–2(–2.5) m high. Fl. yellow, Jun–Sep. Rocky loam, lateritic gravelly soils. Stony hills.
<i>Thryptomene stenophylla</i>	P2	WAHERB	Spreading shrub, 0.3–1.2 m high. Fl. pink, purple, Jun–Aug. Red or yellow sand, loam. Limestone hills, sandplains.
<i>Grevillea triloba</i>	P3	WAHERB	Diffuse or spreading shrub, (0.4–)0.9–1.5(–2.5) m high. Fl. white, pink, Jun–Oct. Sandy loam on sandstone or limestone, lateritic soils.
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3	WAHERB	Open shrub, 0.4–1.3 m high. Fl. pink, white, Sep–Dec. Sandy gravelly soils.
<i>Vittadinia cervicularis</i> var. <i>occidentalis</i>	P1	WAHERB	Annual, herb, more than 0.3 m high. Fl. white, purple, blue, Aug–Sep.
<i>Melaleuca huttensis</i>	P1	WAHERB	Upright shrub, to 3 m high, bark gnarled, white to grey. Fl. cream, yellow, Jun–Sep. Light yellow or beige sand. Lower slopes of undulating plains, sandplains.
<i>Eucalyptus diminuta</i>	P4	WAHERB	Mallee, 1.7–5 m high. Fl. white, cream, Jul–Nov. Sandy clay, white/grey sand, often over laterite. Sandplains, near swampy areas.
<i>Eucalyptus cupree</i>	DRF	WAHERB	Mallee, 2.5–5 m high, bark rough to 1.5 m, box-type. Fl. white, Aug–Nov. Shallow soils over granite.
<i>Thryptomene</i> sp. <i>Moresby Range</i>	P3	WAHERB	Spreading shrub, 0.3–1 m high. Fl. pink, Jul–Sep. Light brown loam, clay loam, sandy clay, sandstone. Hillsides & summits.

Conservation Category Key:

- DRF Declared Rare Flora, taxa which are deemed to be in the wild rare, in danger of extinction, or otherwise in need of special protection and have been declared under the Wildlife Conservation Act 1960 to be "rare flora".
- P1 Taxa known from only one, or a few populations which are under threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P2 Taxa known from only one, or a few populations, at least some of which are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P3 Taxa which are known from several populations, and the taxa are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.

P4 Taxa which are considered to have been adequately surveyed and which, whilst being rare, are not currently threatened by any identifiable factors.

DEC also provided results from a search of their *Declared Rare and Priority Flora (DR&PF)* list. The species in this list are those known to exist in the general Geraldton region and surrounds, and not to this project Site specifically.

The results of these searches are attached at **Appendix A**.

The previous report considered the possibility of these species being found on Site was low due to the degraded nature of the land and continued disturbance through grazing activities, however, the DEC search did indicate that priority species were previously located on Site, refer to Figure 2.

2.3 Threatened Ecological Communities in the Vicinity

A search of the CALM Threatened Ecological Community (TEC) database was undertaken. No known occurrences of threatened ecological communities have been recorded within the Site boundaries.

CALM further advised that there are known occurrences of the priority ecological community referred to as "*Melaleuca megacephala* and *Hakea pycnonera* thickets on the Moresby Range" within 10 kilometres of the Site.

3. Targeted Flora Survey

3.1 Methodology

A site visit was conducted by GHD on 11th August 2006 as part of the original environmental assessment work. A further site visit was conducted on the 21st September 2006 to survey the area for priority flora known to exist in the vicinity, as per the CALM search results. A final inspection was undertaken on the 21st December 2006 to review the Priority Flora populations.

The site was inspected on foot and by vehicle for the CALM listed Priority Flora species. Other common native species were recorded, but a full flora survey of the Site was not undertaken. The survey particularly focused on bushland areas to the west of the Site in or adjacent to proposed development areas. No detailed survey was undertaken of the escarpment, plateau or bushland area to the north, as these locations are proposed to be set aside in Public Open Space (POS).

No quadrat or transect recordings were undertaken.

Any potential Priority Flora species that couldn't be readily identified, were collected and identified at the Perth Herbarium at later date.

3.2 Site Vegetation Condition

The vegetation at the Site was given a condition rating based on the Bush Forever (Government of Western Australia, 2000) vegetation condition ratings scale. This scale recognises a level of intactness of vegetation, which is defined by the following:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping;
- The potential for natural or assisted regeneration.

The ratings in this scale are described in Table 3.

The majority of the Site supported Completely Degraded (Condition 6) agricultural grazing land, as shown in the aerial photograph in Figure 2 and photographs in Appendix B. Some individual, or copses of, remnant trees remain in these areas.

One area of Excellent (Condition 2) and several areas of Very Good (Condition 3) vegetation do exist to the north of Lot 81, in general these areas are proposed to be set aside in POS. Other areas of remnant bushland that are to be set aside in POS are considered to vary from Very Good to Degraded (Condition 3 to 5).

One isolated portion of bush on the western boundary (containing all of the Priority Flora) is also considered to be in Very Good to Good (Condition 3 to 4) condition, this area has been shown as being located within a proposed development lot.

The wetland area on Lot 80 had been recently burnt and so it was not possible to assess the condition of this section, it is assumed that this area was similar to the surrounding unburnt areas.

Vegetation conditions have been presented in Figure 4.



Table 3 Government of Western Australia (2000) Vegetation Condition Scale

Assigned Number	Classification	Description
1	<i>Pristine or nearly so</i>	No obvious signs of disturbance
2	<i>Excellent</i>	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species
3	<i>Very Good</i>	Vegetation structure altered, obvious signs of disturbance
4	<i>Good</i>	Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it
5	<i>Degraded</i>	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6	<i>Completely degraded</i>	The structure of the vegetation is no longer intact and the area is completely or almost without native species

3.3 Site Flora

3.3.1 General

Although a full flora survey was not conducted as part of this assessment a list of common weed and native species on site have been tabulated in Appendix C.

3.3.2 Priority Species

The site was inspected for the Priority Flora species identified by the DEC searches.

No Declared Rare Flora (DRF) was recorded on site.

Three Priority Flora species were identified, being; *Gleznovia verrucosa* ssp *formosa*, *Grevillea triloba* and *Metaleuca huttensis*. Refer to Table 4 for details.

Table 4 Priority Species Located on Site

Species	Conservation Code (see details at Table 2)	Number of plants seen
<i>Gleznovia verrucosa</i> ssp <i>formosa</i>	P3	1
<i>Grevillea triloba</i>	P3	> 100
<i>Metaleuca huttensis</i>	P1	1

The general location of these species has been shown in Figure 3.

Note, the *Gelasynowia verrucosa* ssp *formosa* was not located again in the December 2006 review, therefore no GPS position was recorded, however, the one plant located during the September 2006 survey was known to have occurred in the small area of bush in which the *Melaleuca huttersis* was located (with the general location indicated on Figure 3).

3.3.3 Threatened Ecological Communities

The DEC referred to the possibility of a "*Melaleuca megacephala* and *Hakea pycnantha* thickets on the Moresby Range" within 10 kilometres of the Site. Neither this TEC, nor these flora species, were identified on site.

3.3.4 Weed Species

The site was largely covered with pastoral weed species. Common weed species are included in the plant species list at Appendix C, identified by an asterix (*) notation.

One species, Paterson's Curse, identified on site is declared under the *Agriculture and Related Resources Protection Act (1976)*. Within the Shire of Greenough this is classified as a P1 declared plant species, which prohibits movement of plants or their seeds within the State and prohibits the movement of contaminated machinery and produce including livestock and fodder.

4. Conclusions

The Site largely supports completely cleared and degraded agricultural land, however, there are small isolated pockets of vegetation in Good to Very Good condition.

The survey undertaken found no Declared Rare Flora (DRF) on site, however, three species of Priority Flora were identified.

DRF is protected under the *Wildlife Conservation Act 1950* and any disturbance to these species requires permission to 'take'. To 'take' under the Act includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora. Additionally, the DEC keeps a list of Priority Flora species, that are not listed under legislation but for which the DEC feels there is cause for concern, or for which not enough information is known. The DEC would expect to be consulted with regards to potential loss of Priority Flora species.

Any clearing on site would require a clearing permit approval under the *Environmental Protection Act 1986*, unless the activity qualifies for an exemption under the Act or the *Environmental Protection (Clearing of Native Vegetation Regulations) 2004*. For example, exemptions are available for some approvals received under the *Town Planning & Development Act 1928*.

5. Limitations of this Report

5.1 Survey Limitations

This report presents the results of a desktop review and a single targeted Priority Flora site inspection carried out on the 21st September 2006.

This survey was carried out during only one season, and in one year. Complete surveys require multiple surveys, at different times of the year, and over a period of a number of years, to enable full survey of all species present.

Some flora species, such as annuals, are only available for collection at certain times of the year, and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to above factors. Therefore, while this flora survey was conducted at a time of year when the majority of the flora species would be able to be identified, there is the possibility that some species of Priority Flora on site have been overlooked.

The report provided does not meet the requirements of the Environmental Protection Authority (2004) *Guidance No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. However, due to the disturbed nature of the area, the opportunistic survey undertaken should be adequate for impact assessment purposes.

5.2 Report Limitations

This report presents the results of a targeted flora investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project described herein and must be reviewed by a competent scientist before being used for any other purpose. GHD Pty Ltd accepts no responsibility for other use of the data.

Where reports, searches, any third party information and similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

For these investigations GHD has conducted desktop data searches and field surveys. The conclusions of this report were based on the information gathered during these investigations and thus reflect the environment of the Site at the time of survey. GHD accepts no responsibility for any variation in the flora present at the Site due to natural and seasonal variability.

6. References

Agriculture and Related Resources Protection Act (1976).

Beard, J.S. (1976) *Vegetation Survey of Western Australia: The Vegetation of the Geraldton Area, Western Australia.* Vegmap Publications, Perth.

Environmental Protection Authority (2000) *Environmental Protection of Native Vegetation in Western Australia. clearing of native vegetation, with particular reference to the agricultural area.* Position Statement No. 2. Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Act 1966

Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

GHD Pty Ltd (2006) *80 & 81 Hackett Road, Waggrakine: Environmental Assessment.*

Government of Western Australia (2002) *Bush Forever Volume 2 – Directory of Bush Forever Sites.* Western Australian Planning Commission, Western Australia.

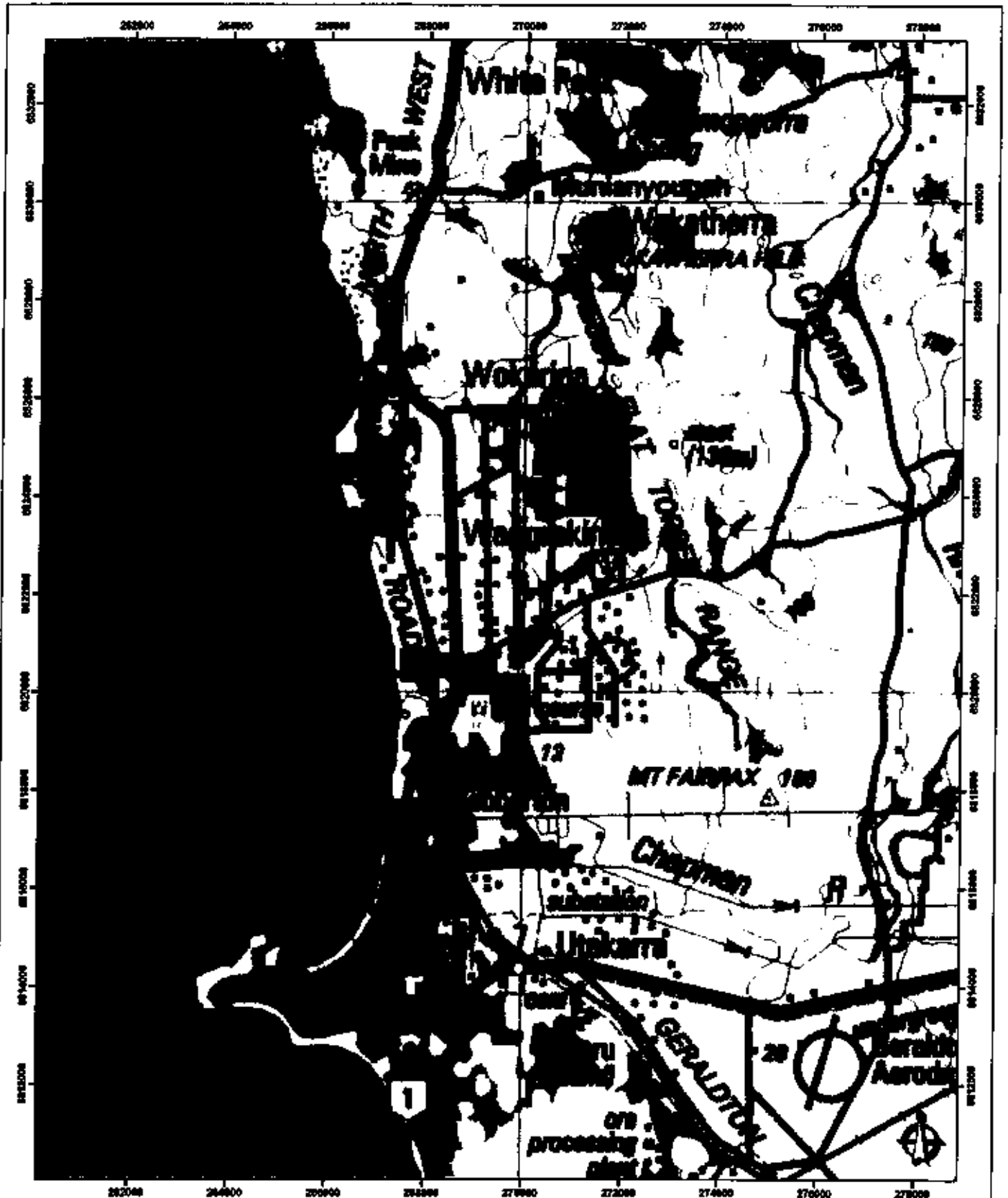
Shepherd, D.P, Beeston, G.R and Hopkins, A.J.M (2002) *Native Vegetation in Western Australia: Extent, Type and Status.* Natural Resource Management Technical Report No. 249: Department of Agriculture.

Shepherd, D.P. (2006) *Personal Communication.* Information updated from above reference, but not as yet developed into a final report.

Town Planning & Development Act 1928

Wildlife Conservation Act (1950).

Figures



LEGEND

 Lot 60 & 61 Hackett Rd Site Boundary

SCALE
 750 0 750 1,500 2,250m
 1:75,000 at A3

LOCALITY MAP



Wooroloo W.A.

COPYRIGHT

THE INFORMATION ON THIS MAP IS THE PROPERTY OF GILLY & PARTNERS
 AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS
 WITHOUT THE WRITTEN PERMISSION OF GILLY & PARTNERS

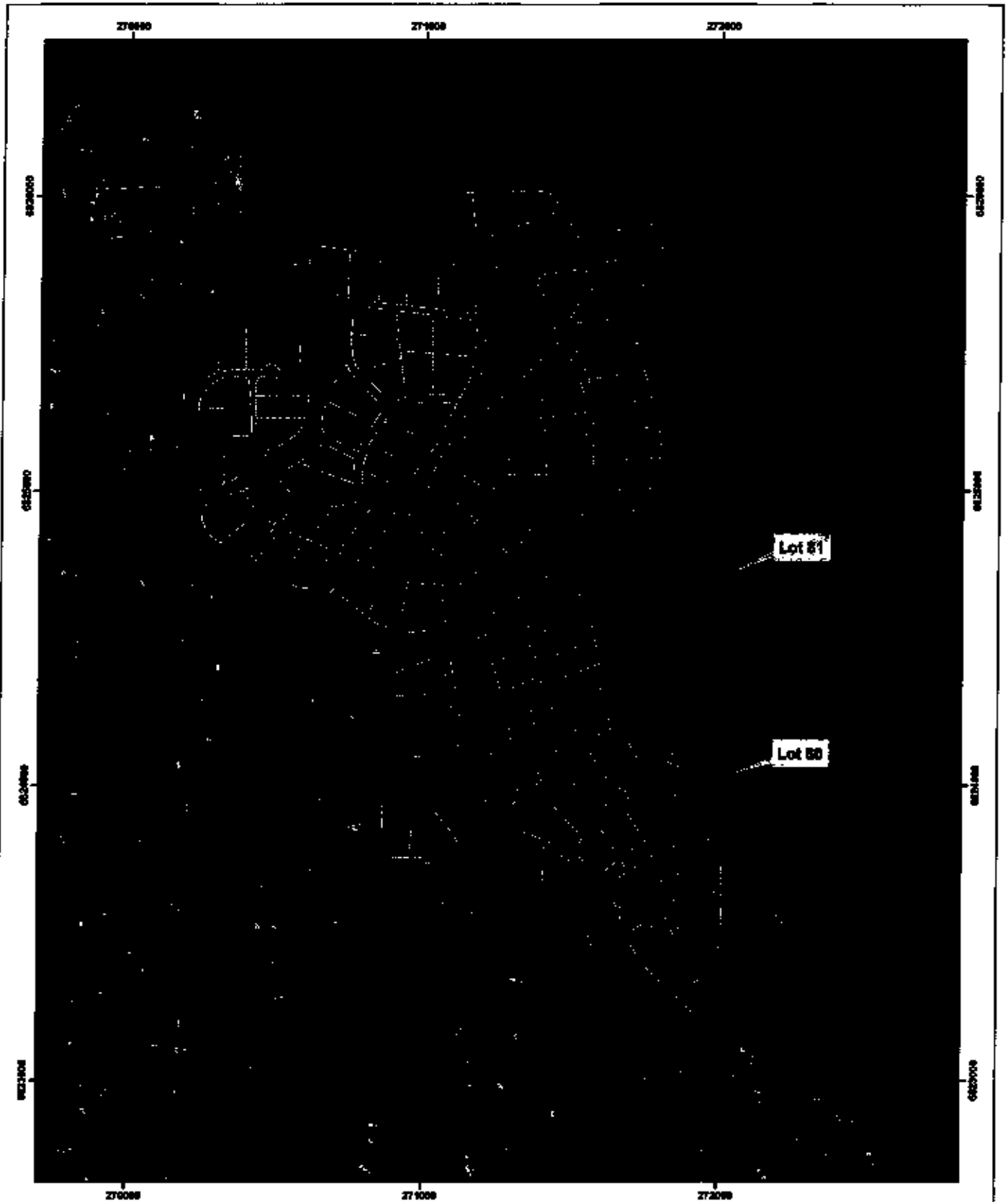
CREATED BY ML	CHECKED	APP'D BY
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
VERTICAL DATUM: NA		METADATA: ISO19115-2
DATE 04.08.2009	FILE LOCATION I:\GIS\Projects\Wooroloo\116225-09.mxd	
REVISION 0	CREATED BY ML	






Environmental Assessment
 Hackett Road, Wooroloo

Figure 1 - Site Locality

MAP UNITS PROMOTED IN MGA ZONE 50
 NOTE THAT POSITIONAL ERRORS CAN BE ± 5M IN SOME AREAS
 THIS BOUNDARY SHOULD BE CHECKED ON THE GROUND



LEGEND

-  Existing Cadastre
-  Proposed Subdivision Cadastre
-  Lot 60 & 61 Site Boundary

SCALE
 0 125 250 375m
 1:12,800 at A3



COPYRIGHT
 INFORMATION CONTAINED HEREIN IS THE PROPERTY OF GHD Pty Ltd
 THIS DOCUMENT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS
 WITHOUT THE WRITTEN PERMISSION OF GHD Pty Ltd

CREATED BY WD	CHECKED	APPROVED
-------------------------	----------------	-----------------

NORTHING DATUM: GDA 84	PROJECTION: UTM ZONE 50
EASTING DATUM: M	METADATA RECORDED: 1998

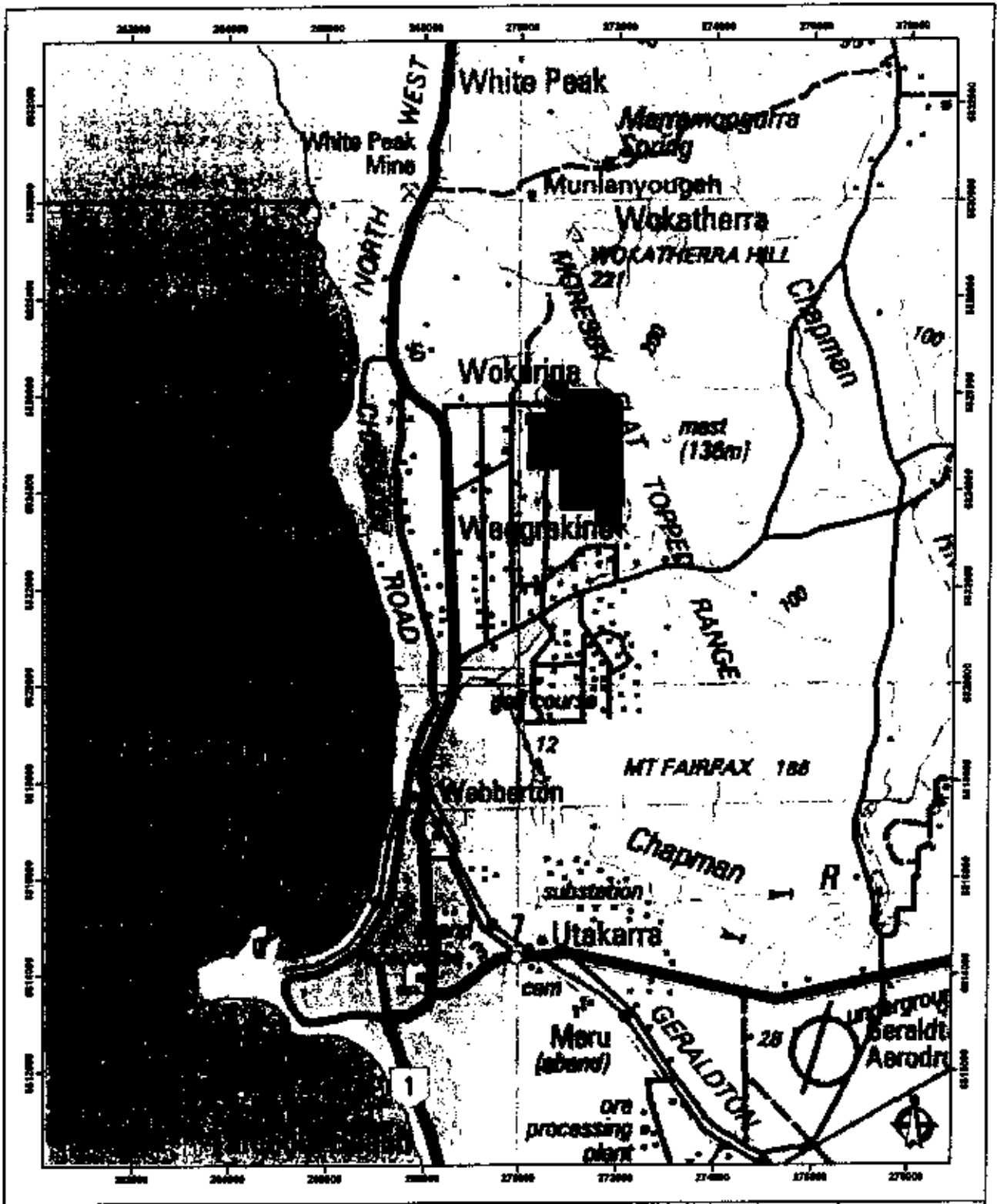
DATE 12.02.07	FILE LOCATION G:\PROJECTS\Wagga\Wagga\120206-02_Rev1.dwg
REVISION 1	DRAWING NO 04WEG-02




Environmental Assessment
Heekod Road, Wagga

Figure 2 - Proposed Development

NOTE THAT POSITIONAL ERRORS CAN BE ± 0.4 M AT 95% CL
 AIRPHOTO PHOTOGRAPHY ACQUIRED FROM DJL - 2005 ORIGINATOR'S RECORD REPRODUCED BY PERMISSION
 OF THE DEPT. OF LAND INFORMATION SYSTEMS, WESTERN AUSTRALIA, COPYRIGHT LICENSE 2006/04



LEGEND

 Lot 80 & 81 Hackett Rd
Site Boundary

MAP DATA PROVIDED BY BUA LTD/BC
NOTE THAT PORTION AREAS CAN BE ± 5M IN SOME AREAS
2004 BUREAU OF GEOSCIENCE AUSTRALIA



COPYRIGHT
MATERIALS AND INFORMATION CONTAINED HEREIN ARE THE PROPERTY OF BUA LTD/BC AND ARE NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF BUA LTD/BC.

DESIGNED BY ML	CHECKED	APPROVED
-------------------	---------	----------

REVISION/DATE/USER: 004/9/04 REVISION/DATE/USER: NA	PRODUCTION AND SCALE TO BE REVISIONS/DATE/USER: 007/04
--	---

DATE 04/09/2004	FILE LOCATION \\BUE01\BUE00\proj\004\004\004\004.dwg
REVISION 0	ISSUING NO 01/0007-00






Environmental Assessment
Hackett Road, Waggakine

Figure 1 - Site Locality



LEGEND

-  Existing Cadastral
-  Proposed Subdivision Cadastral
-  Lot 80 & 81 Site Boundary

NOTE THAT CERTAIN FEATURES CAN BE - BE IN SOME AREAS
 AREAL PHOTOGRAPHY SOURCES FROM 2011 DEVELOPMENTAL INFORMATION PROVIDED BY PERMISSION
 OF THE DEPT. OF LAND INFORMATION UNDER ARRANGEMENTS. COPYRIGHT LEGALISE 2011.

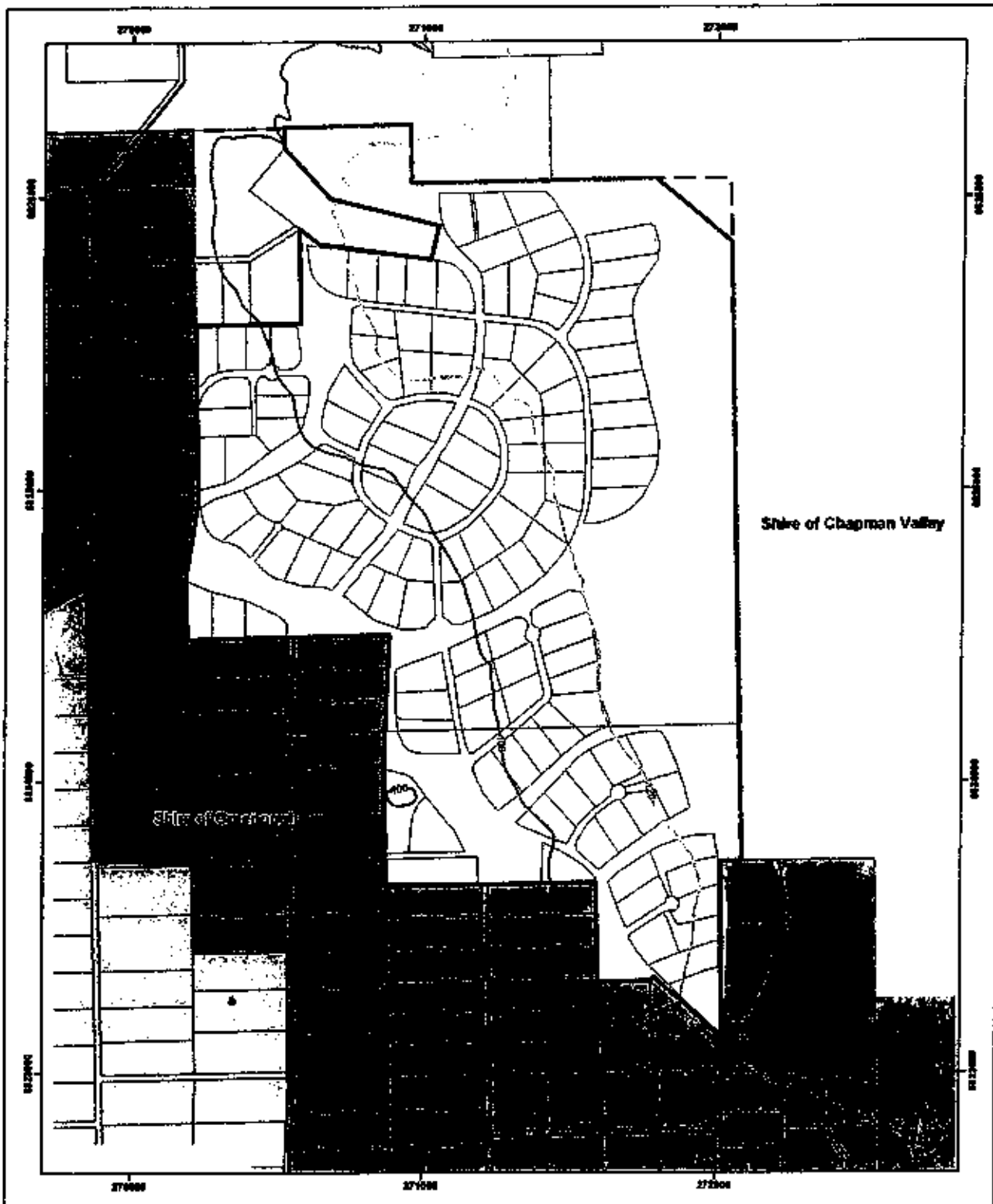


MID-WEST W.A.

COPYRIGHT
UNIVERSITY OF WASHINGTON, copyright 2011. All rights reserved. This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

DESIGNED BY ML	APPROVED [Signature]
REVISIONS 1	DATE 04/01/2010
PROJECT: PROPOSED SUBDIVISION OF LAND LOCATION: HEWITT ROAD, WAGGALINE	

Environmental Assessment
 Hewitt Road, Waggaline
Figure 2 - Proposed Development



LEGEND

- Existing Caustasia
- Proposed Subdivision Caustasia
- 100m Contour
- 120m Contour
- ▭ Lot 80 & 81 Sta Boundary
- ▭ Local Government Boundary

Northern Camaldon District Structure Plan Area

- ▭ R17
- ▭ R10 B
- ▭ R10 A

NOTE THAT PORTION OF THESE COORDINATES ARE NOT TO BE USED FOR ANY PURPOSES OTHER THAN FOR THE PURPOSES OF THIS DOCUMENT AND ANY REPRODUCTION OF THESE COORDINATES FOR ANY OTHER PURPOSE IS PROHIBITED.

SCALE
0 125 250 375m

LOCALITY MAP



MID-WEST WA

COPYRIGHT

THIS DOCUMENT IS THE PROPERTY OF THE DEPARTMENT OF WATER AND POWER SUPPLY AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE DEPARTMENT OF WATER AND POWER SUPPLY.

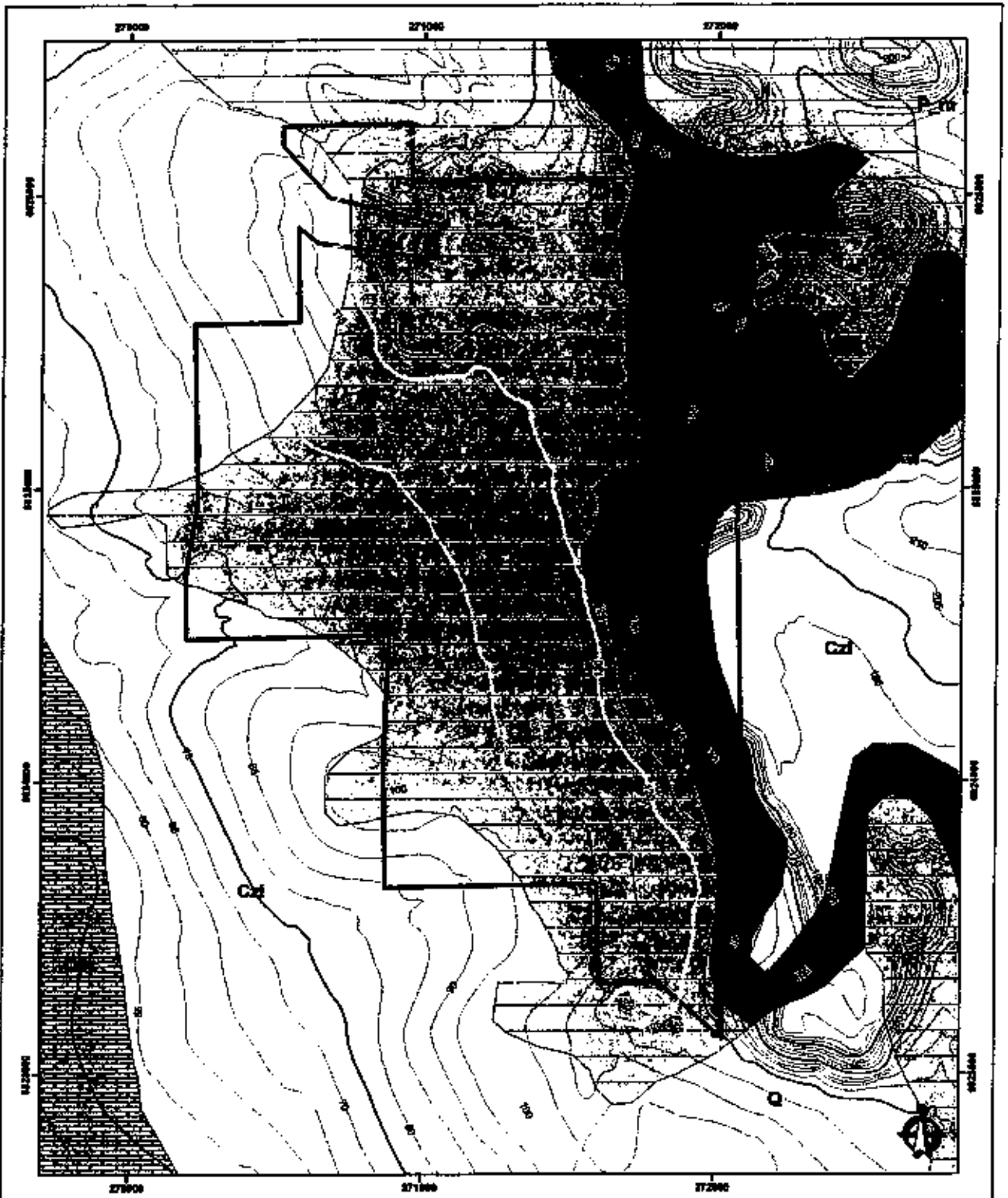
CREATED BY: ML CHECKED: APPROVED:

PROJECT NO: 004-04 PROJECT NO: 004-04
 PROJECT NAME: MID-WEST WA PROJECT NAME: MID-WEST WA

DATE: 01/01/2004 FILE LOCATION: \\server\projects\004-04\004-04.dwg
 REVISION: 0 DRAWING NO: 01/0001-02_Planning

Environmental Assessment
 Newby Road, Wagga Wagga

Figure 3 - Planning Scheme and Constraints



LEGEND

- Lot 80 & 81 Site Boundary
- 5m Contour Intervals
- 25m Index Contours
- 100m Contour
- 120m Contour

GEOLOGY

- Alluvial, colluvial and miscellaneous soils
- Coastal Limestone
- Csl Laticite with overlying quartz sand
- Yamagata Formation: Vailed sandstone
- Champion Bay Group: Kojanass Sandstone
- Chagross Group: Mooryosotoka Sandstone
- Granite - Includes cordierite gneiss

MAP UNITS PROJECTED IN NAD 83 ZONE 67
NOTE THAT PORTIONING ERRORS CAN BE > 6M IN SOME AREAS

SCALE

125 0 125 250 375m

1:12,500 @ A3

LOCALITY MAP

ARO-WEST W/A

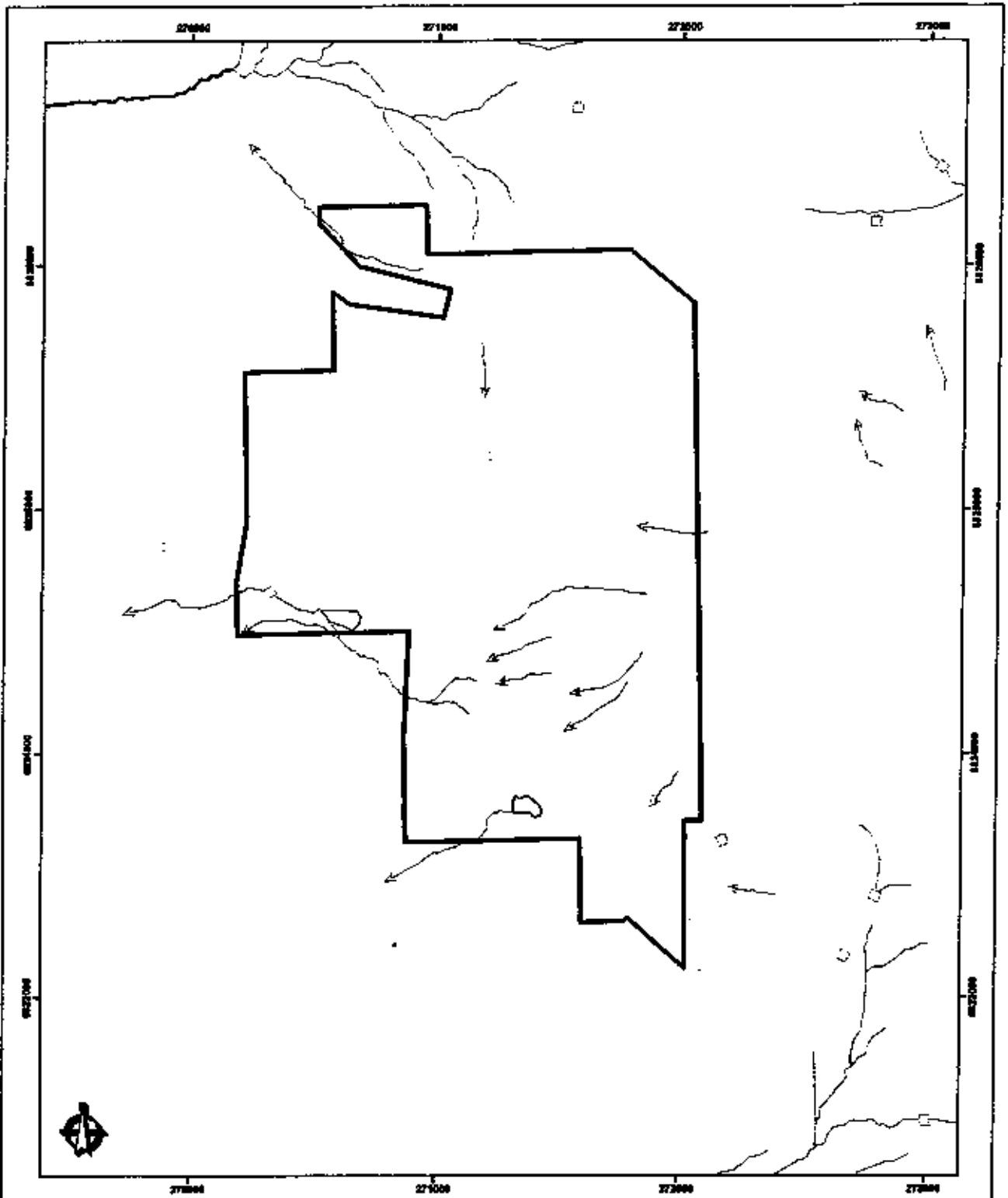
COPYRIGHT

TRADEMARKS AND REGISTERED SERVICE MARKS ARE THE PROPERTY OF THE ORIGINAL OWNERS AND ARE USED HEREIN UNDER LICENSE. ALL RIGHTS RESERVED. FOR SERVICE AND INFORMATION PURPOSES ONLY. THIS DOCUMENT IS THE PROPERTY OF THE ORIGINAL OWNER AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

CREATED BY BL	CHECKED	APPROVED
HORIZONTAL DATUM: GDA 84		VERTICAL DATUM: MGA 84
HEIGHT SYSTEM: NA		PROJECTION: UTM
DATE 14/01/2008	FILE LOCATION C:\PROJ\2008\140108\140108_04_gm_report.mxd	
PROJECT 0	SCALE 1:12500	

Environmental Assessment
Hackett Road, Waggeville

Figure 4 - Geology and Topography



LEGEND

- Lot 80 & 81 Site Boundary
- Lower Hydrography (DEC 2005)**
- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to Inundation
- Earth Dam

- Flow Direction Arrow
- Tank
- Well
- Well With Windmill

SCALE
 1:75,000 M.A.S.
 0 100 200 400m



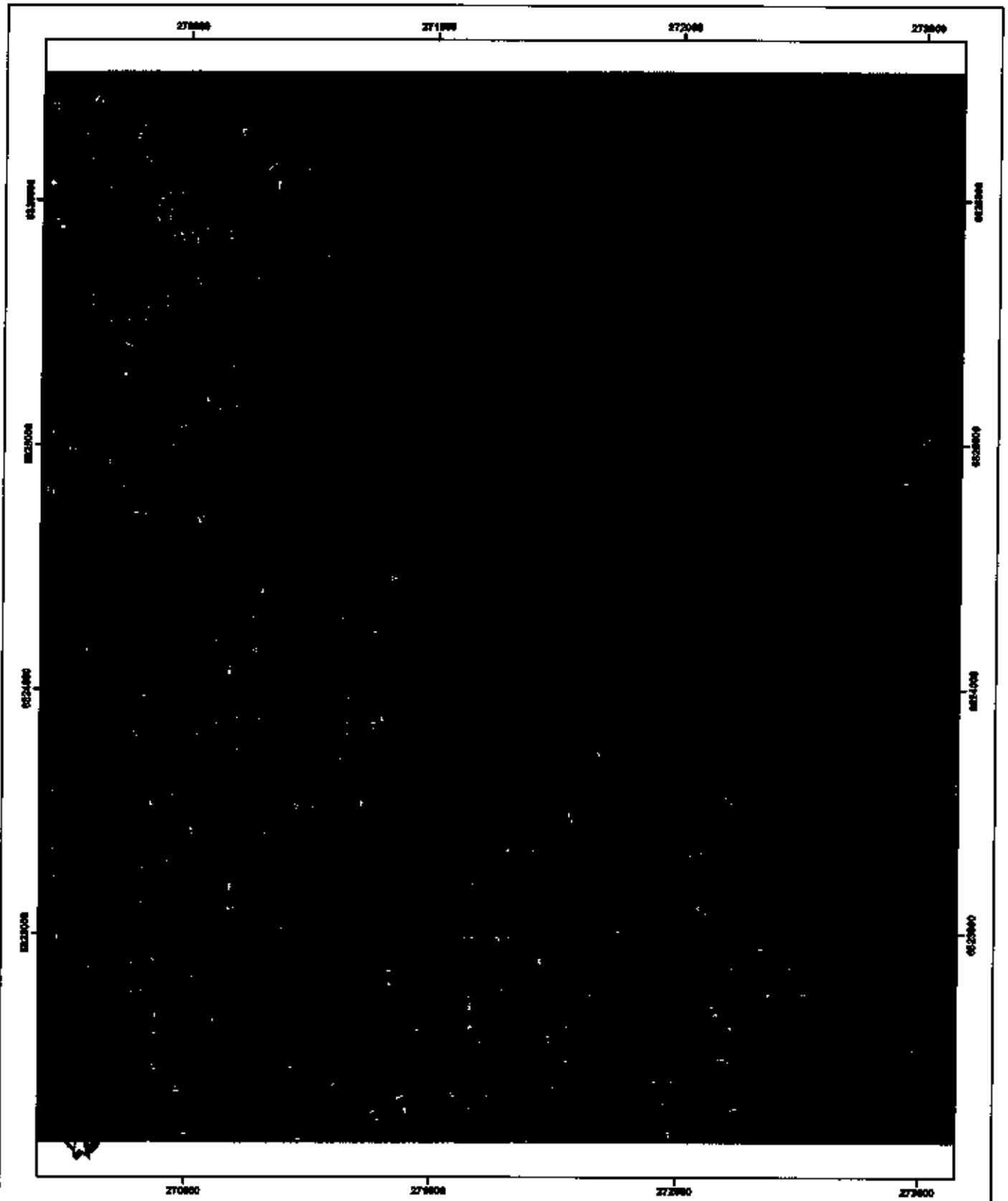
COPYRIGHT
 THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF THE TERRITORY OF NORTHWEST TERRITORIES AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

DATE: 04.06.2008	FILE LOCATION: \\S:\Projects\Hydro\2008\110205-02_Hydro.mxd
REVISION: 0	DISCUSSION ID: 110205-02

Environmental Assessment
 Hockatt Road, Waggonville

Figure 6 - Hydrography

MAP DATA PROVIDED BY AEN 2008-02. NOTE THAT POSITIONAL ACCURACY CAN BE +/- 5m IN SOME AREAS.



LEGEND

Lot 80 & 81 Site Boundary
 Declared Rare and Priority Flora
 (R) Declared Rare Flora - Extant Taxa
 Priority 1 - Poorly Known Taxa
 Priority 2 - Poorly Known Taxa
 Priority 3 - Poorly Known Taxa
 Priority 4 - Rare Taxa

Priority Species
Grevillea adspira
Melaleuca holtzei
Galaxiomyia ventricosa sp. formosa

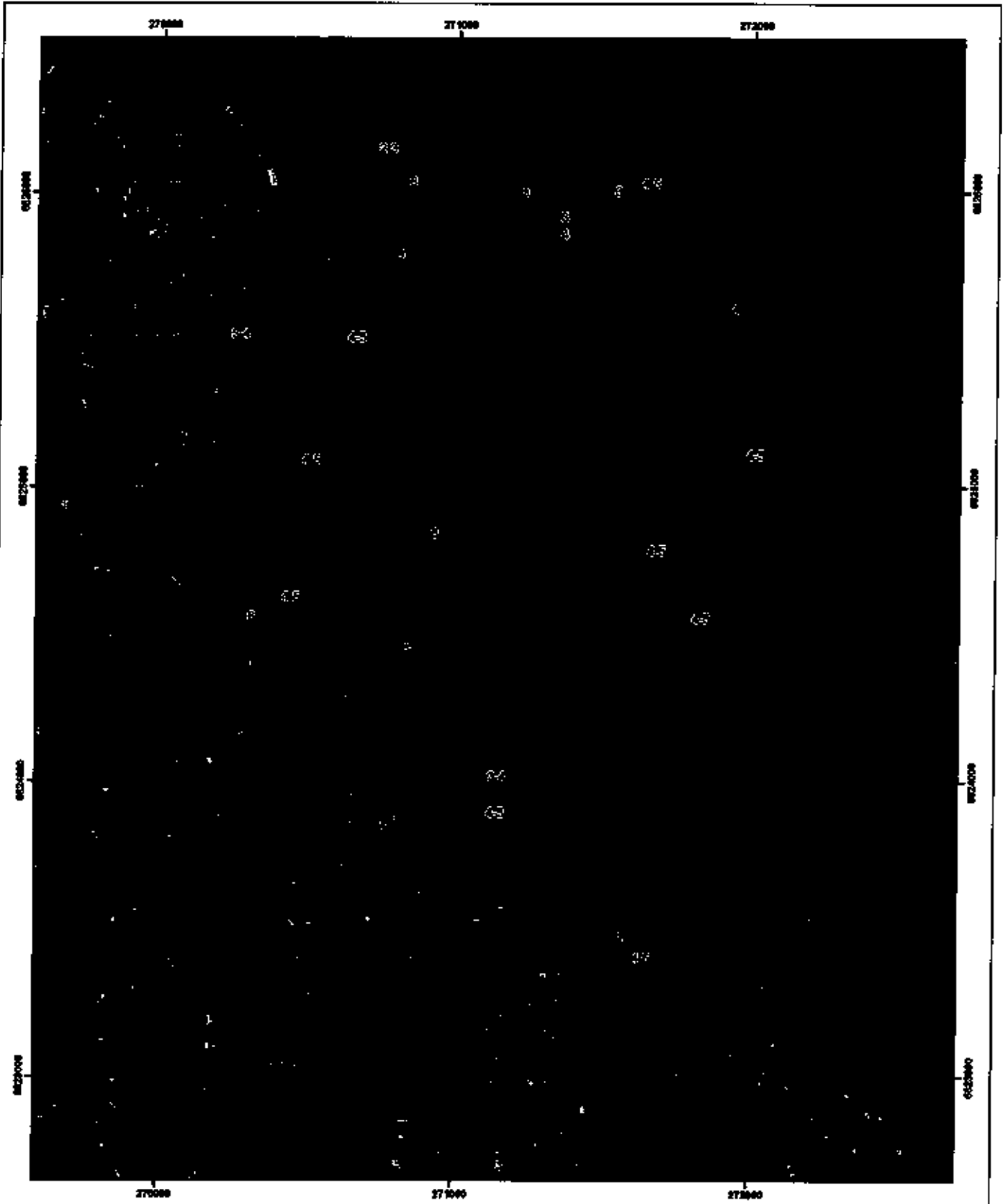
MAP UNITS PROJECTED IN MGA ZONE 80 NOTE THAT POSITIONAL ERRORS CAN BE ± 5M IN SOME AREAS

SCALE
 100 0 100 200 400m
 1:10,000 at A3
LOCALITY MAP



 MND-WEST W.A.
COPYRIGHT
THE GOVERNMENT OF WESTERN AUSTRALIA
 THE GOVERNMENT OF THE STATE OF WESTERN AUSTRALIA
 FOR ALL RIGHTS RESERVED AND IN ACCORDANCE
 WITH THE TERMS OF LICENSING FROM THE GOVERNMENT

CREATED BY MT	CHECKED	APPROVED
HORIZONTAL DATUM: SDA 84		PROJECTION: MGA ZONE 80
HEMISPHERE: NA		DATA SOURCE: 1995
DATE 20/1/07	FILE LOCATION G:\1\1023\glaciated\1023-01.jpg Revised	
REVISION 0	DRAWING NO 011023-01	

Environmental Assessment
 Hackett Road, Wagga Wagga
Figure 3 - Priority Flora



LEGEND

-  Lot 80 & 81 Site Boundary
-  Burnt Area

- Vegetation Condition**
1. Pristine or nearly so
 2. Excellent
 3. Very Good
 4. Good
 5. Degraded
 6. Completely degraded

SCALE
125 0 125 250 375 m

1:12,500 at A3

LOCALITY MAP



COPYRIGHT

THIS DOCUMENT IS THE PROPERTY OF THE COMMONWEALTH OF AUSTRALIA AND IS LOANED TO YOUR OFFICE. IT IS TO BE RETURNED TO THE COMMONWEALTH OF AUSTRALIA WITHIN THE TIME AND MANNER SPECIFIED BY THE COMMONWEALTH OF AUSTRALIA.

DEVELOPED BY MID	DESIGNED MID	APPROVED MID
---------------------	-----------------	-----------------

HORIZONTAL DATUM: GDA 84
VERTICAL DATUM: MSL
PROJECTION: UTM ZONE 52
METADATA RECORDS: None

DATE 18.02.2007	FILE LOCATION D:\GIS\Projects\2007\2007-02-18_VegCond
VERSION 1	ISSUANCE NO. 001207-02



Environmental Assessment
Hackett Road, Wagga Wagga

Figure 4 - Vegetation Condition

MAP UNITS PROJECTED IN MGA ZONE 52. NOTE THAT POSITIONAL ERRORS CAN BE > 1M IN SOME AREAS

Appendix A

DEC Priority Flora Search Results



Department of Environment and Conservation

Your reference:
Our reference: 2006-003551
Enquiries: Ben Lullfitz

Phone: 9334 0123
Fax: 9334 0278
Email: Ben.Lullfitz@dec.wa.gov.au

GHD Pty Ltd
76 Forrest Street
GERALDTON WA 6530

Attention: Cathie Miller

Dear Ms Miller

REQUEST FOR RARE FLORA INFORMATION

I refer to your request of 3 August 2006 for information on rare flora in the Geraldton and Morawa areas. The search co-ordinates used were (Geraldton) $28^{\circ} 39' - 28^{\circ} 43' S$ and $114^{\circ} 37' - 114^{\circ} 41' E$ and (Morawa) $29^{\circ} 07' - 29^{\circ} 15' S$ and $115^{\circ} 57' - 116^{\circ} 05' E$.

A search was undertaken for this area of (1) the Department's *Threatened (Declared Rare) Flora* database (for results, if any, see "Threatened Flora Data" – coordinates are GDA94), (2) the *Western Australian Herbarium Specimen* database for priority species opportunistically collected in the area of interest (for results, if any, see "WAHERB" – coordinates are GDA94 – see condition number 9 in the attached 'Conditions in Respect of Supply' and (3), the Department's *Declared Rare and Priority Flora List* [this list is searched using 'place names'. This list which may also be used as a species target list, contains species that are declared rare (Conservation Code R or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) – for results, if any, see "Declared Rare and Priority Flora List"]. The results are attached electronically to this email.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the seventh point, which refers to the requirement to undertake field investigations for the accurate determination of rare flora occurrence at a site. *The information supplied should be regarded as an indication only of the rare flora that may be present and may be used as a target list in any surveys undertaken.*

The information provided does not preclude you from obtaining and complying with, where necessary, land clearing approvals from other agencies.

An invoice for \$350 (plus GST) to supply this information will be forwarded.

It would be appreciated if any populations of rare flora encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss rare flora management, please contact my Principal Botanist, Dr Ken Atkins, on (08) 9334 0425.

Yours faithfully

B.R. Lullfitz

.....
for Keiran McNamara
DIRECTOR GENERAL
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

4 August, 2006

Please note: Co-ordinates supplied for all data search requests must be provided in latitude/longitude format, 'eastings and northings' are no longer suitable. Thank you.

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

RARE FLORA INFORMATION

CONDITIONS IN RESPECT OF SUPPLY OF INFORMATION

1. All requests for data to be made in writing to the Director General, Department of Environment and Conservation, Attention: Threatened Flora Database Officer, Species and Communities Branch.
2. The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided, without the prior written consent of the Director General, Department of Environment and Conservation.
3. Specific locality information for Declared Rare Flora is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for DRF may not be used in public reports without the written permission of the Executive Director, Department of Environment and Conservation. Publicly available reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Department is to be contacted for guidance on the presentation of rare flora information.
4. Note that the Department of Environment and Conservation respects the privacy of private landowners who may have rare flora on their property. Rare flora locations identified in the data as being on private property should be treated in confidence, and contact with property owners made through the Department of Environment and Conservation.
5. Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data provided, they may be present. The Department of Environment and Conservation accepts no responsibility for this.
6. Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.
7. It should be noted that the supplied data do not necessarily represent a comprehensive listing of the rare flora of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area. The receiving organisation should employ a botanist, if required, to undertake a survey of the area under consideration.
8. Acknowledgment of the Department of Environment and Conservation as source of the data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Environment and Conservation, Attention: The Manager, Species and Communities Branch.
9. The development of the PERTH Herbarium database was not originally intended for electronic mapping (eg. GIS ArcView). The latitude and longitude coordinates for each entry are not verified prior to being databased. It is only in recent times that collections have been submitted to PERTH with GPS recorded in latitude and longitude coordinates. Therefore, be aware when using this data in ArcView that some records may not plot to the locality description given with each collection.

THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DECLARED RARE AND PRIORITY FLORA LIST

for Western Australia

CONSERVATION CODES

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

ABBREVIATIONS USED IN THREATENED FLORA DATABASE PRINTOUTS

VESTING		EXL	Exploration Lease
AGR	Chief Exec Dept of Agriculture	EXP	Experimental Farm
ALT	Aboriginal Land Trust	FIR	Firing Range
BAP	Baptist Union of WA Inc	FOR	State Forest
BSA	Boy Scouts Association	GHA	Grain Handling
CC	Conservation Commission - NPNCA - LFC	GOL	Golf
CGT	Crown Grant in Trust	GRA	Gravel Pit
COM	Commonwealth of Australia	GRE	Green Belt
CRO	Crown Freehold-Govt Ownership	GVT	Government Requirements
DOL	Dept of Land Administration	HAR	Harbour Purposes
DFU	Ministry for Planning	HEP	Heritage Purposes
EXD	Exec Direc CALM	HER	Heritage trail
FRE	Freehold	HOS	Hospital
HOW	Homeswest	KEN	Kennels
ILD	Industrial Lands Develop. Auth	MIN	Mining lease
JOI	Joint Vesting-NPNCA & Shire	MUN	Municipal Purposes
LAC	LandCorp	NPK	National Park
LFC	Lands and Forests Commission	NRE	Nature Reserve
MAG	Minister for Agriculture	OTH	Other
MED	Ministry of Education	PAC	Public access
MHE	Minister for Health	PAR	Parkland (& Recreation)
MIN	Minister for Mines	PAS	Pastoral lease
MPL	Ministry for Planning	PFL	Protection of Flora
MPR	Minister for Prisons	PIC	Picnic ground
MRD	Main Roads WA	PLA	Plantation
MTR	Minister for Transport	POS	Public Open Space
MWA	Minister for Water Resources	FPA	Public parkland
MWO	Minister for Works	PRS	Prison site
NAT	Natural Trust of Australia WA	PUT	Public Utility
NON	Not Vested	QUA	Quarry
NPN	NPNCA	RAD	Radio Station
OTH	Other	RAC	Racecourse
FRI	Private	REC	Recreation
RAI	Westrail	REH	Rehabilitation
SEC	Western Power	RNP	Re-establish Native Plants
SHI	Shire	RRE	Railway Reserve
SPC	State Planning Commission	RUB	Rubbish
TEL	Telstra	SAN	Sand
TGR	Timber Govt Requirement	SCH	School-site
TOW	TOWN	SET	Settlers requirements
UNK	Unknown	SHI	Shire Requirements
WAT	Water Corporation	SHO	Showgrounds
WEL	Minister Community Welfare	SNN	Sanitary
WRC	Water & Rivers Commission	STO	Stopping place
XPL	Ex-Pastoral Lease	TIM	Timber
		TOU	Tourism
		TOW	Town-site
		TRA	Training Ground
		TRI	Trig station
		TVT	Television transmitting
		UNK	Unknown
		UTI	Utilities
		VCL	Vacant Crown Land
		VER	Road Verge
		VPF	Vermin Proof Fence
		WAT	Water
		WCO	Water & Conservation of F & F
		WOO	Firewood
PURPOSES			
ABR	Aboriginal Reserve		
AER	Aerodrome		
CAM	Camping		
CAR	Caravan park		
CEM	Cemetery		
CFA	Conservation of Fauna		
CFF	Conservation Of Flora & Fauna		
CFL	Conservation of Flora		
CHU	Church		
CPK	Car Park		
COM	Common		
CON	Conservation Park		
DEF	Defence		
DRA	Drain		
EDE	Educational Endowment		
EDU	Educational purposes UWA		
ENE	Enjoyment of Natural Environ.		
EXC	Excepted from sale		

* Please note that LPC now comes under the Conservation Commission.

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
DECLARED RARE AND PRIORITY FLORA LIST
30 June 2006

SPECIES / TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER PERIOD
<i>Acacia guinetii</i>	4	MW	Geraldton-Northampton	Jun-Aug
<i>Acacia latipes</i> subsp. <i>lidna</i>	3	MW	Erangy Springs, Geraldton, Three Springs, Northampton, Huti River, Eneabba	Jun-Jul
<i>Acacia leptospermoides</i> subsp. <i>psammophila</i>	3	MW	Geraldton, Yuna, Indarra, Eradu	
<i>Acacia megacephala</i>	2	MW	E of Geraldton, Kojarena, Burma Road	Jun-Sep
<i>Baeckea</i> sp. <i>Walkaway</i> (AS George 11249)	3	MW	Nanson, Ambania, Walkaway, Burma Road Reserve, Mt Fanny, Mt Homer	Jan-Apr
<i>Caladenia hoffmanii</i>	R	MW	Geraldton-Kalbarri	Aug-Oct
<i>Chorizema humile</i>	R	MW	Strawberry, Camamah, Geraldton, Kojarena, Coorow	Jul-Sep
<i>Cryptandra scoparia</i> var. <i>microcephala</i>	2	MW	Kalbarri N.P., Geraldton	May-Aug
<i>Dicrastylis incana</i>	2	MW	E of Geraldton, Yuna, Eradu	Sep, Nov
<i>Drummondita ericoides</i>	R	MW	N of Geraldton	Sep-Oct
<i>Enallbatus bounites</i> ms	2	MW	Howatharra Hill	July
<i>Eranophila brevifolia</i>	2	MW, WB	Geraldton, Mt Caroline, Northampton	Aug-Sep
<i>Eucalyptus blaxellii</i>	R	MW	NE of Geraldton	Aug-Nov
<i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>	4	MW	Nanson, Mt Michael, Eradu, Mt Homer, Moresby Range	-
<i>Gastrolobium propinquum</i>	1	MW	Northampton, Geraldton	Jun-Nov
<i>Geleznowia verrucosa</i> subsp. <i>formosa</i> ms	3	MW, WB	Kalbarri, Hill River, Geraldton, Eneabba	Jun-Sep
<i>Grevillea bractisosa</i>	R	MW, SW	Geraldton, Howatharra, Mullewa, Milling, Bindoon	Aug-Oct
<i>Grevillea candicans</i>	3	MW, WB	Dalwallinu, Mingenew, Geraldton, Galena, Yuna, Mullewa	Jul-Oct
<i>Grevillea hirtella</i>	3	MW	Walkaway, Burma Road, Geraldton, Greenough	-
<i>Grevillea triloba</i>	3	MW	Geraldton, Northampton	Jul-Aug
<i>Harperia ferruginipes</i>	1	MW	Geraldton/Mullewa	Apr-May
<i>Homalocalyx chapmanii</i>	1	MW	Arrowsmith River, Geraldton, One Tree Hill, Three Springs	
<i>Homalocalyx inermibundus</i>	2	MW	Geraldton, Bindoo Hill, East Yuna, Mount Magnet	Sep, Oct
<i>Lepidobolus basiflorus</i>	1	MW	Geraldton-Mullewa	Apr-May
<i>Leucopogon oblongus</i> ms	2	MW	Northampton, Howatharra	Jul
<i>Malleostemon</i> sp. <i>Moonyoonooka</i> (RJ Cranfield 2847)	2	MW	Kalbarri, Geraldton	Aug, Sep
<i>Schoenia filifolia</i> subsp. <i>subulifolia</i>	R	MW	Champton Bay, Geraldton	
<i>Scholtzia</i> sp. <i>Valentine Road</i> (S Patrick 2142)	1	MW	Geraldton-Mullewa	Nov
<i>Stenanthemum gracilipes</i>	1	MW	Geraldton, Nabawa	Aug-Sep
<i>Thryptomene</i> sp. <i>Moresby Range</i> (AS George 14873)	3	MW	Moresby Range, Chapman Valley, Howatharra	Jul-Sep
<i>Thryptomene</i> sp. <i>Yuna Reserve</i> (AC Burns 100)	2	MW	East Yuna Reserve, East Chapman, Bella Vista NR	Aug-Sep
<i>Thryptomene stenophylla</i>	2	MW	Kalbarri, Geraldton	-
<i>Verticordia chrysostachya</i> var. <i>pallda</i>	3	MW	Geraldton, Northampton	Dec
<i>Vittadinia cervicalaris</i> var. <i>occidentalis</i>	1	MW	Geraldton, Northampton	-
<i>Wumbea tubulosa</i>	R	MW	Geraldton-Mingenew-Three Springs	Jun-Jul

WA HERBARIUM DATABASE - 4 August 2000

SHEET_NO.	GENUS	SPECIES	RANK	INFRASP	CONS.CODE
PERTH 196940	Acacia	guinetii			P4
PERTH 1135155	Verticordia	penicillaris			P4
PERTH 196428	Acacia	guinetii			P4
PERTH 196371	Acacia	guinetii			P4
PERTH 05395909	Grevillea	triloba			P3
PERTH 00755729	Acacia	guinetii			P4
PERTH 00759430	Acacia	guinetii			P4
PERTH 196399	Acacia	guinetii			P4
PERTH 1048945	Eucalyptus	blaxellii			R
PERTH 02032279	Verticordia	penicillaris			P4
PERTH 197335	Acacia	guinetii			P4
PERTH 197394	Acacia	guinetii			P4
PERTH 196393	Acacia	guinetii			P4
PERTH 196401	Acacia	guinetii			P4
PERTH 196436	Acacia	guinetii			P4
PERTH 196444	Acacia	guinetii			P4
PERTH 05398344	Grevillea	triloba			P3
PERTH 04159918	Grevillea	triloba			P3
PERTH 01648659	Grevillea	triloba			P3
PERTH 05392195	Thryptomene	stenophylla			P2
PERTH 1050508	Eucalyptus	blaxellii			R
PERTH 1048937	Eucalyptus	blaxellii			R
PERTH 196932	Acacia	guinetii			P4
PERTH 197408	Acacia	guinetii			P4
PERTH 01404539	Verticordia	densiflora	var.	roseostella	P3
PERTH 522309	Vitadina	cerviculatis	var.	occidentalis	P1
PERTH 00759449	Acacia	guinetii			P4
PERTH 05481074	Melaleuca	huttensis			P1
PERTH 04257413	Grevillea	triloba			P3
PERTH 05498228	Grevillea	triloba			P3
PERTH 05046433	Melaleuca	huttensis			P1
PERTH 06297161	Eucalyptus	blaxellii			R
PERTH 06297145	Eucalyptus	blaxellii			R

PERTH 1096846	Eucalyptus	diminuta	P4
PERTH 1039646	Eucalyptus	diminuta	P4
PERTH 1022814	Eucalyptus	cuprea	R
PERTH 05758408	Eucalyptus	blaxellii	R
PERTH 06095880	Eucalyptus	blaxellii	R
PERTH 06095879	Eucalyptus	blaxellii	R
PERTH 02191385	Thryptomene	sp. Moresby Range (A.S. George 1457	P3
PERTH 07901049	Metaleuca	huttensis	P1

THREATENED FLORA DATABASE - 4 August 2006

GENUS	SPECIES	CONS. CODE
Drummondita	eircooides	R
Verticordia	pericillaris	4
Eucalyptus	blaxellii	R

Appendix B
Site Photos



Plate 1 – Cleared Pasture Land



Plate 2 – View from escarpment onto Lot 81

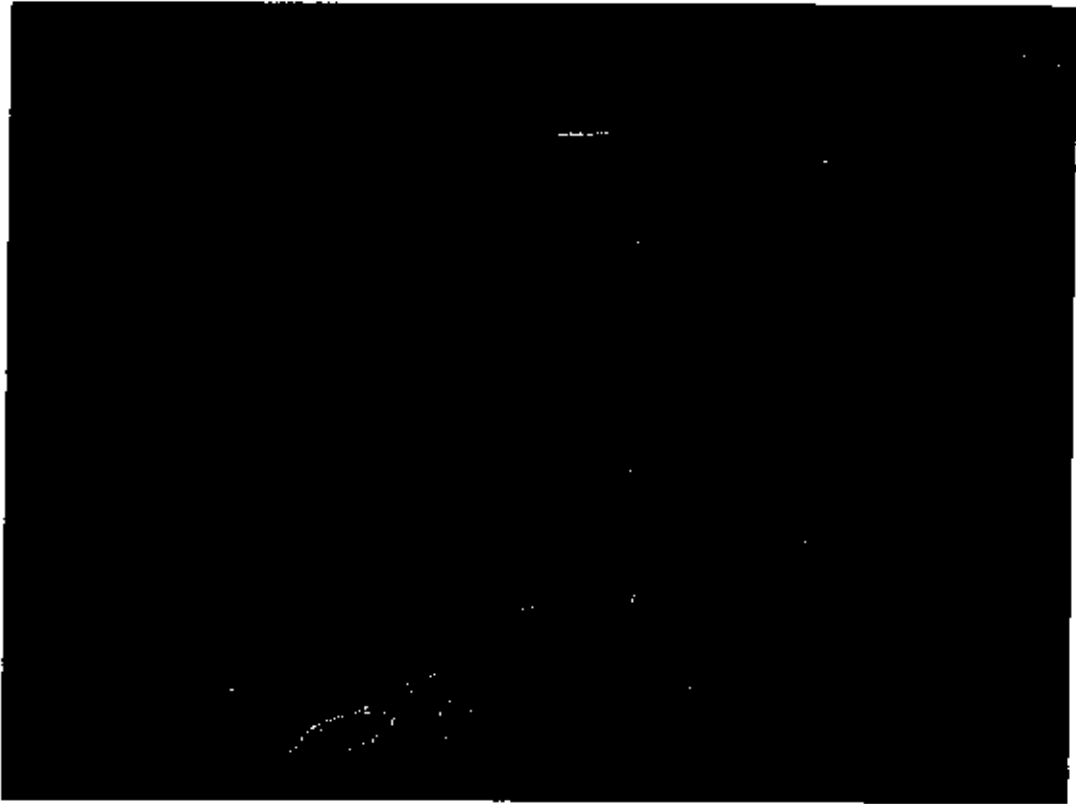


Plate 3 – vegetated area to the north of Lot 81 in mid to background of photo

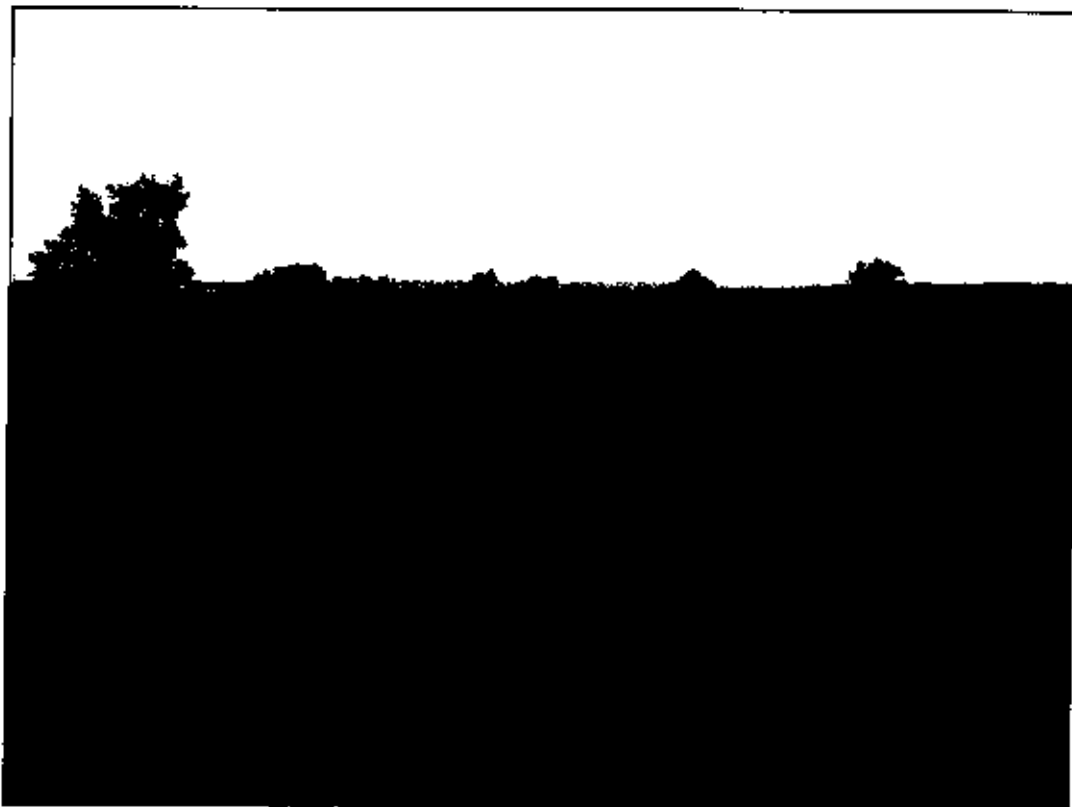


Plate 4 – northern fence line on Lot 81 hosting *Grevillea trifida* population



Plate 5 – Burnt Wetland Area on Lot 80

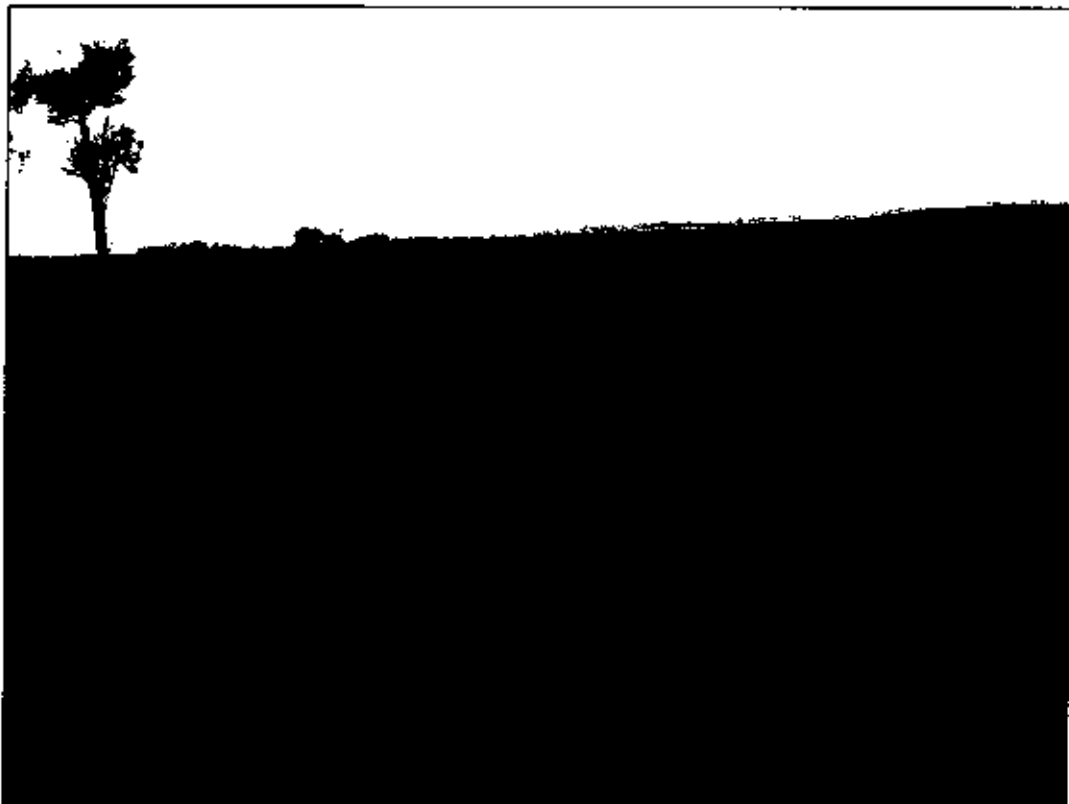


Plate 5 – Gravel Outcrop on Lot 80

Appendix C

Flora Species Recorded on Site

Family	Species	Common Name
	<i>Ptilotus polystachyus</i>	Prince of Wales Feather
AMARANTHACEAE	<i>Ptilotus obovatus</i> var <i>obovatus</i>	Cotton Bush
ANACARDIACEAE	* <i>Schinus terebinthifolia</i>	Japanese Pepper
	<i>Cassia micrantha</i>	Pale Grass Lily
	<i>Corynothea micrantha</i>	Sand Lily
ANTHERICACEAE	<i>Tricoryne elatior</i>	Yellow Autumn Lily
APIACEAE	<i>Trachymene cyanopetala</i>	
	* <i>Arthrotheca calendula</i>	Cape Weed
	<i>Brechyscome ciliaris</i>	
	* <i>Hypochaeris</i> sp	Flat Weed
	<i>Lamrancellia rosea</i>	
	* <i>Monoculus monstrosum</i>	
	<i>Podolepis lessoni</i>	
	<i>Rhodanthe manglesi</i>	
	<i>Rhodanthe spicata</i>	
	* <i>Sonchus oleraceus</i>	Sowthistle
	* <i>Urospermum picroides</i>	False Hawkbit
ASTERACEAE	* <i>Ursinia anthemoides</i>	Ursinia
BORAGINACEAE	* <i>Echium plantagineum</i> (DP)	Paterson's Curse
BRASSICACEAE	* <i>Brassica tournefortii</i>	Wild Turnip
	* <i>Raphanus raphanistrum</i>	Wild Radish
	* <i>Rapistrum rugosum</i>	Turnip Weed
BORYACEAE	<i>Borya sphaerocephala</i>	Pincushions
CARYOPHYLLACEAE	* <i>Petrohragia dubia</i>	
CASUARINACEAE	<i>Allocasuarina campestris</i>	
CHENOPODIACEAE	<i>Chenopodium gaudichaudianum</i>	Cottany Saltbush

	<i>Enchyleena tomentosa</i> var <i>tomentosa</i>	Ruby Saltbush
	<i>Rhagodia pretsii</i> subsp <i>obovata</i>	
CONVOLVULACEAE	<i>Convolvulus remotus</i>	
CRASSULACEAE	<i>Crassula colorata</i>	
CUCURBITACEAE	* <i>Citrullus lanatus</i>	Paddy Melon
CUNONIACEAE	<i>Aphanopetalum dematideum</i>	
	<i>Lepidosperma leptostachyum</i>	
	<i>Lepidosperma tenue</i>	
CYPERACEAE	<i>Mesomelaena pseudostygia</i>	Semaphore Sedge
DASYPOGONACEAE	<i>Acanthocarpus pretsii</i>	
	<i>Hibbertia hypericoides</i>	Yellow Buttercups
DILLENIACEAE	<i>Hibbertia potentilliflora</i>	
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>	
GOODENIACEAE	<i>Dampiera incana</i> var <i>incana</i>	
GYROSTEMONACEAE	? <i>Gyrostemon racemiger</i>	
	<i>Conostylis aculeata</i>	Prickly Conostylis
HAEMODORACEAE	<i>Conostylis cardicans</i>	Grey Cottonhead
JUNCACEAE	<i>Juncus kraussii</i>	Sea Rush
LAURACEAE	<i>Cassytha</i> sp.	Dodder Laurel
LORANTHACEAE	<i>Nuytsia floribunda</i>	WA Christmas Bush
MALVACEAE	<i>Hibiscus ?sturtii</i>	
	<i>Acacia microbotrya</i>	Manna Wattle
	<i>Acacia oxyclada</i>	
	<i>Acacia rostellifera</i>	Summer-scented Wattle
	<i>Acacia setigera</i>	Orange Wattle
MIMOSACEAE	<i>Acacia tetragonophylla</i>	Kurara
MYOPORACEAE	<i>Myoporum montanum</i>	

	<i>Eucalyptus camaldulensis</i> var <i>obtusa</i>	Northern River Red Gum
	<i>Eucalyptus laeophleba</i>	
	<i>Eucalyptus subangulata</i> esp <i>subangulata</i>	
	<i>Malaleuca huttensis</i> (P1)	
	<i>Malaleuca rhamnophylla</i>	Swamp Paperbark
	<i>Malaleuca uncinata</i>	Broom Bush
MYRTACEAE	<i>Verticordia chrysantha</i>	
	<i>Daviesia divaricata</i>	
	<i>Daviesia divaricata</i> esp <i>laniflora</i>	
	<i>Gastrolobium trifangulare</i>	
	<i>Jacksonia calcicola</i>	
	<i>Leptosema aphyllum</i>	
	* <i>Lupinus cosentinii</i>	Blue Lupins
	* <i>Medicago indica</i>	Common Melilot
	* <i>Trifolium fragiferum</i>	Strawberry clover
PAPILIONACEAE	* <i>Trifolium hirtum</i>	Rose clover
PHORMACEAE	<i>Dianella revoluta</i> var <i>divaricata</i>	Blueberry Lily
PITTOSPORACEAE	<i>Pittosporum ligustifolium</i>	
POACEAE	<i>Austroelype elegantissima</i>	Elegant Spear Grass
	* <i>Avena barbata</i>	Bearded Oat Grass
	* <i>Avena fatua</i>	Wild Oats
	* <i>Briza maxima</i>	Blow Fly Grass
	* <i>Bromus diandrus</i>	Great Brome
	* <i>Ehrharta calycina</i>	Perennial Veldt Grass
	* <i>Hordeum leporinum</i>	Barley Grass
	<i>Neurochne alopecuroides</i>	Foxtail Mulga Grass
	* <i>Pennisetum clandestinum</i>	Kikuyu

	* <i>Pennisetum setaceum</i>	Fountain grass
POLYGONACEAE	* <i>Emex australis</i>	Doublegee
	<i>Muehlenbeckia adpressa</i>	Climbing Lignum
PORTULACACEAE	<i>Calandrinia liniflora</i>	
PRIMULACEAE	* <i>Anagallis arvensis</i>	Pimpernel
	<i>Banksia prionotes</i>	
	<i>Dryandra fraseri</i> var <i>fraseri</i>	
	<i>Dryandra sessilis</i> ssp <i>flabellifolium</i>	Parrot Bush
	<i>Grevillea candolabroides</i>	
	<i>Grevillea pinaster</i>	
	<i>Grevillea triloba</i> (P3)	
	<i>Hakea lissocarpa</i>	Honeybush
	<i>Hakea prostrata</i>	Needle Tree
	<i>Hakea recurva</i> ssp <i>recurva</i>	
PROTEACEAE	<i>Petrophile conferta</i>	
RUTACEAE	<i>Galeznovia verrucosa</i> ssp <i>famosa</i> (P3)	
SAPINDACEAE	<i>Dodonaea inaequalis</i>	
	* <i>Lycium ferocissimum</i>	African Boxthorn
	* <i>Solanum nigrum</i>	Blackberry Nightshade
SOLANACEAE	<i>Solanum elaeagnifolium</i>	
	<i>Gutchenotis micrantha</i>	
STERCULIACEAE	<i>Thomasia hemeranthoides</i>	
STYLIDIACEAE	<i>Stylidium septentrionale</i>	
THYMELAEACEAE	<i>Pimelea microcephala</i> ssp <i>microcephala</i>	Shrubby Riceflower
VITACEAE	<i>Clematicissus angustissima</i>	

KEY:

* introduced plant species

DP = declared plant, see Section 3.3.4

P1, P3 = Priority Flora species, see Section 2.3 for further details

GHD Pty Ltd ABN 39 008 488 373

76 Forrest Street Geraldton WA 6530

PO BOX 164 Geraldton WA 6531

T: (08) 9964 3677 F: (08) 9921 7997 E: geraldtonmell@ghd.com.au

© GHD Pty Ltd 2007

This document is and shall remain the property of GHD Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
	C Miller	A Napier		M Coombes		

APPENDIX B - Level 1 Flora and Vegetation Survey (Coterra, 2011)

COTERRA
ENVIRONMENT

Level 1 Flora and Vegetation Survey

Lots 80 & 81 Hackett Road, Waggrakine

Rev 0, May 2011

This report was prepared by;

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): A. Benkovic
Report Version: Rev 0
Date: May, 2010

This report was prepared for;

Humfrey Land Developments
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Key Elements	
Flora	<p>A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants.</p> <p>No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian <i>Wildlife Conservation Act 1950</i> or governed by the <i>Environment Protection and Biodiversity Conservation Act 1999</i> were located within the study area.</p> <p>Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>.</p> <p>No other flora species of other conservation significance as stated in <i>Guidance Statement 51</i> (EPA, 2004) were recorded within the study area.</p>
Vegetation	<p>An expert botanist defined and mapped 12 vegetation units across the study area.</p> <p>The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition. The north western extent of the study area contains remnant heath vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition.</p>
Regional Representation Vegetation	<p>The study area is represented by two Beard vegetation associations: 359 - (Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub) and 675 - (Shrublands; <i>Melaleuca</i> and <i>Hakea</i> mixed thicket). Both of these vegetation associations are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010).</p> <p>Within the study area there are 3 plant communities, as mapped by the Geraldton Regional Flora and Vegetation Survey (WAPC, 2010). These plant communities are: 10 Near Coastal: <i>Acacia rostelifera</i> shrubland, 15 Thicket: <i>Melaleuca</i> spp. /mixed spp. and 13 Sandplain: <i>Banksia prionotes</i>/<i>Acacia rostelifera</i>.</p>
Regionally Significant Vegetation	<p>According to <i>Guidance Statement 33</i> (EPA, 2008) and <i>Position Statement 2</i> (EPA, 2000) the study area is considered Regionally Significant because:</p> <ol style="list-style-type: none"> 1. The vegetation associations within the study area have <30% of their present extents remaining within in WA. 2. The study area contains native vegetation remnants in good or better condition. 3. Two Priority Flora species were recorded; Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>. 4. Within the study area boundary lies, in part, the Moresby Range.

TABLE OF CONTENTS	Page
1.0 BACKGROUND.....	6
1.1 Objectives	6
1.2 Previous Investigations	6
2.0 EXISTING INFORMATION	8
2.1 Threatened Flora and Priority Flora	8
2.1.1 State Legislation.....	8
2.1.2 Federal Legislation	10
2.1.3 Other Species of Conservation Significance.....	10
2.2 Vegetation.....	10
2.2.1 Interim Biogeographical Regionalisation of Australia	10
2.2.2 Beard Vegetation Associations	11
2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).....	11
2.3 Conservation Significant Vegetation	12
2.3.1 Threatened Ecological Communities	12
2.3.2 Threshold Levels for Biodiversity Conservation.....	12
2.3.3 Areas of High Conservation Value.....	13
2.3.4 Significant Natural Areas.....	13
3.0 METHODS	14
3.1 Field Survey.....	14
3.1.1 Vegetation Sampling.....	14
3.2 Vegetation Condition	15
4.0 RESULTS AND DISCUSSION	16
4.1 Flora.....	16
4.1.1 Flora of Conservation Significance	16
4.1.2 Introduced Flora (Weeds).....	18
4.2 Vegetation.....	18
4.2.1 Vegetation Units	18
4.2.2 Vegetation Condition.....	19
4.3 Conservation Significant Vegetation	20

4.3.1	Biodiversity Threshold Levels.....	20
4.3.2	GRFVS Plant Community Representation.....	20
4.3.3	Regionally Significant Natural Areas and Areas of High Conservation Value.....	21
5.0	CONCLUSIONS & RECOMMENDATIONS	23
6.0	LIMITATIONS.....	24
7.0	REFERENCES	25

TABLES (Compiled within the report)

	Page
Table 1: Priority Flora Recorded in 2006 by GHD.....	7
Table 2: Significant Flora Species	9
Table 3: Regional Vegetation Association within Western Australia.....	11
Table 4: Regional Vegetation Association within the GRFVS Area	11
Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010).....	12
Table 6: Vegetation Structure Classes.....	15
Table 7: Vegetation Condition Scale.....	15
Table 8: Criteria for Environmental Weeds Strategy Rating.....	18
Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton	18

PLATES (Compiled within the report)

Plate 1: Mean Monthly Temperatures and Rainfall for Geraldton Airport (1941-2010) (BOM, 2011).....	Error! Bookmark not defined.
Plate 2: P1 <i>Melaleuca huttensis</i>	17
Plate 3: P3 <i>Grevillea triloba</i>	17

FIGURES (Compiled at the end of the report)

- Figure 1: Beard Vegetation Association
- Figure 2: Vegetation Units
- Figure 3: Vegetation Condition

APPENDICES

- Appendix A: Species List
- Appendix B: Vegetation Unit Photos

1.0 BACKGROUND

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the study area') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. In order to facilitate development of the site in accordance with this Concept Plan, the site is proposed be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5.

In accordance with Section 48A of the Environmental Protection (EP) Act (1986), any proposed change to a town planning scheme must be referred to the Environmental Protection Authority (EPA) for consideration.

In order to provide the EPA with the information necessary to properly assess this rezoning application, Coterra Environment have undertaken this Level 1 Flora and Vegetation survey to supplement the Environmental Assessment Report which will form part of the overall amendment application.

1.1 Objectives

This report presents the findings of the Level 1 Flora and Vegetation Survey for Lots 80 & 81 Hackett Road. The survey was carried out in accordance with the EPA's Guidance Statement 51 - *Terrestrial Flora and Vegetation Surveys for Environmental Impact assessment in Western Australia* requirements for a Level 1 Flora and Vegetation Survey (EPA, 2004) and involved the following components:

- Desktop review of the Department of Environment and Conservation (DEC) database search to identify any significant flora species that could potentially exist on site.
- A site visit to detail the vegetation and flora present on site. This involved undertaking selective low level sampling of native vegetation to produce maps of vegetation units and condition across the site.
- A targeted search for any Threatened Flora (TF) or Priority species known from the Geraldton area (as identified in the DEC database search).
- Analysis of the floristic composition of the vegetation for any species of conservation significance. This includes TF, Priority species and any species of other conservation value (EPA, 2004).
- Assessment of the condition and conservation significance of the vegetation using criteria outlined in *Position Statement 2* (EPA, 2000) and *Guidance Statement 33* (EPA, 2008).
- Preparation of a report and relevant maps.

1.2 Previous Investigations

A Priority Flora survey of the study area was conducted previously in 2006 by GHD (GHD, 2007). This survey only concentrated on locating DEC listed Priority Flora and therefore did not meet the requirements of a full flora survey. In addition the study did

not include the escarpment, plateau or bushland area in the north, as these portions of the site were proposed to be set aside as open spaces.

In this GHD survey, three Priority Flora species were recorded within the study area. These species and the number of plants recorded are listed in Table 1.

Table 1: Priority Flora Recorded in 2006 by GHD

Species	Conservation Code	Number of Plants Recorded
<i>Geleznovia verrucosa</i> subsp. <i>formosa</i> #	P3	1
<i>Grevillea triloba</i>	P3	>100
<i>Melaleuca huttensis</i>	P1	1

This taxon name is no longer current; it is a taxonomic synonym of *Geleznovia verrucosa*, which is not a Priority Flora species

The priority flora report completed by GHD (2007) is attached to the EAR, prepared as part of the overall scheme amendment submission.

2.0 EXISTING INFORMATION

2.1 Threatened Flora and Priority Flora

2.1.1 State Legislation

Threatened Flora (TF) are flora that have been adequately surveyed and are considered to be in danger of extinction, rare or otherwise in need of special protection within Western Australia. TF are protected under the *Wildlife Conservation Act 1950* (as amended).

Additionally in Western Australia there are five categories of Priority Flora, which are not specifically covered under current legislation, but their conservation status warrants some protection and/or further investigation. Three categories of Priority Flora are allocated to species that are poorly known (Priority 1 to 3). These require more information to be assessed for inclusion as TF. The categories are arranged to give an indication of the priority for undertaking further surveys based on the number of known sites, and the degree of threat to those populations. A fourth category of priority (Priority 4) is included for those species that have been adequately surveyed and are considered to be rare but not currently threatened. Priority 5 species are those that are also not threatened but are subject to a specific conservation program

The Department of Environment and Conservation's (DEC) databases for Threatened Flora, the Western Australian Herbarium (WAH) Specimen and Threatened Flora were searched for known records within the vicinity of the study area. There were twelve conservation significant species recorded, three of which are TF. The list of significant flora is provided in **Table 2** below.

Table 2: Significant Flora Species

Species	Conservation Code ¹
<i>Drummondita ericoides</i>	T - EN
<i>Eucalyptus cuprea</i>	T - EN
<i>Melaleuca huttensis</i>	P1
<i>Vittadinia cervicularis</i> var. <i>occidentalis</i>	P1
<i>Thryptomene</i> sp. Moresby Range	P3
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3
<i>Grevillea triloba</i>	P3
<i>Thryptomene stenophylla</i>	P2
<i>Acacia guinetii</i>	P4
<i>Eucalyptus blaxellii</i>	P4
<i>Verticordia penicillaris</i>	P4

¹ T: Threatened Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. Threatened Flora are further ranked by the Department according to their level of threat using IUCN Red List criteria:

CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
 EN: Endangered – considered to be facing a very high risk of extinction in the wild
 VU: Vulnerable – considered to be facing a high risk of extinction in the wild.

P1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

P4: Priority Four – Rare, Near Threatened and other species in need of monitoring

Rare Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection

Near Threatened Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent

Other Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

P5: Priority Five – Conservation Dependant Species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

2.1.2 Federal Legislation

Some flora species have additional protection under the *Environment Protection and Biodiversity Conservation Act (EPBC) 1999*. In Western Australia, this predominantly consists of Threatened Flora. Penalties apply for any damage to individuals, populations or habitats of species protected.

2.1.3 Other Species of Conservation Significance

Environmental Protection Authority (EPA) *Guidance Statement 51* (EPA, 2004) lists species other than Threatened Flora and Priority Flora as of conservation significance where a species has:

- A keystone role.
- Relictual status.
- Anomalous features indicating a potential new discovery.
- A representation of a species range (range extensions, extremes or an outlier population).
- Status as a restricted subspecies, variety, or naturally occurring hybrid.
- Poor reservation.
- Status as a local endemic or has a restricted distribution.

This document states that conservation significance includes these criteria, but is not limited to them. It may include flora that are poorly represented in WAH and short range endemic flora (those with a known range less than 200km).

2.2 Vegetation

2.2.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway & Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2, 242, 033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

2.2.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are;

- 675 -Shrublands; mixed thicket (*Melaleuca* and *Hakea*), and;
- 359 -Shrublands; *Acacia* and *Banksia* scrub.

The extent of these two vegetation associations within the study area is illustrated in **Figure 1**.

The vegetation extents within Western Australia of these two 'associations' are presented in **Table 3** (WAPC, 2010).

Table 3: Regional Vegetation Association within Western Australia

Vegetation Association	Pre-Europe Extent (WA)	Current Extent (WA)	% Remaining in WA
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51 850	10 992	21.2
359 Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub	44 493	8 366	18.8

The vegetation extents within the Geraldton Regional Flora and Vegetation Survey area (see section 2.4.3) of these two associations' are presented in **Table 4** (WAPC, 2010).

Table 4: Regional Vegetation Association within the GRFVS Area

Vegetation Association	Pre-Europe Extent (GRFVS)	Current Extent (GRFVS)	% Remaining in GRFVS area
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	3 148	240	7.62
359 Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub	17 805	3 077	17.28

2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010)

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed to describe and map the flora and vegetation within the Geraldton area. The report generated from the outcomes of this survey aims to provide information, from a regional context, to aid local scale studies in the assessment of proposals that may affect the native vegetation within the Geraldton region (WAPC, 2010). This survey

has been endorsed by the EPA (2010) as a key source to help minimise the environmental impact of future development in the Geraldton region.

Most of the remnants in the study area are within the GRFVS boundaries. However, no GRFVS quadrats were established within the study area for the GRFVS report. Therefore the plant communities within the study area that have been mapped by the GRFVS were done so at a 90% confidence level (WAPC, 2010).

The GRFVS mapped plant communities for the study area are listed in **Table 5**. The majority of the study area, which consists of cleared pastureland, and in part the Moresby Ranges, falls outside the GRFVS boundary.

Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010)

Beard Vegetation Association	Plant Community	Extent of GRFVS Plant Communities %
359	10 Near Coastal: <i>Acacia rostellifera</i> shrubland	36.63
675	15 Thicket: <i>Melaleuca</i> spp. /mixed spp.	7.61
359	13 Sandplain: <i>Banksia prionotes</i> / <i>Acacia rostellifera</i>	12.23

2.3 Conservation Significant Vegetation

2.3.1 Threatened Ecological Communities

DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database was searched for known occurrences within the vicinity of the study area.

This search relates to TECs listed under the *Wildlife Conservation Act 1950* (as amended). Some TECs have further protection under the *Environmental Protection Biodiversity Conservation (EPBC) Act 1999*. TEC and PEC listings are administered through the DEC Threatened Communities Branch.

No previously known TECs or PECs were identified as occurring within the search area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca megacephala* and *Hakea pycnoneura* thickets on the Moresby Range.

2.3.2 Threshold Levels for Biodiversity Conservation

To highlight the need for biodiversity protection within the agricultural areas of the Wheatbelt/ Geraldton region – due to high clearing practices - the EPA published *Position Statement 2* (EPA, 2000). According to *Position Statement 2*, for the EPA to support clearing within the Wheatbelt/ Geraldton region, alternative mechanisms need to be put in place that address biodiversity protection.

As a result EPA (2000 & 2008) has adopted two criteria that are to be taken into consideration when assessing a clearing application, these are:

- i. *The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type*
- ii. *A level of 10% of the original extent is regarded as being a level representing “endangered”*

Vegetation below the 30% “threshold level” is deemed to be significant (EPA, 2008).

2.3.3 Areas of High Conservation Value

In addition to the above criteria, *Guidance Statement 33* (EPA, 2008) lists areas of high conservation value that require protection in WA, these are:

- State and regional conservation areas
- Areas where clearing would conflict with the native vegetation clearing principles in schedule 5 of the *Environmental Protection Act 1986*
- Threatened Ecological Communities
- Significant flora and fauna
- Wetlands and buffers
- Rivers and foreshores
- Important landscapes and landforms
- Natural areas of heritage significance
- Other natural areas, such as ecological linkages

2.3.4 Significant Natural Areas

To assist proponents in the identification of significant natural areas, *Guidance Statement 33* (EPA, 2008) outlines methodology used by government agencies within the Perth Metropolitan Region (Del Marco *et al.* 2004). This methodology adopts the following criteria:

- Representation of ecological communities
- Diversity
- Rarity
- Maintaining ecological processes or natural systems
- Scientific or evolutionary importance
- Protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

3.0 METHODS

3.1 Field Survey

An expert botanist conducted a Level 1 Flora Survey of the Moresby Heights study area (Figure 1) in April 2011. The survey methodology was based on a Level 1 Flora Survey as outlined in *Guidance Statement 51* (EPA, 2004).

A Level 1 Survey comprises of:

Background Research or Desktop Study

- i. Gather together background information on the target area.

Reconnaissance Survey

- i. Verify accuracy of the Desktop Study.
- ii. Delineate and characterise the flora and range of vegetation units present in the target area.
- iii. Identify potential impacts

This involves selective, low intensity sampling of flora and vegetation to produce maps of vegetation units and vegetation condition at an appropriate scale. Searches for significant flora (**Table 2**) were also performed within the study area.

A species list was compiled using the latest nomenclature and taxonomic references (*Florabase*, 2011 and Smith, 2010).

3.1.1 Vegetation Sampling

Mapping of each vegetation unit was completed using aerial photographs and on site surveying. Each vegetation unit was defined by the dominant plant species (>2% cover) throughout its extent, using the vegetation structure classes of the WAPC (2000) (**Table 6**).

Table 6: Vegetation Structure Classes

Life Form/ Height Class	Canopy Cover (percentage)			
	100% - 70%	70% - 30%	30% - 10%	10% - 2%
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees <10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Scrub Mallee
Shrubs >2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs <1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

(WAPC, 2000)

3.2 Vegetation Condition

The site was traversed by foot and vehicle to assess the vegetation condition. The Vegetation Condition Scale (Keighery, 1994) recommended in *Bush Forever* (WAPC, 2000) (Table 7) was used to classify the vegetation condition of the study area.

Table 7: Vegetation Condition Scale

Condition	Definition
Pristine	No obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species; weeds are non-aggressive species.
Very Good	Vegetation structure altered; obvious signs of disturbance.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance; basic vegetation structure or ability to regenerate is retained.
Degraded	Basic vegetation structure severely impacted by disturbance; scope for regeneration but not to a state approaching good (sic) condition without intensive management.
Completely Degraded	Vegetation structure not intact; the area completely or almost completely without native species ('parkland cleared').

(WAPC, 2000)

4.0 RESULTS AND DISCUSSION

4.1 Flora

A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants. A list of species recorded within the study area is presented in **Appendix A**.

There were a number of taxa that could not be positively identified due to inadequate fruiting or flowering material available at the time of the survey. These are labeled throughout this document with a '?'.

4.1.1 Flora of Conservation Significance

No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian *Wildlife Conservation Act 1950* or governed by the *Environment Protection and Biodiversity Conservation Act 1999* were located within the study area.

Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) *Melaleuca huttensis* (**Plate 1**) and Priority 3 (P3) *Grevillea triloba* (**Plate 2**). One individual *Melaleuca huttensis* was recorded within vegetation unit ArAt (**Section 4.2.1**) (**Figure 2**). *Grevillea triloba* was recorded in large numbers (>100) within vegetation units ArAt and EInF (**Section 4.2.1**) (**Figure 2**).

Both Priority Flora species located in this survey (current report) were also recorded in the previous survey of the study area by GHD (2007). GHD also recorded *Geleznovia verrucosa* subsp. *formosa*, which was a P3 species at the time of that survey. This species has since been identified as a taxonomic synonym of *Geleznovia verrucosa* and is no longer a Priority Flora species.



Plate 1: P1 *Melaleuca huttensis*



Plate 2: P3 *Grevillea triloba*

No other flora species of other conservation significance as stated in *Guidance Statement 51* (EPA, 2004) were recorded within the study area.

4.1.2 Introduced Flora (Weeds)

Thirteen introduced flora (weeds and landscaping plants) were recorded from the survey site, representing 16% of the total flora recorded.

The Environmental Weeds Strategy for WA (EWSWA) (CALM, 1999) rated all the weeds known for Western Australia at the time of publication, according to invasiveness, distribution and environmental impact (**Table 8**). Weeds were classified into four categories; High, Moderate, Mild and Low. High rated species are those that all three criteria apply to (**Table 8**) and Moderate to which two criteria apply. The High and Moderate category weeds recorded in the survey area that should be prioritised for control or eradication are listed in **Table 9**.

Table 8: Criteria for Environmental Weeds Strategy Rating

Criteria	Description
Invasiveness	Ability to invade bushland in good to excellent condition or ability to invade waterways.
Distribution	Wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world.
Environmental Impacts	Ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton

Weed	Rating	Weed	Rating
* <i>Brassica tournefortii</i>	High	* <i>Lycium ferocissimum</i>	High
* <i>Bromus diandrus</i>	High	* <i>Avena barbata</i>	Moderate
* <i>Ehrharta calycina</i>	High	* <i>Briza maxima</i>	Moderate
* <i>Lupinus cosentinii</i>	High	* <i>Ursinia anthemoides</i>	Moderate

4.2 Vegetation

4.2.1 Vegetation Units

An expert botanist defined and mapped 12 vegetation units across the study area, as shown in **Figure 3**. Photographs of some vegetation units and the general study area can be found in **Appendix B**. Descriptions of the vegetation units for the study area are as follows:

1. **EPw** - *Eucalyptus loxophleba*, *E. camaldulensis*, **E.utilis* and *E. sp?* Low Open Woodland over pasture weeds

2. **AAH** - *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladius asper*, **Avena barbata* and Poaceae sp.? Open Herbland/Grassland.
3. **AtMc** - *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland
4. **MrAr** - *Melaleuca raphiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostelifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and Poaceae sp.? Grassland.
5. **EIAr** - Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostelifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland
6. **AsAr** - Scattered *Acacia scirpifolia* and *A. rostelifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds
7. **ArAt** - *Acacia rostelifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmocladius asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
8. **EINF** - Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, *?Austrostipa* sp. and *Desmocladius asper* Herbland/ Grassland.
9. **ArAc** - Scattered *Acacia rostelifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland
10. **Hp** - *Hakea preissii* Tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face
11. **Di** - *Dodonaea inaequifolia* Closed Tall Scrub over Poaceae sp.
12. **CP** - Scattered *Eucalyptus loxophleba*, *Acacia rostelifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland

4.2.2 Vegetation Condition

The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition (Figure 3). The north western extent of the study area contains remnant heath

vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition. Within close proximity to this are small patches of 'Very Good' and 'Very Good' - 'Good' vegetation. The remainder of the study area has been affected - to varying degrees from grazing, clearing and weeds. Small patches of remnant vegetation exist within the cleared pasturelands, however weeds dominate most of these areas.

4.3 Conservation Significant Vegetation

4.3.1 Biodiversity Threshold Levels

Beard Vegetation Association Extent for WA and the GRFVS Area

Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010) (Table 3). In WA these two vegetation types have been cleared below the threshold at which species loss appears to accelerate exponentially at the ecosystem level (EPA, 2000 & 2008).

Within the GRFVS area Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have 17.28% and 7.62% respectively remaining (Table 4). Even though the 'threshold' extents apply to vegetation associations at state level, it is still important to consider the representation of these two vegetation associations within the GRFVS area in terms of local biodiversity.

It should be noted that these statistics do not take into account remnant size or vegetation condition of the areas represented by these vegetation associations. The majority of the study area has been historically cleared, and small remnants of vegetation within cleared pastureland are generally what is remaining. These remnants are continuing to degrade due to grazing and weed invasion, with the exception of the remnant vegetation represented by vegetation unit E1Nf in the north western corner of the site, rated as being in 'Excellent' condition (Figures 2 & 3).

4.3.2 GRFVS Plant Community Representation

To effectively assess the regional representation of vegetation within the study area and compare it to the dataset of the GRFVS, a 10m x 10m plot based survey followed by a quantitative statistical analysis would need to be done; this would involve a detailed Level 2 Flora and Vegetation survey in accordance with the EPA's Guidance Statement 51 (EPA, 2004). As outlined above in section 2.2.3, no GRFVS plots were established within the study area. The plant communities outlined below for the study area were mapped by the GRFVS at a confidence level of 90% (WAPC, 2010).

Plant Community 10 Near Coastal: *Acacia rostellifera* shrubland

This plant community is represented by vegetation units AAH, E1Ar and AtMc within the study area. The vegetation condition for these units ranged from 'Good' to 'Degraded' (Figure 3). Plant community 10 is thought to have previously included *Banksia prionotes*, but due to disturbance from clearing, grazing, fire and weed invasion it has been reduced to a community dominated by *Acacia rostellifera*.

This community occupies 36.63% of the native vegetation of the GRFVS area (Table 5), and is the most widespread of the plant communities

Plant Community 15 Thicket: *Melaleuca* spp / mixed spp.

This plant community is represented by vegetation units AAH, ElAr, MrAr, and Elnf. The vegetation condition for these units ranged from 'Excellent' to 'Degraded' (Figure 3). This community is dominated by *Melaleuca* spp. and is most accurately portrayed in the study area by vegetation unit Elnf.

Significant numbers of Threatened and Priority Flora species were recorded in this plant community by the GRFVS. Five out of eight plant community 15 quadrats surveyed by GRFVS contained flora species of conservation significance. This survey (current report) recorded Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 7.61% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area.

Plant Community 13 Sandplain: *Banksia prionotes/ Acacia rostellifera*

This plant community is only represented within the study area by vegetation unit ArAt; the condition of this unit was assessed as 'Good'. Species characteristic of this community include *Grevillea candelabroides*, *Melaleuca depressa*, *Hibbertia* spp., *Conostylis* spp., sedges and rushes. This survey (current report) recorded Priority Flora 1 (P1) *Melaleuca huttensis* and Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 12.23% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area. The GRFVS (WAPC, 2010) has stated that this community within Beard Association 359 has conservation significance because of the reduced numbers of *Banksia prionotes* due factors such as; fire, *Phytophthora* and grazing. As a result, large areas of this community no longer have this characteristic species present.

4.3.3 Regionally Significant Natural Areas and Areas of High Conservation Value

According to the EPA's *Position Statement 2* (2000) and *Guidance Statement 33* (2008) the study area is a Regionally and Locally Significant Natural Area for the following reasons:

Representation of ecological communities – Beard vegetation association 359 – (Shrublands; *Acacia* and *Banksia* scrub) and 675 – (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have < 30% of their pre-European extents remaining in WA

Diversity – The study area contains natural areas in good or better condition; namely vegetation unit Elnf (Figures 2 & 3).

Significant Flora/ Rarity – Two Priority Flora species were recorded with the study area. These species were Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba*. One individual *Melaleuca huttensis* was recorded, whilst *Grevillea triloba* was recorded in densities of 5% and 20% (Figure 3).

Important landscapes and landforms/ Maintaining ecological processes or natural systems and Ecological Linkages - The Moresby Range follows the boundary of the eastern extent of the study area. The Moresby range is an important landscape that is part of a natural system and provides an ecological linkage throughout its extent.

The Moresby Range escarpment within the study area was not covered by the GRFVS (WAPC, 2010), so no plant community was assigned. However, plant assemblages of the Moresby Range system are considered to be synonymous with Beard vegetation association 675 (WAPC, 2010).

5.0 CONCLUSIONS & RECOMMENDATIONS

According to *Guidance Statement 33* (EPA, 2008) and *Position Statement 2* (EPA, 2000) the study area is considered Regionally Significant because:

5. The vegetation associations within the study area have <30% of their present extents remaining within in WA (**Table 3**)
6. The study area contains native vegetation remnants in good or better condition
7. Two Priority Flora species were recorded; Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba* (**Figure 3**)
8. Within the study area boundary lies, in part, the Moresby Range

To assess the proposed development of the study area, in reference to points 1 and 4, some details should be noted:

- The majority of the study area has been historically cleared and is in Completely Degraded condition (**Figure 3**)
- The Moresby Range escarpment of the study area will not be affected by the proposed development, as this area is to be set-aside as an open space.

With regards points 2 and 3 - vegetation in good or better condition, and Priority Flora – the following should be addressed:

- Within vegetation unit ArAt, P1 *Melaleuca huttensis* and P3 *Grevillea triloba* were recorded. This remnant was in Good condition but is small in size (<1ha). It is currently not fenced off from livestock, so without proper management the area will become further degraded. Due to the occurrence of P1 and P3 flora in this portion of remnant vegetation, it is recommended the area be conserved and fenced off from livestock.
- Vegetation unit EInF was in Excellent condition and is just over 10ha in size, with P3 *Grevillea triloba* recorded within this vegetation unit. Under *Guidance Statement 51* (EPA, 2004) the impact of clearing this vegetation would be considered high to moderate, as a result, a Level 2 Flora and Vegetation Survey of vegetation unit EInF would be required. Alternatively, in keeping with *Position Statement 2* (EPA, 2000) and its requirement for alternative mechanisms that address biodiversity protection, it is recommended that this remnant be retained and managed as a conservation area.

6.0 LIMITATIONS

As with any biological survey, additional flora species including potential threatened, priority or other conservation significant species may be detected in subsequent surveys. For example, ephemeral species such as orchids are not always present in each year/season or at the particular time a single botanical survey is conducted. This is a common limitation to all botanical surveys.

Approximately 10% of Western Australian flora species are undescribed, with new species found regularly. The flora identifications for this project were completed in line with the taxonomic resources and expertise available at the time.

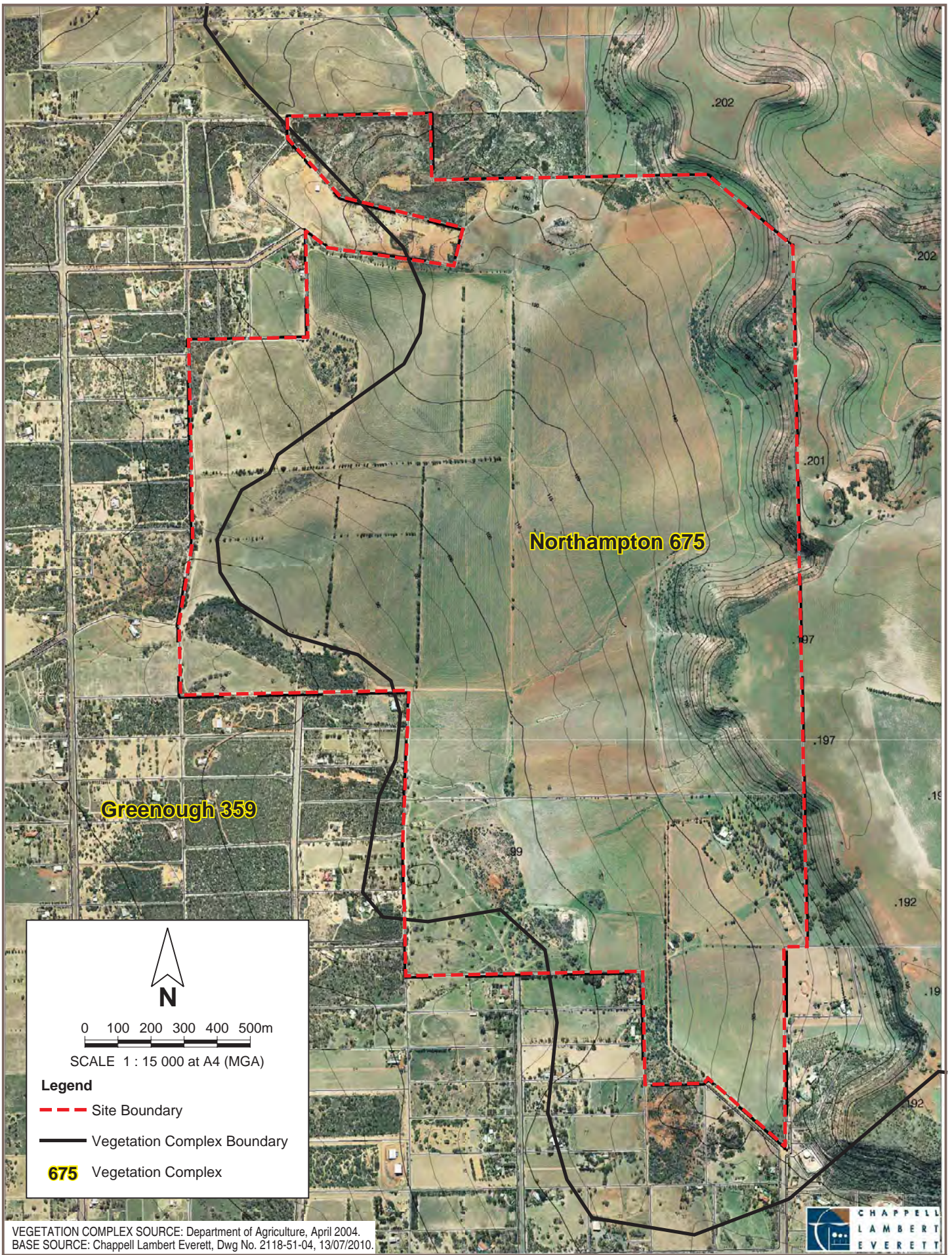
Conservation significant plant communities on site can not be positively confirmed without conducting a plot based survey.

7.0 REFERENCES

- Beard, J (1976), *Vegetation of the Geraldton Area*
- BOM (2011) *Climatic Statistics for Australian Locations*.
http://www.bom.gov.au/climate/averages/tables/cw_008051.shtml Accessed Online, May 2011
- CALM (1999), *Environmental Weed Strategy for Western Australia* Includes weedBase – a digital weed database, Department of Conservation and Land Management, Perth.
- Del Marco, A., Taylor, R., Clarke, K., Savage, K., Cullity, J. and Miles, C. (2004). *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*. Perth Biodiversity Project, Western Australian Local Government Association. West Perth.
- Desmond, A. & Chant, A. (2001) *Geraldton Sandplains 2 (GS2 - Geraldton Hills subregion)*. Department of Environment and Conservation
- Environment Australia. (2000). *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and development of Version 5.1 – Summary Report*. Environment Australia, Canberra
- EPA (2000), *Position Statement No. 2 - Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation with Particular Reference to the Agricultural Area*, Environmental Protection Authority, Perth.
- EPA (2004), *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) No 51 - Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, Environmental Protection Authority, Perth.
- EPA (2008), *Guidance Statement No. 33 - Environmental Guidance for Planning and Development*, Environmental Protection Authority, Western Australia.
- EPA (2010) *Environmental Protection Bulletin No. 10 Geraldton Regional Flora and Vegetation Survey*, Environmental Protection Authority, Western Australia
- Florabase® (2011). Department of Environment, Western Australian Herbarium <http://florabase.calm.wa.gov.au/>. Accessed Online, May 2011.
- GHD (2007) *Lots 80 & 81 Hackett Road, Waggrakine*. Unpublished report.
- Keighery, B (1994), *Bushland Plant Survey – A Guide to Plant Community Survey for the Community*, Wildflower Society of WA (Inc.), Nedlands, Western Australia.
- Noel Schoknecht, N, Tille, P and Purdie, B. (2004) *Soil-landscape mapping in south-western Australia: An overview of methodology and outputs*. Department of Agriculture.
- Smith, M.G. (2010). *Declared Rare and Priority Flora List for Western Australia, 16 September 2010*. Dept of Environment and Conservation. Como, W.A.

- Stuart-Street, A. & Clarke, M. (2005) *Greenough Region Catchment Appraisal*.
Department of Agriculture
- Thackway, R and Cresswell, I (eds.) (1995), *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0*, Australian Nature Conservation Agency, Canberra.
- WAPC (2010) *Geraldton Regional Flora and Vegetation Survey*. Western Australian Planning Commission, Perth.
- WAPC. (2000). *Bush Forever: Volume 2 Directory of Bush Forever Sites*, Perth.

FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-veg-f01.dgn

VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



COTERRA
 ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers	Date: 19 May 2011
Job: HUMMOR01	Revision: A

BEARD VEGETATION ASSOCIATIONS

Figure 1

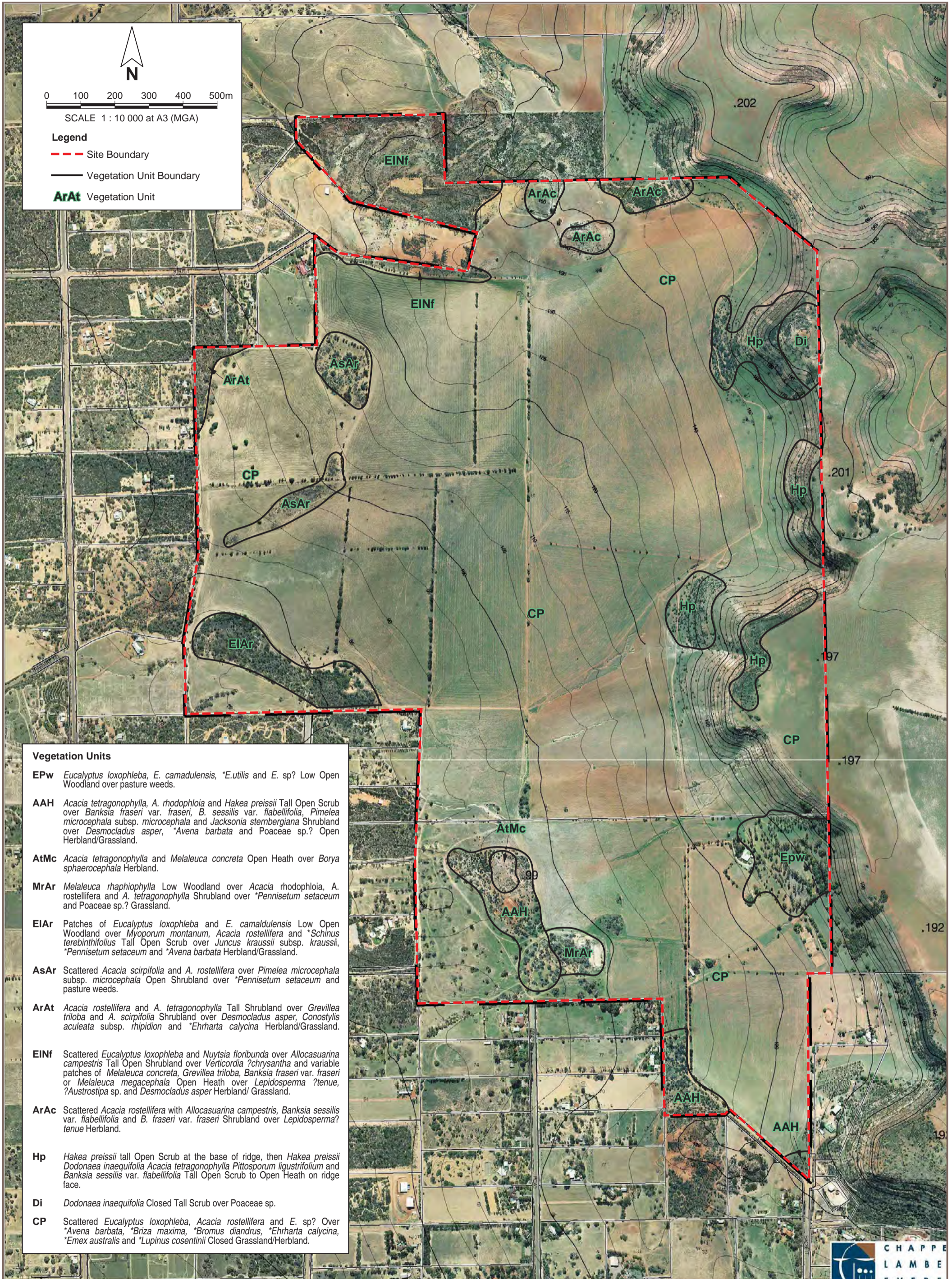
N

0 100 200 300 400 500m

SCALE 1 : 10 000 at A3 (MGA)

Legend

- - - Site Boundary
- Vegetation Unit Boundary
- ArAt Vegetation Unit



Vegetation Units

- EPw** *Eucalyptus loxophleba*, *E. camadulensis*, **E. utilis* and *E. sp?* Low Open Woodland over pasture weeds.
- AAH** *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia stembergiana* Shrubland over *Desmocladius asper*, **Avena barbata* and *Poaceae sp?* Open Herbland/Grassland.
- AtMc** *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland.
- MrAr** *Melaleuca rhapsiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostellifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and *Poaceae sp?* Grassland.
- EIAR** Patches of *Eucalyptus loxophleba* and *E. camadulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.
- AsAr** Scattered *Acacia scirpifolia* and *A. rostellifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds.
- ArAt** *Acacia rostellifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmocladius asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
- EINF** Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenuis*, **Austrostipa sp.* and *Desmocladius asper* Herbland/ Grassland.
- ArAc** Scattered *Acacia rostellifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland.
- Hp** *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
- Di** *Dodonaea inaequifolia* Closed Tall Scrub over *Poaceae sp.*
- CP** Scattered *Eucalyptus loxophleba*, *Acacia rostellifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland.

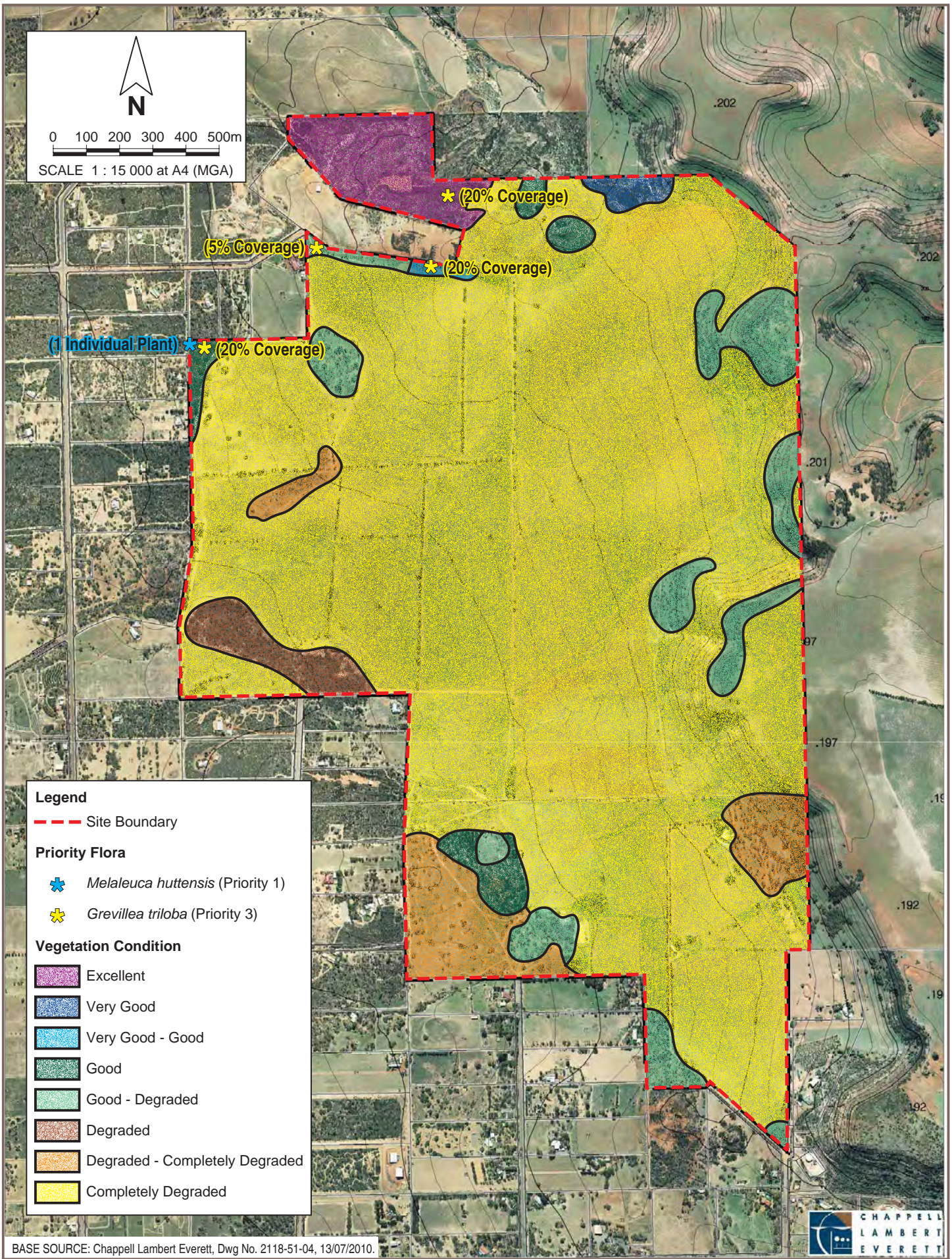


COTERRA
ENVIRONMENT

Humfrey Land Developments
FLORA AND VEGETATION REPORT
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers Date: 19 May 2011
Job: HUMMOR01 Revision: A

VEGETATION UNITS



Legend

--- Site Boundary

Priority Flora

- ★ *Melaleuca huttensis* (Priority 1)
- ★ *Grevillea triloba* (Priority 3)

Vegetation Condition

- Excellent
- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-reg-f03.dgn

		Humfrey Land Developments FLORA AND VEGETATION REPORT LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON
Drawn: L. Rogers Job: HUMMOR01	Date: 19 May 2011 Revision: A	<p style="text-align: center;">VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA</p>

Figure 3

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Flora Species List

APPENDIX A: Species List

* denotes weed species

P1 or P3 denotes Priority Flora 1 or 3

*p denotes planted WA species

Family	Species
ANACARDIACEAE	* <i>Schinus terebinthifolius</i>
ASPARAGACEAE	<i>Acanthocarpus preissii</i>
ASTERACEAE	* <i>Ursinia anthemoides</i>
BORYACEAE	<i>Borya sphaerocephala</i>
BRASSICACEAE	* <i>Brassica tournefortii</i>
CASUARINACEAE	<i>Allocasuarina campestris</i>
CHENOPODIACEAE	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i> <i>Rhagodia preissii</i> subsp. <i>obovata</i>
COLCHICACEAE	<i>Burchardia congesta</i>
CUCURBITACEAE	* <i>Citrullus lanatus</i>
CYPERACEAE	<i>Lepidosperma ? tenue</i> <i>Lepidosperma</i> sp.? <i>Mesomelaena pseudostygia</i>
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>
ERICACEAE	<i>Astroloma serratifolium</i>
FABACEAE	<i>Acacia daphnifolia</i> <i>Acacia oxyclada</i> <i>Acacia rhodophloia</i> <i>Acacia rostelifera</i> <i>Acacia saligna</i> subsp. <i>lindleyi</i> <i>Acacia scirpifolia</i> <i>Acacia tetragonophylla</i> <i>Daviesia divaricata</i> subsp. <i>lanulosa</i> <i>Gastrolobium triangulare</i> <i>Jacksonia sternbergiana</i> * <i>Lupinus cosentinii</i>

Family	Species
GOODENIACEAE	<i>Lechenaultia linarioides</i>
HAEMODORACEAE	<i>Conostylis aculeata</i> subsp. <i>hipidion</i>
HEMEROCALLIDACEAE	<i>Corynotheca micrantha</i> var. <i>micrantha</i> <i>Dianella revoluta</i> var. <i>divaricata</i> <i>Tricoryne elatior</i>
JUNCEAE	<i>Juncus kraussii</i>
LAURACEAE	<i>Cassytha aurea</i>
LORANTHACEAE	<i>Amyema preissii</i> <i>Nuytsia floribunda</i>
MYRTACEAE	<i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> <i>Eucalyptus camaldulensis</i> var. <i>obtusata</i> <i>Eucalyptus loxophleba</i> <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i> *p <i>Eucalyptus utilis</i> <i>Eucalyptus</i> sp.? <i>Melaleuca concreta</i> P1 <i>Melaleuca huttensis</i> <i>Melaleuca megacephala</i> <i>Melaleuca raphiophylla</i> <i>?Thryptomene</i> sp. <i>Verticordia ?chrysantha</i>
PITTOSPORACEAE	<i>Pittosporum ligustrifolium</i> Pittosporaceae sp.?
POACEAE	<i>Amphipogon caricinus</i> <i>Austrodanthonia</i> sp. <i>?Austrostipa</i> sp. * <i>Avena barbata</i> * <i>Briza maxima</i> * <i>Bromus diandrus</i> * <i>Ehrharta calycina</i> * <i>Pennisetum setaceum</i> Poaceae sp.
POLYGONACEAE	* <i>Emex australis</i>

Family	Species
PROTEACEAE	<i>Banksia fraseri</i> var. <i>fraseri</i> <i>Banksia prionotes</i> <i>Banksia sessilis</i> var. <i>flabellifolia</i> <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> <i>Grevillea candelabroides</i> P3 <i>Grevillea triloba</i> <i>Hakea preissii</i> <i>Petrophile conifera</i>
RESTIONACEAE	<i>Desmocladius asper</i> <i>Lepidobolus preissianus</i>
SANTALACEAE	<i>Santalum acuminatum</i>
SAPINDACEAE	<i>Dodonaea inaequifolia</i>
SCROPHULARIACEAE	<i>Myoporum montanum</i>
SOLANACEAE	* <i>Lycium ferocissimum</i>
THYMELAEACEAE	<i>Pimelea microcephala</i> subsp. <i>microcephala</i>
VITACEAE	<i>Clematicissus angustissima</i>

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Vegetation Unit Photos

APPENDIX B – Vegetation Unit Photographs



Plate 1: AAH – Good to Degraded Condition



Plate 2: EIAr – Degraded Condition



Plate 3: ArAt – Good Condition



Plate 4: ArAc – Very Good Condition



Plate 5: E1Nf – Excellent Condition



Plate 6: E1Nf – Excellent Condition



Plate 7: E1pw – Degraded to Completely Degraded Condition



Plate 8: H1p – Good to Degraded Condition

**APPENDIX C - DEC Threatened Flora and Fauna Database Search
Results (Naturemaps, 2011)**

NatureMap Species Report

Created By Guest user on 06/05/2011

Method 'By Circle'

Centre 114°39' 20" E,28°41' 30" S

Buffer 40km

Group By Kingdom

Kingdom	Species	Records
Animalia	597	8627
Chromista	18	33
Fungi	77	114
Plantae	1482	7231
TOTAL	2174	16005

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Animalia				
1.	<i>Ablabesmyia notabilis</i>			
2.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
3.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill (Inland Thornbill))			
4.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
5.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
6.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
7.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
8.	24282 <i>Accipiter fasciatus</i> subsp. <i>fasciatus</i>			
9.	<i>Acercella falcipes</i>			
10.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
11.	-1576 <i>Actitis hypoleucos</i>			
12.	<i>Aedes</i> sp.			
13.	25544 <i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
14.	<i>Agrioptocorixa eurynome</i>			
15.	<i>Agrioptocorixa parvipunctata</i>			
16.	<i>Ainudrilus</i> sp.			Y
17.	<i>Allodessus bistrigatus</i>			
18.	<i>Alona rigidicaudis</i> s.l.			
19.	<i>Alona</i> sp. nov. d (<i>Wicherina</i>)			Y
20.	30833 <i>Amphibolurus longirostris</i>			
21.	24310 <i>Anas castanea</i> (Chestnut Teal)			
22.	24312 <i>Anas gracilis</i> (Grey Teal)			
23.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
24.	25550 <i>Anas rhynchotis</i> subsp. <i>rhynchotis</i>			
25.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
26.	24332 <i>Anhinga melanogaster</i> subsp. <i>novaehollandiae</i>			
27.	-1591 <i>Anhinga novaehollandiae</i>			
28.	<i>Anisops hyperion</i>			
29.	<i>Anisops thienemanni</i>			
30.	25634 <i>Anous stolidus</i> (Common Noddy)			
31.	25635 <i>Anous tenuirostris</i> (Lesser Noddy)			
32.	25241 <i>Antaresia stimsoni</i> subsp. <i>stimsoni</i>			
33.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
34.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
35.	25670 <i>Anthus australis</i> (Australian Pipit)			
36.	-1612 <i>Anthus novaeseelandiae</i>			
37.	<i>Antiporus</i> sp.			
38.	25528 <i>Aphelocephala leucopsis</i> (Southern Whiteface)			
39.	24266 <i>Aphelocephala leucopsis</i> subsp. <i>castaneiventris</i>			
40.	24991 <i>Aprasia repens</i>			
41.	25743 <i>Aptenodytes patagonicus</i> (King Penguin)			
42.	25554 <i>Apus pacificus</i> (Fork-tailed Swift)			
43.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
44.	25538 <i>Aquila morphnoides</i> (Little Eagle)			
45.	25558 <i>Ardea ibis</i> (Cattle Egret)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
46.	-1578 <i>Ardea modesta</i>			
47.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
48.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
49.	-1583 <i>Ardenna carneipes</i>			
50.	-1571 <i>Ardenna pacifica</i>			
51.	24610 <i>Ardeotis australis</i> (Australian Bustard)		P4	
52.	25736 <i>Arenaria interpres</i> (Ruddy Turnstone)			
53.	<i>Arrenurus balladoniensis</i>			
54.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
55.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
56.	<i>Arteria sp. 1</i>			
57.	25236 <i>Aspidites ramsayi</i> (Woma)		S	
58.	<i>Asteron-complex sp. 2</i>			
59.	<i>Atractocerus kreuslerae</i>			
60.	<i>Aulonogyrus strigosus</i>			
61.	<i>Australocyclops australis</i>			
62.	<i>Australutica quaerens</i>			
63.	<i>Austrochiltonia subtenuis</i>			
64.	<i>Austrolestes aridus</i>			
65.	<i>Austrotrombella sp. nov.</i>			
66.	24318 <i>Aythya australis</i> (Hardhead)			
67.	-1633 <i>Barnardius zonarius</i>			
68.	<i>Bennelongia australis</i>			
69.	<i>Berosus approximans</i>			
70.	<i>Berosus australiae</i>			
71.	<i>Bezzia sp. 1</i>			
72.	<i>Bezzia sp. 2</i>			
73.	24319 <i>Biziura lobata</i> (Musk Duck)			
74.	<i>Boeckella triarticulata</i>			
75.	24251 <i>Bos taurus</i> (European Cattle)	Y		
76.	<i>Bostrychopsis jesuita</i>			
77.	34059 <i>Bothriembryon whiteleyi</i>		X	Y
78.	25245 <i>Brachyurophis semifasciata</i>			
79.	24723 <i>Cacatua pastinator</i> subsp. <i>butleri</i> (Butler's Corella)			
80.	24725 <i>Cacatua roseicapilla</i> subsp. <i>assimilis</i>			
81.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
82.	-1686 <i>Cacatua sp.</i>			
83.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
84.	-1590 <i>Cacomantis pallidus</i>			
85.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)			
86.	24780 <i>Calidris alba</i> (Sanderling)			
87.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)			
88.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)			
89.	24790 <i>Calidris tenuirostris</i> (Great Knot)			
90.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
91.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)		T	
92.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)		T	
93.	<i>Candonocypris sp. 682</i> (? <i>novaezelandiae</i>)			
94.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
95.	24507 <i>Catharacta antarctica</i> subsp. <i>lonnbergi</i>			
96.	<i>Cavasteron sp. 1</i>			
97.	<i>Cephrenes augiades</i> subsp. <i>sperthias</i>			
98.	<i>Cercophonius sp.</i>			
99.	<i>Ceriodaphnia sp. nov. d</i> (Berner sp.#5)			
100.	24564 <i>Certhionyx variegatus</i> (Pied Honeyeater)			
101.	<i>Chaetogaster diastrophus</i>			
102.	-1624 <i>Chalcites basalis</i>			
103.	-1581 <i>Chalcites lucidus</i>			
104.	-1615 <i>Chalcites osculans</i>			
105.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattleed Bat)			
106.	-1634 <i>Charadrius australis</i>			
107.	25573 <i>Charadrius bicinctus</i> (Double-banded Plover)			
108.	25574 <i>Charadrius dubius</i> (Little Ringed Plover)			
109.	25575 <i>Charadrius leschenaultii</i> (Greater Sand Plover)			
110.	24373 <i>Charadrius melanops</i> (Black-fronted Dotterel)			
111.	25576 <i>Charadrius mongolus</i> (Lesser Sand Plover)			
112.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
113.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck (Wood Duck))			
114.	-1602 <i>Cheramoeca leucosterna</i>			
115.	24488 <i>Cheramoeca leucosternus</i> (White-backed Swallow)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
116.	<i>Chironomus aff. alternans</i> (V24)			
117.	<i>Chironomus tepperi</i>			
118.	-1579 <i>Chlidonias hybrida</i>			
119.	-1637 <i>Chroicocephalus novaehollandiae</i>			
120.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i>			
121.	24833 <i>Cincloramphus cruralis</i> (Brown Songlark)			
122.	24834 <i>Cincloramphus mathewsi</i> (Rufous Songlark)			
123.	-1620 <i>Cinclosoma castanotum</i>			
124.	24288 <i>Circus approximans</i> (Swamp Harrier)			
125.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
126.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
127.	24396 <i>Climacteris rufa</i> (Rufous Treecreeper)			
128.	<i>Cloeon</i> sp.			
129.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
130.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
131.	<i>Colurella coluris</i>			
132.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
133.	24416 <i>Corvus bennetti</i> (Little Crow)			
134.	25592 <i>Corvus coronoides</i> (Australian Raven)			
135.	24417 <i>Corvus coronoides</i> subsp. <i>perplexus</i>			
136.	25593 <i>Corvus orru</i> (Torresian Crow)			
137.	-1666 <i>Corvus</i> sp.			
138.	<i>Corynoneura</i> sp. (V49)			
139.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
140.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
141.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
142.	24422 <i>Cracticus tibicen</i> subsp. <i>dorsalis</i> (White-backed Magpie)			
143.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
144.	24918 <i>Crenadactylus ocellatus</i> subsp. <i>ocellatus</i>			
145.	25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet)			
146.	<i>Croitana croites</i>			
147.	30893 <i>Cryptoblepharus buchanani</i>			
148.	25020 <i>Cryptoblepharus plagioccephalus</i>			
149.	<i>Cryptochironomus griseidorsum</i>			
150.	24881 <i>Ctenophorus maculatus</i> subsp. <i>maculatus</i>			
151.	24886 <i>Ctenophorus reticulatus</i> (Western Nettle Dragon)			
152.	25027 <i>Ctenotus australis</i>			
153.	25039 <i>Ctenotus fallens</i>			
154.	25065 <i>Ctenotus pantherinus</i> subsp. <i>pantherinus</i>			
155.	<i>Culex (culex) australicus</i>			
156.	<i>Culicoides</i> sp.			
157.	25086 <i>Cyclodomorphus branchialis</i>		T	
158.	25087 <i>Cyclodomorphus celatus</i>			
159.	24322 <i>Cygnus atratus</i> (Black Swan)			
160.	<i>Cypretta baylyi</i>			
161.	<i>Cypretta</i> sp. 527			
162.	<i>Cypricerus</i> sp. 442			
163.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
164.	<i>Daphnia cf. cephalata</i>			
165.	24995 <i>Delma australis</i>			
166.	24997 <i>Delma butleri</i>			
167.	25766 <i>Delma fraseri</i>			
168.	24999 <i>Delma grayii</i>			
169.	<i>Delma</i> sp ? nov SAP			Y
170.	25004 <i>Delma tincta</i>			
171.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i>			
172.	25346 <i>Dermodochelys coriacea</i> (Leatherback Turtle)		T	
173.	<i>Dero furcata</i>			
174.	<i>Dero nivea</i>			
175.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
176.	<i>Diplacodes bipunctata</i>			
177.	25469 <i>Diplodactylus granariensis</i>			
178.	24929 <i>Diplodactylus granariensis</i> subsp. <i>granariensis</i>			
179.	24938 <i>Diplodactylus ornatus</i>			
180.	24940 <i>Diplodactylus pulcher</i>			
181.	25359 <i>Disteira major</i>			
182.	<i>Doratifera</i> sp.			
183.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
184.	<i>Ecnomus pansus/turgidus</i>			
185.	-1623 <i>Egretta garzetta</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
186.	-1577 <i>Egretta novaehollandiae</i>			
187.	-1647 <i>Egretta sacra</i>			
188.	-1600 <i>Elanus axillaris</i>			
189.	25250 <i>Elapognathus coronatus</i> (Crowned Snake)			
190.	-1573 <i>Euseyornis melanops</i>			
191.	<i>Enoplognatha</i> sp.			
192.	-1569 <i>Eolophus roseicapillus</i>			
193.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
194.	-1629 <i>Eopsaltria griseogularis</i>			
195.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
196.	24568 <i>Epthianura aurifrons</i> (Orange Chat)			
197.	24570 <i>Epthianura tricolor</i> (Crimson Chat)			
198.	25109 <i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)			
199.	24379 <i>Erythrogonys cinctus</i> (Red-kneed Dotterel)			
200.	<i>Eucyclops australiensis</i>			
201.	<i>Eucypris virens</i>			
202.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
203.	<i>Euryopsis</i> sp. 7			
204.	<i>Euryopsis</i> sp. 9			
205.	24415 <i>Eurystomus orientalis</i> subsp. <i>pacificus</i>			
206.	<i>Eylais</i> sp.			
207.	25621 <i>Falco berigora</i> (Brown Falcon)			
208.	25622 <i>Falco cenchroides</i> (Australian Kestrel)			
209.	24472 <i>Falco cenchroides</i> subsp. <i>cenchrroides</i>			
210.	25623 <i>Falco longipennis</i> (Australian Hobby)			
211.	24474 <i>Falco longipennis</i> subsp. <i>longipennis</i>			
212.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
213.	24475 <i>Falco peregrinus</i> subsp. <i>macropus</i>		S	
214.	24041 <i>Felis catus</i> (Cat)	Y		
215.	25727 <i>Fulica atra</i> (Eurasian Coot)			
216.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
217.	24765 <i>Gallirallus philippensis</i> subsp. <i>mellori</i>			
218.	<i>Gamasomorpha</i> sp. 7			
219.	<i>Gamasomorpha</i> sp. 8			
220.	24959 <i>Gehyra variegata</i>			
221.	-1614 <i>Gelochelidon nilotica</i>			
222.	Gen. 1 sp. 1			
223.	Gen. 1 sp. 1			
224.	Gen. 1 sp. 1			
225.	Gen. 1 sp. 1			
226.	Gen. 1 sp. 1			
227.	Gen. 1 sp. 1			
228.	Gen. 1 sp. 1			
229.	Gen. 1 sp. 1			
230.	Gen. 1 sp. 1			
231.	Gen. 1 sp. 1			
232.	Gen. 1 sp. 1			
233.	Gen. 1 sp. 1			
234.	Gen. 1 sp. 2			
235.	Gen. 1 sp. 2			
236.	Gen. 1 sp. 2			
237.	Gen. 1 sp. 2			
238.	Gen. 1 sp. 2			
239.	Gen. 1 sp. 2			
240.	Gen. 1 sp. 2			
241.	Gen. 1 sp. 2			
242.	Gen. 1 sp. 2			
243.	Gen. 12 sp. 2			
244.	Gen. 12 sp. 4			
245.	Gen. 2 sp. 1			
246.	Gen. 2 sp. 1			
247.	Gen. 2 sp. 1			
248.	Gen. 2 sp. 1			
249.	Gen. 2 sp. 1			
250.	Gen. 2 sp. 1			
251.	Gen. 2 sp. 1			
252.	Gen. 2 sp. 1			
253.	Gen. 3 sp. 1			
254.	Gen. 3 sp. 1			
255.	Gen. 3 sp. 1			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
256.	Gen. 3 sp. 1			
257.	Gen. 3 sp. 1			
258.	Gen. 3 sp. 1			
259.	Gen. 3 sp. 1			
260.	Gen. 3 sp. 10			
261.	Gen. 3 sp. 11			
262.	Gen. 3 sp. 12			
263.	Gen. 3 sp. 3			
264.	Gen. 3 sp. 3			
265.	Gen. 5 sp. 1			
266.	Gen. 5 sp. 1			
267.	Gen. 5 sp. 1			
268.	Gen. 6 sp. 1			
269.	Gen. 6 sp. 1			
270.	Gen. ?? sp. 12			
271.	Gen. ?? sp. 12			
272.	Gen. A sp.			
273.	-1684 Genus sp.			
274.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
275.	25585 <i>Geopelia striata</i> (Peaceful Dove)			
276.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
277.	-1596 <i>Glyciphila melanops</i>			
278.	<i>Gmogola</i> sp. B			
279.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
280.	<i>Grayenulla australensis</i>			
281.	<i>Grymeus</i> sp. 10			
282.	<i>Grymeus</i> sp. 4			
283.	<i>Grymeus</i> sp. 9			
284.	<i>Gymnometriocnemus</i> sp. A			
285.	<i>Habronestes</i> sp. 15			
286.	<i>Habronestes</i> sp. 27			Y
287.	<i>Habronestes</i> sp. 5			
288.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
289.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
290.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
291.	<i>Haliplus gibbus</i>			
292.	24689 <i>Halobaena caerulea</i> (Blue Petrel)			
293.	24297 <i>Hamirostra melanosternon</i> (Black-breasted Buzzard)			
294.	<i>Harrisius</i> sp. A			
295.	25408 <i>Heleioporus albopunctatus</i> (Western Spotted Frog)			
296.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
297.	25412 <i>Heleioporus psammophilus</i> (Sand Frog)			
298.	<i>Helobdella papillornata</i>			
299.	<i>Hemianax papuensis</i>			
300.	<i>Hemicordulia tau</i>			
301.	<i>Heterocypris tatei</i>			
302.	24961 <i>Heteronotia binoei</i> (Bynoe's Gecko)			
303.	-1601 <i>Hieraaetus morphnoides</i>			
304.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
305.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
306.	25629 <i>Hirundo nigricans</i> (Tree Martin)			
307.	<i>Hyderodes crassus</i>			
308.	25366 <i>Hydrophis elegans</i>			
309.	-1642 <i>Hydroprogne caspia</i>			
310.	24075 <i>Hyperoodon planifrons</i> (Southern Bottlenose Whale)			Y
311.	<i>Hyphydrus elegans</i>			
312.	<i>Hypochrysops halyaetus</i>			
313.	33917 <i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)		T	
314.	<i>Ilyodromus</i> sp. 566 (aff. <i>amplicolis</i>)			
315.	<i>Ischnura aurora aurora</i>			
316.	<i>Isidorella</i> sp.			
317.	<i>Kerasteron</i> sp. 1			
318.	<i>Keratella procurva</i>			
319.	<i>Kiefferulus intertinctus</i>			
320.	-1641 <i>Lalage sueurii</i>			
321.	<i>Lampona cylindrata</i>			
322.	<i>Larsia ? albiceps</i>			
323.	25638 <i>Larus pacificus</i> (Pacific Gull)			
324.	<i>Latrodectus hasseltii</i>			
325.	<i>Lecane aculeata</i>			Y

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
326.	<i>Lecane bulla</i>			
327.	<i>Lecane closterocerca</i>			
328.	<i>Lecane hamata</i>			
329.	<i>Lecane ludwigii</i>			
330.	<i>Lecane luna</i>			
331.	<i>Lecane papuana</i>			
332.	24218 <i>Leporillus apicalis</i> (Lesser Stick-nest Rat)		X	
333.	25131 <i>Lerista distinguenda</i>			
334.	25133 <i>Lerista elegans</i>			
335.	25137 <i>Lerista gerrardii</i>			
336.	25147 <i>Lerista lineata</i>		P3	
337.	25148 <i>Lerista lineopunctulata</i>			
338.	25160 <i>Lerista planiventralis</i> subsp. <i>decora</i>			
339.	25165 <i>Lerista praepedita</i>			
340.	25005 <i>Lialis burtonis</i>			
341.	24575 <i>Lichenostomus keartlandi</i> (Grey-headed Honeyeater)			
342.	25659 <i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
343.	24577 <i>Lichenostomus ornatus</i> (Yellow-plumed Honeyeater)			
344.	24578 <i>Lichenostomus penicillatus</i> (White-plumed Honeyeater)			
345.	24579 <i>Lichenostomus plumulus</i> (Grey-fronted Honeyeater)			
346.	24581 <i>Lichenostomus virescens</i> (Singing Honeyeater)			
347.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
348.	<i>Limnocythere porphyretica</i>			
349.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
350.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)			
351.	25741 <i>Limosa limosa</i> (Black-tailed Godwit)			
352.	<i>Liodessus inornatus</i>			
353.	<i>Liparetrus</i> sp.			
354.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
355.	<i>Lophocharis salpina</i>			
356.	-1635 <i>Lophochroa leadbeateri</i>			
357.	<i>Lychas</i> sp. 3			
358.	<i>Lycidas chrysomelas</i>			
359.	<i>Lycidas</i> sp. 21			Y
360.	<i>Lycidas</i> sp. 3			
361.	<i>Lycidas</i> sp. 4			
362.	<i>Lycosa forresti</i>			
363.	<i>Lycosa</i> sp. 1			
364.	<i>Lycosa</i> sp. 10			
365.	<i>Lycosa</i> sp. 14			
366.	<i>Lycosa</i> sp. 17			
367.	<i>Lycosa</i> sp. 6			
368.	<i>Lycosa</i> sp. 8			
369.	<i>Lynceus</i> sp.			
370.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		T	
371.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
372.	24133 <i>Macropus irma</i> (Western Brush Wallaby)		P4	
373.	25489 <i>Macropus robustus</i>			
374.	24135 <i>Macropus robustus</i> subsp. <i>erubescens</i> (Euro, Biggada)			
375.	<i>Macrothrix breviseta</i>			
376.	<i>Macrothrix schauinslandi</i>			
377.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
378.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
379.	24544 <i>Malurus lamberti</i> subsp. <i>assimilis</i>			
380.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
381.	24551 <i>Malurus pulcherrimus</i> (Blue-breasted Fairy-wren)			
382.	-1674 <i>Malurus</i> sp.			
383.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
384.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
385.	<i>Maratus pavonis</i>			
386.	<i>Matilda</i> sp. 1			
387.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
388.	<i>Megaporus</i> sp.			
389.	24051 <i>Megaptera novaeangliae</i> (Humpback Whale)		T	
390.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
391.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
392.	25184 <i>Menetia greyii</i>			
393.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
394.	<i>Mesocyclops brooksi</i>			
395.	-1636 <i>Microcarbo melanoleucos</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
396.	25693 <i>Microeca fascinans</i> (Jacky Winter)			
397.	<i>Micronecta gracilis</i>			
398.	<i>Micronecta robusta</i>			
399.	25542 <i>Milvus migrans</i> (Black Kite)			
400.	<i>Missulena</i> sp. 5			
401.	<i>Missulena</i> sp. 6			
402.	24904 <i>Moloch horridus</i> (Thorny Devil)			
403.	<i>Monohelea</i> sp. 3			
404.	25240 <i>Morelia spilota</i> subsp. <i>imbricata</i> (Carpet Python)		S	
405.	25191 <i>Morethia lineocellata</i>			
406.	25192 <i>Morethia obscura</i>			
407.	-1595 <i>Morus serrator</i>			
408.	24601 <i>Motacilla alba</i> subsp. <i>ocularis</i>			Y
409.	24223 <i>Mus musculus</i> (House Mouse)	Y		
410.	25610 <i>Myiagra inquieta</i> (Restless Flycatcher)			
411.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
412.	<i>Myrmopopaea</i> sp.			
413.	<i>Necterosoma</i> sp.			
414.	<i>Necterosoma wollastoni</i>			
415.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
416.	25425 <i>Neobatrachus kunapalari</i> (Kunapalari Frog)			
417.	25426 <i>Neobatrachus pelobatoides</i> (Humming Frog)			
418.	25428 <i>Neobatrachus wilmorei</i> (Plonking Frog)			
419.	24210 <i>Neophoca cinerea</i> (Australian Sea Lion)		S	
420.	<i>Neostorena</i> sp. 12			
421.	<i>Neostorena</i> sp. 4			
422.	24968 <i>Nephurus levis</i> subsp. <i>occidentalis</i>			
423.	30941 <i>Nephurus millii</i> (Barking Gecko)			
424.	<i>Nilobezzia</i> sp. 1			
425.	25748 <i>Ninox novaeseelandiae</i> (Boobook Owl)			
426.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
427.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
428.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
429.	24495 <i>Oceanites marinus</i> subsp. <i>dulciae</i>			
430.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
431.	<i>Oecetis</i> sp.			
432.	-1606 <i>Onychoprion anaethetus</i>			
433.	-1656 <i>Onychoprion fuscata</i>			
434.	<i>Opopaea</i> sp. 1			
435.	<i>Opopaea</i> sp. 10			
436.	<i>Opopaea</i> sp. 11			
437.	<i>Opopaea</i> sp. 12			
438.	<i>Opopaea</i> sp. 2			
439.	<i>Opopaea</i> sp. 3			
440.	<i>Opopaea</i> sp. 4			
441.	<i>Opopaea</i> sp. 7			
442.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
443.	<i>Orthertrum caledonicum</i>			
444.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
445.	34016 <i>Ovis aries</i> (Sheep)			
446.	24328 <i>Oxyura australis</i> (Blue-billed Duck)			
447.	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
448.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
449.	-1611 <i>Pandion cristatus</i>			
450.	<i>Parachironomus</i> sp. 1 (VSCL35)			
451.	<i>Paracyclops chiltoni</i>			
452.	<i>Parakiefferiella</i> sp. A			
453.	<i>Paramerina levidensis</i>			
454.	<i>Paramerina</i> sp.a			
455.	<i>Pararchaea</i> sp. 2			
456.	25254 <i>Parasuta monachus</i>			
457.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
458.	25687 <i>Passer domesticus</i> (House Sparrow)	Y		
459.	24642 <i>Passer montanus</i> (Eurasian Tree Sparrow)	Y		
460.	-1631 <i>Pelagodroma marina</i>			
461.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
462.	-1638 <i>Petrochelidon ariel</i>			
463.	-1640 <i>Petrochelidon nigricans</i>			
464.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
465.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
466.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
467.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
468.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
469.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
470.	<i>Phenasteron longiconductor</i>			
471.	<i>Philodina</i> sp.			Y
472.	<i>Phoracantha lata</i>			
473.	<i>Phoracantha rugithoracica</i>			
474.	-1643 <i>Phylidonyris niger</i>			
475.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
476.	24073 <i>Physeter macrocephalus</i> (Sperm Whale)		P4	
477.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
478.	25721 <i>Platycercus zonarius</i> (Australian Ringneck (Ring-necked Parrot))			
479.	<i>Platynectes decempunctatus</i> var. <i>polygrammus</i>			
480.	<i>Platynectes</i> sp.			
481.	<i>Platyomopsis</i> sp.			
482.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)			
483.	25509 <i>Pletholax gracilis</i> (Keeled Legless Lizard)			
484.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i>			
485.	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)			
486.	24383 <i>Pluvialis squatarola</i> (Grey Plover)			
487.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
488.	25510 <i>Pogona minor</i>			
489.	24907 <i>Pogona minor</i> subsp. <i>minor</i>			
490.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
491.	<i>Polypedilum nubifer</i>			
492.	<i>Polypedilum watsoni</i>			
493.	30854 <i>Polytelis anthopeplus</i> subsp. <i>westralis</i>			
494.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
495.	34013 <i>Pomatostomus superciliosus</i> subsp. <i>ashbyi</i> (White-browed Babbler (western wheatbelt))		P4	
496.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
497.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
498.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
499.	<i>Pristina jenkiniae</i>			
500.	<i>Procladius paludicola</i>			
501.	33991 <i>Psacodonotus seriatus</i> ((cricket))		P1	Y
502.	-1655 <i>Psephotus varius</i>			
503.	25261 <i>Pseudechis australis</i> (Mulga Snake)			
504.	24230 <i>Pseudomys albocinereus</i> (Ash-grey Mouse)			
505.	25263 <i>Pseudonaja modesta</i> (Ringed Brown Snake)			
506.	25264 <i>Pseudonaja nuchalis</i> (Gwardar)			
507.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
508.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill (Chiming Wedgebill))			
509.	24173 <i>Pteropus scapulatus</i> (Little Red Flying-fox)			
510.	-1625 <i>Purnella albifrons</i>			
511.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
512.	25009 <i>Pygopus nigriceps</i>			
513.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
514.	25271 <i>Ramphotyphlops australis</i>			
515.	25279 <i>Ramphotyphlops hamatus</i>			
516.	25281 <i>Ramphotyphlops leptosoma</i>			
517.	25285 <i>Ramphotyphlops pinguis</i>			
518.	25288 <i>Ramphotyphlops waitii</i>			
519.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
520.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
521.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
522.	<i>Rhantus</i> sp.			
523.	-1654 <i>Rhipidura albiscapa</i>			
524.	25613 <i>Rhipidura fuliginosa</i> (Grey Fantail)			
525.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
526.	<i>Sarscyridopsis aculeata</i>			
527.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
528.	24279 <i>Sericornis frontalis</i> subsp. <i>maculatus</i>			
529.	<i>Simocephalus elizabethae</i>			
530.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
531.	25267 <i>Simoselaps littoralis</i> (West Coast Banded Snake)			
532.	<i>Simulium ornatipes</i>			
533.	30948 <i>Smicromis brevirostris</i> (Weebill)			
534.	24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
535.	24109 <i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			
536.	24112 <i>Sminthopsis granulipes</i> (White-tailed Dunnart)			
537.	<i>Sondra</i> sp. 1			
538.	<i>Steatoda</i> sp. 1			
539.	-1574 <i>Stercorarius antarcticus</i>			
540.	-1619 <i>Stercorarius maccormicki</i>			Y
541.	24517 <i>Stercorarius parasiticus</i> (Arctic Skua)			
542.	25640 <i>Sterna dougallii</i> (Roseate Tern)			
543.	24530 <i>Sterna nereis</i> subsp. <i>nereis</i>			
544.	-1599 <i>Sternula nereis</i>			
545.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
546.	24426 <i>Strepera versicolor</i> subsp. <i>plumbea</i>			
547.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
548.	30950 <i>Streptopelia senegalensis</i> subsp. <i>senegalensis</i>	Y		
549.	25518 <i>Strophurus spinigerus</i>			
550.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
551.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe (Black-throated Grebe))			
552.	24207 <i>Tachyglossus aculeatus</i> (Echidna)			
553.	24185 <i>Tadarida australis</i> (White-striped Freetail-bat)			
554.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck (Mountain Duck))			
555.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
556.	30871 <i>Taeniopygia guttata</i> subsp. <i>castanotis</i>			
557.	<i>Tanytarsus fuscithorax/semibarbitarsus</i>			
558.	<i>Tanytarsus</i> sp. F			Y
559.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
560.	<i>Tasmanocoenis tillyardi</i>			
561.	<i>Textracella</i> sp. 1			
562.	34135 <i>Thalassarche cauta</i> (Shy Albatross)		T	
563.	34007 <i>Thalassarche chlororhynchos</i> (Atlantic Yellow-nosed Albatross)		T	
564.	-1582 <i>Thalassarche melanophris</i>			
565.	-1622 <i>Thalasseus bergii</i>			
566.	<i>Thienemanniella</i> sp. (V19)			
567.	24844 <i>Threskiornis molucca</i> (Australian White Ibis)			
568.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
569.	25203 <i>Tiliqua occipitalis</i> (Western Bluetongue)			
570.	25519 <i>Tiliqua rugosa</i>			
571.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
572.	24308 <i>Todiramphus pyrrhopygia</i> (Red-backed Kingfisher)			
573.	-1613 <i>Todiramphus pyrrhopygius</i>			
574.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
575.	-1617 <i>Tribonyx ventralis</i>			
576.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
577.	24803 <i>Tringa brevipes</i> (Grey-tailed Tattler)			
578.	24806 <i>Tringa glareola</i> (Wood Sandpaper)			
579.	24808 <i>Tringa nebularia</i> (Common Greenshank)			
580.	<i>Triplectides australis</i>			
581.	24851 <i>Turnix velox</i> (Little Button-quail)			
582.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
583.	24852 <i>Tyto alba</i> subsp. <i>delicatula</i>			
584.	-1626 <i>Tyto javanica</i>			
585.	24855 <i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i>		P3	
586.	24983 <i>Underwoodisaurus millii</i> (Barking Gecko)			
587.	<i>Urodacus</i> sp. 1			
588.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
589.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
590.	25227 <i>Varanus tristis</i> subsp. <i>tristis</i> (Racehorse Monitor)			
591.	<i>Venatrix pullastra</i>			
592.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
593.	<i>Xanthagrion erythroneurum</i>			
594.	-1639 <i>Xenus cinereus</i>			
595.	<i>Zillimata scintillans</i>			
596.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye (Silvereye))			
597.	24856 <i>Zosterops lateralis</i> subsp. <i>gouldi</i>			
Chromista				
598.	26586 <i>Caulocystis uvifera</i>			
599.	26731 <i>Cystoseira trinodis</i>			
600.	26766 <i>Dictyopteris muelleri</i>			
601.	26767 <i>Dictyopteris plagiogramma</i>			
602.	29537 <i>Dictyota fastigiata</i>			
603.	29939 <i>Dictyota moniliformis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
604.	35216 <i>Dictyota paniculata</i>			
605.	26946 <i>Hormophysa cuneiformis</i>			
606.	27043 <i>Lobophora variegata</i>			
607.	27090 <i>Myriodesma quercifolium</i>			
608.	27118 <i>Padina sanctae-crucis</i>			
609.	27123 <i>Perithalia caudata</i>			
610.	-9620 <i>Sargassum cinctum</i>			Y
611.	27236 <i>Sargassum decurrens</i>			
612.	27245 <i>Sargassum ilicifolium</i>			
613.	27264 <i>Scaberia agardhii</i>			
614.	27273 <i>Scytothalia dorycarpa</i>			
615.	27373 <i>Zonaria turneriana</i>			

Fungi

616.	27574 <i>Acarospora citrina</i>			
617.	-10227 <i>Alternaria brassicae</i>			Y
618.	-11461 <i>Alternaria japonica</i>			Y
619.	-4469 <i>Alternaria solani</i>			
620.	-13185 <i>Ascochyta rabiei</i>			
621.	27587 <i>Aspicilia calcarea</i>			
622.	27593 <i>Buellia alboatra</i>			
623.	-5725 <i>Buellia sp.</i>			
624.	-5296 <i>Caloplaca burneimensis</i>			
625.	27625 <i>Caloplaca cinnabarina</i>			
626.	27628 <i>Caloplaca erythrostricta</i>			
627.	-12556 <i>Caloplaca kaernefeltii</i>			
628.	31099 <i>Caloplaca kantvilasii</i>			
629.	27638 <i>Caloplaca marina</i>			
630.	-3957 <i>Caloplaca mereschkowskiana</i>			
631.	-11616 <i>Caloplaca michelagoensis</i>			
632.	31095 <i>Caloplaca montisfracti</i>			
633.	-12902 <i>Caloplaca sp.</i>			
634.	-6058 <i>Caloplaca yorkensis</i>			Y
635.	27645 <i>Candelariella xanthostigmoides</i>			
636.	27649 <i>Canoparmelia pruinata</i>			
637.	-8172 <i>Cercospora echii</i>			Y
638.	-13018 <i>Cladosporium herbarum</i>			Y
639.	-4180 <i>Cochliobolus victoriae</i>			
640.	-8329 <i>Colletotrichum gloeosporioides</i>			
641.	-7183 <i>Colletotrichum orbiculare</i>			Y
642.	27718 <i>Diploschistes euganeus</i>			
643.	-3855 <i>Drechslera teres</i>			
644.	27741 <i>Endocarpon simplicatum</i>			
645.	-9728 <i>Endocarpon sp.</i>			
646.	27748 <i>Flavoparmelia rutidota</i>			
647.	-9847 <i>Flavoparmelia sp.</i>			
648.	-4702 <i>Fusarium equiseti</i>			
649.	-12094 <i>Fusarium oxysporum</i>			Y
650.	-6320 <i>Gaeumannomyces graminis var. tritici</i>			
651.	-11951 <i>Graphis sp.</i>			
652.	-11257 <i>Hyperphyscia sp.</i>			
653.	-11223 <i>Leptosphaeria nodorum</i>			
654.	-5611 <i>Mycosphaerella capsellae</i>			Y
655.	27956 <i>Pertusaria thiospoda</i>			
656.	20167 <i>Pertusaria trachyspora</i>		P2	
657.	-9407 <i>Phaeogyroporus portentosus</i>			
658.	27972 <i>Physcia jackii</i>			
659.	-9592 <i>Physoderma trifolii</i>			
660.	-10822 <i>Placidium lacinulatum</i>			
661.	-3905 <i>Placidium sp.</i>			
662.	27998 <i>Psora crenata</i>			
663.	-7216 <i>Puccinia coronata</i>			
664.	-5068 <i>Puccinia graminis</i>			
665.	-6842 <i>Puccinia graminis forma avenae</i>			
666.	-12538 <i>Puccinia graminis forma tritici</i>			
667.	-12188 <i>Puccinia haemodori</i>			
668.	28007 <i>Punctelia subalbicans</i>			
669.	28017 <i>Pyxine cocoes</i>			
670.	28052 <i>Rinodina thiomela</i>			
671.	-12715 <i>Septoria lycopersici</i>			Y
672.	28060 <i>Siphula coriacea</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
673.	28065 <i>Teloschistes chrysophthalmus</i>			
674.	28075 <i>Toninia glaucocarpa</i>			
675.	-9750 <i>Toninia</i> sp.			
676.	28080 <i>Trapeliopsis psammophila</i>			
677.	-6370 <i>Uromyces polygoni-aviculariae</i>			
678.	-8367 <i>Uromycladium tepperianum</i>			
679.	28102 <i>Xanthoparmelia alternata</i>			
680.	28104 <i>Xanthoparmelia amplexula</i>			
681.	28145 <i>Xanthoparmelia isidiosa</i>			
682.	29019 <i>Xanthoparmelia kondininensis</i>		P2	
683.	28156 <i>Xanthoparmelia nana</i>			
684.	29964 <i>Xanthoparmelia sargentii</i>		P1	
685.	28180 <i>Xanthoparmelia succedans</i>			
686.	28181 <i>Xanthoparmelia taractica</i>			
687.	28192 <i>Xanthoparmelia yowaensis</i>			
688.	-10456 <i>Xanthoria ectanea</i>			
689.	30455 <i>Xanthoria elixii</i>			
690.	28193 <i>Xanthoria ligulata</i>			
691.	28194 <i>Xanthoria parietina</i>			
692.	-3959 <i>Xanthoria parietinoides</i>			Y

Plantae

693.	4889 <i>Abutilon cryptopetalum</i>			
694.	-4675 <i>Acacia Plurinerves-Microneurae Phyllodes >8-nerved, terete(Misc.- SW)</i>			
695.	3197 <i>Acacia aciphylla</i>			
696.	3199 <i>Acacia acuaría</i>			
697.	3200 <i>Acacia acuminata (Jam)</i>			
698.	3207 <i>Acacia alata (Winged Wattle)</i>			
699.	16111 <i>Acacia alata var. biglandulosa</i>			
700.	3225 <i>Acacia ashbyae</i>			
701.	3238 <i>Acacia bidentata</i>			
702.	3242 <i>Acacia blakelyi</i>			
703.	15471 <i>Acacia brumalis</i>			
704.	3265 <i>Acacia comans</i>			
705.	-10495 <i>Acacia comans Variant No. 1</i>			
706.	15473 <i>Acacia congesta subsp. congesta</i>			
707.	3269 <i>Acacia coolgardiensis (Spinifex Wattle)</i>			
708.	3282 <i>Acacia cyclops (Coastal Wattle)</i>			
709.	20435 <i>Acacia daphnifolia</i>			
710.	3301 <i>Acacia dielsii</i>			
711.	3323 <i>Acacia ericifolia</i>			
712.	3358 <i>Acacia guinetii (Guinet's Wattle)</i>		P4	Y
713.	3376 <i>Acacia idiomorpha</i>			
714.	3391 <i>Acacia jacksonioides</i>			
715.	-8604 <i>Acacia lasiocarpa var. *</i>			
716.	-4811 <i>Acacia lasiocarpa var. ?</i>			
717.	11611 <i>Acacia lasiocarpa var. lasiocarpa</i>			
718.	-4667 <i>Acacia lasiocarpa var. lasiocarpa (flat pinnule variant)</i>			
719.	15721 <i>Acacia lasiocarpa var. sedifolia</i>			
720.	3412 <i>Acacia latipes</i>			
721.	-10506 <i>Acacia latipes Variant No. 2</i>			
722.	15476 <i>Acacia latipes subsp. latipes</i>			
723.	11448 <i>Acacia leptospermoides subsp. leptospermoides</i>			
724.	-5526 <i>Acacia leptospermoides subsp. leptospermoides/psammophila</i>			
725.	11330 <i>Acacia leptospermoides subsp. psammophila</i>		P3	
726.	3419 <i>Acacia ligulata (Umbrella Bush)</i>			
727.	3437 <i>Acacia megacephala</i>		P2	
728.	15290 <i>Acacia neurophylla subsp. erugata</i>			
729.	15291 <i>Acacia neurophylla subsp. neurophylla</i>			
730.	3466 <i>Acacia oldfieldii</i>			
731.	3470 <i>Acacia orbifolia</i>			
732.	3474 <i>Acacia oxyclada</i>			
733.	14134 <i>Acacia pelophila</i>		P1	
734.	3515 <i>Acacia restiacea</i>			
735.	3525 <i>Acacia rostellifera (Summer-scented Wattle)</i>			
736.	-12473 <i>Acacia rostellifera x xanthina</i>			
737.	3527 <i>Acacia saligna (Orange Wattle)</i>			
738.	30033 <i>Acacia saligna subsp. lindleyi</i>			
739.	-8016 <i>Acacia saligna x xanthina</i>			Y
740.	3532 <i>Acacia scirpifolia</i>			
741.	3534 <i>Acacia sclerosperma (Limestone Wattle)</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
742.	3541 <i>Acacia sessilis</i>			
743.	3546 <i>Acacia signata</i>			
744.	-6755 <i>Acacia</i> sp.			
745.	20344 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798)			
746.	29118 <i>Acacia</i> sp. small seed (B.R. Maslin 7830)			
747.	-11839 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798) subsp.			
748.	8951 <i>Acacia spathulata</i>			
749.	3549 <i>Acacia spathulifolia</i>			
750.	15484 <i>Acacia sphacelata</i> subsp. <i>sphacelata</i>			
751.	12268 <i>Acacia sphenophylla</i>			
752.	15294 <i>Acacia stereophylla</i> var. <i>stereophylla</i>			
753.	3577 <i>Acacia tetragonophylla</i> (Kurara)			
754.	3581 <i>Acacia trigonophylla</i>			
755.	3587 <i>Acacia ulicina</i>			
756.	3604 <i>Acacia xanthina</i> (White-stemmed Wattle)			
757.	1205 <i>Acanthocarpus canaliculatus</i>			
758.	1207 <i>Acanthocarpus parviflorus</i>		P3	
759.	1208 <i>Acanthocarpus preissii</i>			
760.	1209 <i>Acanthocarpus robustus</i>			
761.	-9369 <i>Acanthocarpus</i> sp.			
762.	20797 <i>Acanthocarpus</i> sp. <i>Ajana</i> (C.A. Gardner 8596)			
763.	26441 <i>Acanthopora spicifera</i>			
764.	32310 <i>Acaulon triquetrum</i>			Y
765.	26447 <i>Acrothamnion preissii</i>			
766.	19901 <i>Actinobole oldfieldianum</i>			
767.	7817 <i>Actinobole uliginosum</i> (Flannel Cudweed)			
768.	7818 <i>Actites megalocarpus</i> (Dune Thistle)			
769.	11837 <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (Common Woollybush)			
770.	4582 <i>Adriana quadripartita</i> (Bitter Bush)			
771.	20331 <i>Aeonium arboreum</i>	Y		
772.	176 <i>Agrostis avenacea</i> (Blowgrass)			
773.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
774.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
775.	1376 <i>Allium orientale</i>	Y		
776.	-7430 <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> / <i>prinsepiana</i>			
777.	1721 <i>Allocasuarina campestris</i>			
778.	1725 <i>Allocasuarina dielsiana</i> (Northern Sheoak)			
779.	1731 <i>Allocasuarina huegeliana</i> (Rock Sheoak)			
780.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
781.	-6080 <i>Allocasuarina</i> sp.			
782.	1739 <i>Allocasuarina thuyoides</i> (Horned Sheoak)			
783.	2652 <i>Alternanthera nodiflora</i> (Common Joyweed)			
784.	19465 <i>Aluta aspera</i> subsp. <i>hesperia</i>			
785.	20173 <i>Alyogyne coronopifolia</i>			
786.	-7864 <i>Alyogyne coronopifolia</i> x <i>purpurea</i>			Y
787.	4905 <i>Alyogyne hakeifolia</i>			
788.	4906 <i>Alyogyne huegelii</i> (Lilac Hibiscus)			
789.	17975 <i>Alyogyne huegelii</i> var. <i>grossulariifolia</i>			
790.	15458 <i>Alyogyne huegelii</i> var. <i>huegelii</i>			
791.	15459 <i>Alyogyne huegelii</i> var. <i>wrayae</i>			
792.	4907 <i>Alyogyne pinoniana</i> (Sand Hibiscus)			
793.	20082 <i>Alyogyne purpurea</i>			
794.	20078 <i>Alyogyne wrayae</i>			
795.	6565 <i>Alyxia buxifolia</i> (Dysentery Bush)			
796.	2671 <i>Amaranthus viridis</i> (Green Amaranth)	Y		
797.	6209 <i>Ammi majus</i> (Bishop's Weed)	Y		
798.	126 <i>Amphibolis antarctica</i> (Sea Nymph)			
799.	127 <i>Amphibolis griffithii</i>			
800.	196 <i>Amphipogon caricinus</i> (Long Greybeard Grass)			
801.	-3593 <i>Amphipogon caricinus</i> - <i>strictus</i> complex			
802.	12025 <i>Amphipogon caricinus</i> var. <i>caricinus</i>			
803.	26463 <i>Amphiroa gracilis</i>			
804.	2372 <i>Amyema fitzgeraldii</i> (Pincushion Mistletoe)			
805.	13266 <i>Amyema miraculosa</i> subsp. <i>miraculosa</i>			
806.	-11696 <i>Amyema miraculosum</i>			Y
807.	2383 <i>Amyema preissii</i> (Wireleaf Mistletoe)			
808.	6480 <i>Anagallis arvensis</i> (Pimpernel)	Y		
809.	7827 <i>Angianthus cunninghamii</i> (Coast Angianthus)			
810.	-4422 <i>Angianthus</i> sp.			
811.	7836 <i>Angianthus tomentosus</i> (Camel-grass)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
812.	1409 <i>Anigozanthos humilis</i> (Catspaw)			
813.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
814.	1411 <i>Anigozanthos manglesii</i> (Mangles Kangaroo Paw)			
815.	11565 <i>Anigozanthos manglesii</i> subsp. <i>quadrans</i>			
816.	2332 <i>Anthobolus foveolatus</i>			
817.	11725 <i>Anthocercis ilicifolia</i> subsp. <i>ilicifolia</i>			
818.	6948 <i>Anthocercis intricata</i>		P3	
819.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
820.	-7127 <i>Anthoceros</i> sp.			
821.	6953 <i>Anthotroche walcottii</i>			
822.	3180 <i>Aphanopetalum clematideum</i>			
823.	1117 <i>Aphelia cyperoides</i>			
824.	12040 <i>Apium prostratum</i> var. <i>prostratum</i> (Sea Celery)			
825.	7838 <i>Arctotheca calendula</i> (Cape Weed)	Y		
826.	7839 <i>Arctotheca populifolia</i> (Dune Arctotheca)	Y		
827.	17797 <i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	Y		
828.	207 <i>Aristida contorta</i> (Bunched Kerosene Grass)			
829.	210 <i>Aristida holathera</i>			
830.	12063 <i>Aristida holathera</i> var. <i>holathera</i>			
831.	11542 <i>Arrhenatherum elatius</i> var. <i>bulbosum</i> (Onion Twitch)	Y		
832.	1266 <i>Arthropodium dyeri</i>			
833.	-11798 <i>Arthropodium</i> sp.			
834.	6580 <i>Asclepias curassavica</i> (Redhead Cottonbush)	Y		
835.	-10279 <i>Asterella</i> sp.			
836.	7845 <i>Asteridea asteroides</i>			
837.	7850 <i>Asteridea nivea</i>			
838.	6328 <i>Astroloma glaucescens</i>			
839.	6332 <i>Astroloma microdonta</i> (Sandplain Cranberry)			
840.	16941 <i>Astroloma pedicellatum</i>			
841.	6336 <i>Astroloma serratifolium</i> (Kondrung)			
842.	2450 <i>Atriplex amnicola</i> (Swamp Saltbush)			
843.	2452 <i>Atriplex cinerea</i> (Grey Saltbush)			
844.	2463 <i>Atriplex isatidea</i> (Coast Saltbush)			
845.	2476 <i>Atriplex semilunaris</i> (Annual Saltbush)			
846.	-8696 <i>Atriplex</i> sp.			
847.	2479 <i>Atriplex stipitata</i> (Mallee Saltbush)			
848.	17951 <i>Austrodanthonia acerosa</i>			
849.	17950 <i>Austrodanthonia caespitosa</i>			
850.	17945 <i>Austrodanthonia setacea</i>			
851.	-3439 <i>Austrodanthonia setacea</i> group			
852.	-8365 <i>Austrodanthonia</i> sp.			
853.	17234 <i>Austrostipa compressa</i>			
854.	17235 <i>Austrostipa crinita</i>			
855.	17237 <i>Austrostipa elegantissima</i>			
856.	17239 <i>Austrostipa exilis</i>			
857.	17240 <i>Austrostipa flavescens</i>			
858.	17241 <i>Austrostipa hemipogon</i>			
859.	17244 <i>Austrostipa macalpinei</i>			
860.	17246 <i>Austrostipa nitida</i>			
861.	17251 <i>Austrostipa scabra</i>			
862.	37421 <i>Austrostipa</i> sp. <i>Marchagee</i> (B.R. Maslin 1407)			
863.	17254 <i>Austrostipa tenuifolia</i>			
864.	17255 <i>Austrostipa trichophylla</i>			
865.	17257 <i>Austrostipa variabilis</i>			
866.	231 <i>Avellinia michelii</i>	Y		
867.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
868.	234 <i>Avena fatua</i> (Wild Oat)	Y		
869.	5341 <i>Baeckea crispiflora</i>			
870.	5350 <i>Baeckea grandiflora</i> (Large-flowered Baeckea)			
871.	16815 <i>Baeckea</i> sp. <i>Mingenew</i> (M.E. Trudgen 12029)			
872.	14476 <i>Baeckea</i> sp. <i>Walkaway</i> (A.S. George 11249)		P3	
873.	5366 <i>Baeckea staminosa</i>		P1	
874.	1799 <i>Banksia ashbyi</i> (Ashby's Banksia)			
875.	1800 <i>Banksia attenuata</i> (Slender Banksia)			
876.	32623 <i>Banksia carlinoides</i> (Pink Dryandra)			
877.	32576 <i>Banksia dallanneyi</i> (Couch Honeyypot)			
878.	1816 <i>Banksia elegans</i> (Elegant Banksia)		P4	
879.	32524 <i>Banksia fraseri</i> var. <i>ashbyi</i>			
880.	32523 <i>Banksia fraseri</i> var. <i>fraseri</i>			
881.	1828 <i>Banksia leptophylla</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
882.	11386 <i>Banksia leptophylla</i> var. <i>melletica</i>			
883.	1829 <i>Banksia lindleyana</i> (Porcupine Banksia)			
884.	-1257 <i>Banksia menz_ellii</i>			
885.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
886.	1842 <i>Banksia prionotes</i> (Acorn Banksia)			
887.	1846 <i>Banksia scabrella</i> (Burma Road Banksia)		P4	
888.	1847 <i>Banksia sceptrum</i> (Sceptre Banksia)			
889.	32079 <i>Banksia sessilis</i> var. <i>flabellifolia</i>			
890.	32080 <i>Banksia sessilis</i> var. <i>sessilis</i>			
891.	1855 <i>Banksia victoriae</i> (Woolly Orange Banksia)			
892.	32315 <i>Barbula calycina</i>			
893.	15037 <i>Bartsia trixago</i>	Y		
894.	2482 <i>Bassia scoparia</i>	Y		
895.	740 <i>Baumea arthropophylla</i>			
896.	743 <i>Baumea juncea</i> (Bare Twigrush)			
897.	17761 <i>Beaufortia aestiva</i>			
898.	-4152 <i>Beaufortia</i> sp.			
899.	4601 <i>Beyeria viscosa</i> (Pinkwood)			
900.	20815 <i>Biserrula pelecinus</i>	Y		Y
901.	31606 <i>Blackallia nudiflora</i> (Wedge-leaved Cryptandra)		P3	
902.	7856 <i>Blennochora drummondii</i>			
903.	2770 <i>Boerhavia coccinea</i> (Tar Vine)			
904.	-5923 <i>Boerhavia</i> sp.			
905.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
906.	6609 <i>Bonamia rosea</i> (Felted Bellflower)			
907.	-4800 <i>Bonamia</i> sp.			
908.	4409 <i>Boronia coerulescens</i>			
909.	11498 <i>Boronia coerulescens</i> subsp. <i>spicata</i>			
910.	11274 <i>Boronia coerulescens</i> subsp. <i>spinescens</i>			
911.	4414 <i>Boronia cymosa</i> (Granite Boronia)			
912.	4438 <i>Boronia ramosa</i>			
913.	11381 <i>Boronia ramosa</i> subsp. <i>anethifolia</i>			
914.	16639 <i>Boronia scabra</i> subsp. <i>scabra</i>			
915.	-4748 <i>Boronia</i> sp.			
916.	1273 <i>Borya sphaerocephala</i> (Pincushions)			
917.	30232 <i>Bossiaea calcicola</i>		P3	
918.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
919.	3719 <i>Bossiaea spinescens</i>			
920.	240 <i>Bothriochloa ewartiana</i> (Desert Bluegrass)			
921.	15000 <i>Brachychiton populneus</i> subsp. <i>populneus</i>	Y		
922.	30132 <i>Brachyloma pirara</i>			
923.	8661 <i>Brachypodium distachyon</i> (False Brome)	Y		
924.	7870 <i>Brachyscome cheilocarpa</i>			
925.	7871 <i>Brachyscome ciliaris</i>			
926.	7872 <i>Brachyscome ciliocarpa</i>			
927.	7878 <i>Brachyscome iberidifolia</i>			
928.	7881 <i>Brachyscome oncocarpa</i>			
929.	7882 <i>Brachyscome perpusilla</i>			
930.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
931.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
932.	245 <i>Briza minor</i> (Shivery Grass)	Y		
933.	248 <i>Bromus catharticus</i> (Prairie Grass)	Y		
934.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
935.	250 <i>Bromus hordeaceus</i> (Soft Brome)	Y		
936.	252 <i>Bromus madritensis</i> (Madrid Brome)	Y		
937.	253 <i>Bromus rubens</i> (Red Brome)	Y		
938.	7413 <i>Brunonia australis</i> (Native Cornflower)			
939.	6675 <i>Buglossoides arvensis</i> (Corn Gromwell)	Y		
940.	12770 <i>Burchardia congesta</i>			
941.	3167 <i>Bursaria occidentalis</i>			
942.	15445 <i>Caesia alfordii</i>			
943.	1276 <i>Caesia micrantha</i> (Pale Grass-lily)			
944.	29439 <i>Caesia</i> sp. Wongan (K.F. Kenneally 8820)			
945.	3002 <i>Cakile maritima</i> (Sea Rocket)	Y		
946.	15337 <i>Caladenia bryceana</i> subsp. <i>cracens</i>		T	
947.	1584 <i>Caladenia deformis</i> (Blue Fairy Orchid)			
948.	11136 <i>Caladenia denticulata</i>			
949.	13618 <i>Caladenia elegans</i>		T	
950.	1592 <i>Caladenia flava</i> (Cowslip Orchid)			
951.	15348 <i>Caladenia flava</i> subsp. <i>flava</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
952.	15349 <i>Caladenia flava</i> subsp. <i>maculata</i>			
953.	15502 <i>Caladenia footeana</i>			
954.	13857 <i>Caladenia hoffmanii</i>		T	
955.	-11348 <i>Caladenia hoffmanii</i> x <i>longicauda</i>			
956.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
957.	1602 <i>Caladenia longicauda</i> (Common White Spider Orchid)			
958.	15360 <i>Caladenia longicauda</i> subsp. <i>borealis</i>			
959.	1603 <i>Caladenia longiclavata</i> (Clubbed Spider Orchid)			
960.	17760 <i>Caladenia nobilis</i>			
961.	1611 <i>Caladenia radialis</i> (Drooping Spider Orchid)			
962.	15378 <i>Caladenia reptans</i> subsp. <i>impensa</i>			
963.	1620 <i>Caladenia wanosa</i> (Kalbarri Spider Orchid)		T	
964.	2845 <i>Calandrinia brevipedata</i> (Short-stalked Purslane)			
965.	2846 <i>Calandrinia calyptata</i> (Pink Purslane)			
966.	2848 <i>Calandrinia corrigioloides</i> (Strap Purslane)			
967.	2854 <i>Calandrinia granulifera</i> (Pygmy Purslane)			
968.	2855 <i>Calandrinia lehmannii</i>			
969.	2860 <i>Calandrinia polyandra</i> (Parakeelya)			
970.	2867 <i>Calandrinia remota</i>			
971.	-3613 <i>Calandrinia</i> sp.			
972.	20478 <i>Calandrinia</i> sp. Blackberry (D.M. Porter 171)			
973.	19832 <i>Calandrinia</i> sp. Ongerup (K.R. Newbey 11834)			
974.	20477 <i>Calandrinia</i> sp. SW coastal (J. Dodd 753)			
975.	19304 <i>Calectasia browneana</i>		P2	
976.	5395 <i>Callistemon phoeniceus</i> (Lesser Bottlebrush)			
977.	36560 <i>Callitris arenaria</i> (Sandplain Cypress)			
978.	26533 <i>Callophycus costatus</i>			
979.	26536 <i>Callophycus oppositifolius</i>			
980.	5401 <i>Calothamnus blepharospermus</i>			
981.	34196 <i>Calothamnus chrysanthereus</i> (Claw Flower)			
982.	35856 <i>Calothamnus glaber</i>			
983.	35696 <i>Calothamnus phellosus</i>			
984.	35756 <i>Calothamnus quadrifidus</i> subsp. <i>angustifolius</i>			
985.	35758 <i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> (Murchison Clawflower)			
986.	35759 <i>Calothamnus quadrifidus</i> subsp. <i>obtusus</i>			
987.	5429 <i>Calothamnus sanguineus</i> (Silky-leaved Blood flower)			
988.	7903 <i>Calotis hispidula</i> (Bindy Eye)			
989.	7905 <i>Calotis multicaulis</i> (Many-stemmed Burr-daisy)			
990.	-12966 <i>Calotis</i> sp.			
991.	5443 <i>Calytrix brevifolia</i>			
992.	5450 <i>Calytrix depressa</i>			
993.	5462 <i>Calytrix gracilis</i>			
994.	5465 <i>Calytrix leschenaultii</i>			
995.	5468 <i>Calytrix oldfieldii</i>			
996.	19978 <i>Calytrix pimeleoides</i>		P3	
997.	5475 <i>Calytrix purpurea</i>		P2	
998.	5479 <i>Calytrix strigosa</i>			
999.	5485 <i>Calytrix variabilis</i>			
1000.	2796 <i>Carpobrotus modestus</i> (Inland Pigface)			
1001.	-7790 <i>Carpobrotus praecox</i>			Y
1002.	2798 <i>Carpobrotus virescens</i> (Coastal Pigface)			
1003.	7911 <i>Carthamus lanatus</i> (Saffron Thistle)	Y		
1004.	7913 <i>Carthamus tinctorius</i>	Y		
1005.	12073 <i>Cassytha aurea</i> var. <i>aurea</i>			
1006.	11351 <i>Cassytha aurea</i> var. <i>hirta</i>			
1007.	2952 <i>Cassytha glabella</i> (Tangled Dodder Laurel)			
1008.	11211 <i>Cassytha glabella</i> forma <i>dispar</i>			
1009.	11857 <i>Cassytha glabella</i> forma <i>glabella</i>			
1010.	2956 <i>Cassytha pomiformis</i> (Dodder Laurel)			
1011.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
1012.	11242 <i>Cassytha racemosa</i> forma <i>pilosa</i>			
1013.	11799 <i>Cassytha racemosa</i> forma <i>racemosa</i>			
1014.	-9051 <i>Cassytha</i> sp.			
1015.	1742 <i>Casuarina obesa</i> (Swamp Sheoak)			
1016.	13685 <i>Catapodium rigidum</i> (Rigid Fescue)	Y		
1017.	26555 <i>Caulerpa brownii</i>			
1018.	26556 <i>Caulerpa cactoides</i>			
1019.	26557 <i>Caulerpa cliftonii</i>			
1020.	26560 <i>Caulerpa distichophylla</i>			
1021.	27380 <i>Caulerpa flexilis</i> var. <i>muelleri</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1022.	26573 <i>Caulerpa racemosa</i>			
1023.	26578 <i>Caulerpa simpliciuscula</i>			
1024.	258 <i>Cenchrus ciliaris</i> (Buffel Grass)	Y		
1025.	259 <i>Cenchrus echinatus</i> (Burrgrass)	Y		
1026.	262 <i>Cenchrus longispinus</i> (Spiny Burrgrass)	Y		
1027.	29721 <i>Cenchrus setiger</i> (Birdwood Grass)	Y		
1028.	6539 <i>Centaurium erythraea</i> (Common Centaury)	Y		
1029.	6542 <i>Centaurium tenuiflorum</i>	Y		
1030.	6214 <i>Centella asiatica</i>			
1031.	19759 <i>Centipeda crateriformis</i> subsp. <i>crateriformis</i>			
1032.	26587 <i>Centroceras clavulatum</i>			
1033.	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
1034.	1124 <i>Centrolepis cephaliformis</i>			
1035.	1125 <i>Centrolepis drummondiana</i>			
1036.	1131 <i>Centrolepis inconspicua</i>			
1037.	1133 <i>Centrolepis pilosa</i>			
1038.	1134 <i>Centrolepis polygyna</i> (Wiry Centrolepis)			
1039.	7922 <i>Cephalopterum drummondii</i> (Pompom Head)			
1040.	7923 <i>Cephalosorus carpesioides</i>			
1041.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
1042.	7924 <i>Ceratogyne obionoides</i> (Wingwort)			
1043.	17685 <i>Chaetanthus aristatus</i>			
1044.	18156 <i>Chamaecytisus palmensis</i> (Tagasaste)	Y		
1045.	11299 <i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>			
1046.	-3963 <i>Chamaescilla</i> sp.			
1047.	8788 <i>Chamaescilla versicolor</i>			
1048.	14808 <i>Chamelaucium drummondii</i> subsp. <i>drummondii</i>			
1049.	5496 <i>Chamelaucium micranthum</i>			
1050.	5497 <i>Chamelaucium pauciflorum</i>			
1051.	35596 <i>Chamelaucium</i> sp. <i>Yuna</i> (A.C. Burns 53)		P2	
1052.	5498 <i>Chamelaucium uncinatum</i> (Geraldton Wax)			
1053.	1513 <i>Chasmanthe floribunda</i> (African Cornflag)	Y		
1054.	12796 <i>Cheilanthes adiantoides</i>			
1055.	31 <i>Cheilanthes austrotenuifolia</i>			
1056.	12818 <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			
1057.	31768 <i>Cheiranthra simplicifolia</i>			
1058.	2489 <i>Chenopodium gaudichaudianum</i> (Cottony Saltbush)			
1059.	2494 <i>Chenopodium murale</i> (Nettle-leaf Goosefoot)	Y		
1060.	270 <i>Chloris pumilio</i>			
1061.	271 <i>Chloris truncata</i> (Windmill Grass)			
1062.	7925 <i>Chondrilla juncea</i> (Skeleton Weed)	Y		
1063.	763 <i>Chorizandra enodis</i> (Black Bristlerush)			
1064.	13111 <i>Chorizema aciculare</i> subsp. <i>laxum</i>			
1065.	13115 <i>Chorizema humile</i>		T	
1066.	13114 <i>Chorizema racemosum</i>			
1067.	11900 <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Y		
1068.	7928 <i>Chrysanthemum coronarium</i>	Y		
1069.	12612 <i>Chrysocephalum apiculatum</i>			
1070.	7933 <i>Chthonocephalus pseudevax</i> (Woolly Groundheads)			
1071.	-9828 <i>Chthonocephalus</i> sp.			
1072.	6543 <i>Cicendia filiformis</i> (Slender Cicendia)	Y		
1073.	7936 <i>Cirsium arvense</i> (Canada Thistle)	Y		Y
1074.	-7982 <i>Cirsium</i> sp.			Y
1075.	7370 <i>Citrullus lanatus</i> (Pie Melon)	Y		
1076.	26659 <i>Cladophora valonioides</i>			
1077.	26663 <i>Cladurus elatus</i>			
1078.	26665 <i>Clavicleonium ovatum</i>			
1079.	4853 <i>Clematicissus angustissima</i>			
1080.	10804 <i>Clematis linearifolia</i>			
1081.	26677 <i>Codium mamillosum</i>			
1082.	2778 <i>Codonocarpus cotinifolius</i> (Native Poplar)			
1083.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
1084.	4555 <i>Comesperma integerrimum</i>			
1085.	4560 <i>Comesperma rhadinocarpum</i> (Slender-fruited Comesperma)		P2	
1086.	4561 <i>Comesperma scoparium</i> (Broom Milkwort)			
1087.	4563 <i>Comesperma spinosum</i> (Spiny Milkwort)			
1088.	4564 <i>Comesperma virgatum</i> (Milkwort)			
1089.	20541 <i>Commersonia bivillosa</i>		P1	
1090.	5002 <i>Commersonia gaudichaudii</i>			
1091.	5004 <i>Commersonia microphylla</i>		P2	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1092.	2776 <i>Commicarpus australis</i> (Perennial Tar Vine)			
1093.	15608 <i>Conospermum acerosum</i> subsp. <i>hirsutum</i>			
1094.	15512 <i>Conospermum boreale</i> subsp. <i>ascendens</i>			
1095.	15513 <i>Conospermum boreale</i> subsp. <i>boreale</i>			
1096.	1876 <i>Conospermum incurvum</i> (Plume Smokebush)			
1097.	16849 <i>Conospermum microflorum</i>			
1098.	1882 <i>Conospermum stoechadis</i> (Common Smokebush)			
1099.	15611 <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> (Common Smokebush)			
1100.	15523 <i>Conospermum wycherleyi</i>			
1101.	15522 <i>Conospermum wycherleyi</i> subsp. <i>wycherleyi</i>			
1102.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
1103.	11641 <i>Conostylis aculeata</i> subsp. <i>rhipidion</i>			
1104.	-8419 <i>Conostylis aculeata</i> x <i>prolifera</i> subsp. <i>rhipidion</i>			Y
1105.	1420 <i>Conostylis androstemma</i> (Trumpets)			
1106.	1423 <i>Conostylis aurea</i> (Golden Conostylis)			
1107.	12027 <i>Conostylis candicans</i> subsp. <i>calcicola</i>			
1108.	-6130 <i>Conostylis candicans</i> x <i>robusta</i>			
1109.	-12821 <i>Conostylis candicans</i> x <i>stylidioides</i>			
1110.	1442 <i>Conostylis neocymosa</i>			
1111.	1446 <i>Conostylis prolifera</i> (Mat Cottonheads)			
1112.	1448 <i>Conostylis resinosa</i>			
1113.	1450 <i>Conostylis robusta</i>			
1114.	1456 <i>Conostylis stylidioides</i>			
1115.	5502 <i>Conothamnus trinervis</i>			
1116.	6614 <i>Convolvulus remotus</i>			
1117.	7938 <i>Conyza albida</i> (Tall Fleabane)	Y		
1118.	7939 <i>Conyza bonariensis</i> (Flaxleaf Fleabane)	Y		
1119.	2891 <i>Corrigiola litoralis</i> (Strapwort)	Y		
1120.	17104 <i>Corymbia calophylla</i> (Marri)			
1121.	11834 <i>Corynotheca micrantha</i> var. <i>acanthoclada</i>			
1122.	11283 <i>Corynotheca micrantha</i> var. <i>micrantha</i>			
1123.	7943 <i>Cotula australis</i> (Common Cotula)			
1124.	7944 <i>Cotula bipinnata</i> (Ferry Cotula)	Y		
1125.	7945 <i>Cotula coronopifolia</i> (Waterbuttons)	Y		
1126.	3136 <i>Crassula alata</i>	Y		
1127.	17701 <i>Crassula closiana</i>			
1128.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
1129.	11709 <i>Crassula colorata</i> var. <i>acuminata</i>			
1130.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
1131.	3138 <i>Crassula decumbens</i> (Rufous Stonecrop)			
1132.	11349 <i>Crassula decumbens</i> var. <i>decumbens</i>			
1133.	3142 <i>Crassula natans</i>	Y		
1134.	19861 <i>Cristonia biloba</i>			
1135.	35839 <i>Cristonia stenophylla</i>			
1136.	4792 <i>Cryptandra arbutiflora</i> (Waxy Cryptandra)			
1137.	16018 <i>Cryptandra arbutiflora</i> var. <i>borealis</i>			
1138.	31614 <i>Cryptandra multispina</i>			
1139.	4802 <i>Cryptandra mutila</i>			
1140.	9076 <i>Cryptandra myriantha</i>			
1141.	4809 <i>Cryptandra pungens</i>			
1142.	-7517 <i>Cryptandra</i> sp.			
1143.	4811 <i>Cryptandra spyridioides</i>			
1144.	9077 <i>Cryptandra wichurae</i>			Y
1145.	26709 <i>Cryptonemia undulata</i>			
1146.	29599 <i>Cryptostegia grandiflora</i>	Y		
1147.	6663 <i>Cuscuta epithymum</i> (Lesser Dodder)	Y		
1148.	11021 <i>Cuscuta planiflora</i>	Y		
1149.	-11671 <i>Cuscuta</i> sp.			
1150.	15114 <i>Cyanicula gemmata</i>			
1151.	6216 <i>Cyclosporum leptophyllum</i>	Y		
1152.	281 <i>Cymbopogon obtectus</i> (Silkyheads)			
1153.	-12436 <i>Cymbopogon</i> sp.			
1154.	6584 <i>Cynanchum floribundum</i> (Dumara Bush)			
1155.	283 <i>Cynodon dactylon</i> (Couch)	Y		
1156.	786 <i>Cyperus cunninghamii</i>			
1157.	789 <i>Cyperus difformis</i> (Rice Sedge)			
1158.	794 <i>Cyperus gymnocaulos</i> (Spiny Flat-sedge)			
1159.	809 <i>Cyperus rigidellus</i>			
1160.	810 <i>Cyperus rotundus</i> (Nut Grass)	Y		
1161.	-13069 <i>Cyperus</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1162.	815 <i>Cyperus tenellus</i> (Tiny Flatsedge)	Y		
1163.	818 <i>Cyperus vaginatus</i> (Stiffleaf Sedge)			
1164.	10916 <i>Cyrtostylis huegelii</i>			
1165.	7421 <i>Dampiera altissima</i> (Tall Dampiera)			
1166.	7443 <i>Dampiera haematotricha</i>			
1167.	7448 <i>Dampiera incana</i> (Hoary Dampiera)			
1168.	11326 <i>Dampiera incana</i> var. <i>fuscescens</i>			
1169.	7453 <i>Dampiera lindleyi</i>			
1170.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
1171.	7459 <i>Dampiera oligophylla</i> (Sparse-leaved Dampiera)			
1172.	-10054 <i>Dampiera</i> sp.			
1173.	7475 <i>Dampiera spicigera</i> (Spiked Dampiera)			
1174.	5522 <i>Darwinia pauciflora</i>			
1175.	26738 <i>Dasya elongata</i>			
1176.	26752 <i>Dasyclonium incisum</i>			
1177.	26753 <i>Dasyphila preissii</i>			
1178.	10823 <i>Datura innoxia</i>	Y		
1179.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
1180.	3797 <i>Daviesia cardiophylla</i>			
1181.	3807 <i>Daviesia divaricata</i> (Marmo)			
1182.	18561 <i>Daviesia divaricata</i> subsp. <i>lanulosa</i>			
1183.	3814 <i>Daviesia hakeoides</i>			
1184.	11879 <i>Daviesia hakeoides</i> subsp. <i>hakeoides</i>			
1185.	3831 <i>Daviesia pedunculata</i>			
1186.	3832 <i>Daviesia physodes</i>			
1187.	17663 <i>Desmocladius asper</i>			
1188.	17624 <i>Desmocladius glomeratus</i>		P2	Y
1189.	17662 <i>Desmocladius lateriticus</i>			
1190.	17846 <i>Desmocladius parthenicus</i>			
1191.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
1192.	11636 <i>Dianella revoluta</i> var. <i>divaricata</i>			
1193.	1287 <i>Dichopogon capillipes</i>			
1194.	-5372 <i>Dichopogon</i> sp.			
1195.	26758 <i>Dicranema revolutum</i>			
1196.	6760 <i>Dicrastylis fulva</i>			
1197.	26762 <i>Dictyomenia sonderi</i>			
1198.	-5123 <i>Dictyomenia</i> sp.			
1199.	26763 <i>Dictyomenia tridens</i>			
1200.	26782 <i>Digenea simplex</i>			
1201.	311 <i>Digitaria ciliaris</i> (Summer Grass)	Y		
1202.	1509 <i>Dioscorea hastifolia</i> (Warrine)			
1203.	15270 <i>Diplolaena geraldtonensis</i>			
1204.	-10113 <i>Diplolaena geraldtonensis</i> x <i>grandiflora</i>			Y
1205.	4456 <i>Diplolaena grandiflora</i> (Wild Rose)			
1206.	15273 <i>Diplolaena leemaniana</i>			
1207.	18541 <i>Diplopeltis huegelii</i> subsp. <i>huegelii</i>			
1208.	18542 <i>Diplopeltis huegelii</i> subsp. <i>subintegra</i>			
1209.	4748 <i>Diplopeltis petiolaris</i>			
1210.	7961 <i>Dittrichia graveolens</i> (Stinkwort)	Y		
1211.	11049 <i>Diuris corymbosa</i>			
1212.	1634 <i>Diuris laxiflora</i> (Bee Orchid)			
1213.	12936 <i>Diuris recurva</i>		P4	
1214.	-8553 <i>Diuris refracta</i>			
1215.	1638 <i>Diuris setacea</i> (Bristly Donkey Orchid)			
1216.	19457 <i>Diuris</i> sp. <i>Eneabba</i> (A.H. Burbidge 3941)			
1217.	4754 <i>Dodonaea aptera</i> (Coast Hop-bush)			
1218.	4761 <i>Dodonaea ericoides</i>			
1219.	4766 <i>Dodonaea inaequifolia</i>			
1220.	4768 <i>Dodonaea larreoides</i>			
1221.	13633 <i>Drakaea concolor</i>		T	
1222.	3092 <i>Drosera bulbosa</i> (Red-leaved Sundew)			
1223.	13219 <i>Drosera bulbosa</i> subsp. <i>bulbosa</i>			
1224.	13220 <i>Drosera bulbosa</i> subsp. <i>major</i>			
1225.	3098 <i>Drosera glanduligera</i> (Pimpernel Sundew)			
1226.	8910 <i>Drosera humilis</i>			
1227.	3106 <i>Drosera macrantha</i> (Bridal Rainbow)			
1228.	14298 <i>Drosera macrantha</i> subsp. <i>macrantha</i>			
1229.	3107 <i>Drosera macrophylla</i> (Showy Sundew)			
1230.	11196 <i>Drosera menziesii</i> subsp. <i>thysanosepala</i>			
1231.	11246 <i>Drosera neesii</i> subsp. <i>borealis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1232.	3116 <i>Drosera omissa</i> (Bright Sundew)			
1233.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
1234.	3127 <i>Drosera radicans</i>			
1235.	8911 <i>Drosera rosulata</i>			
1236.	3131 <i>Drosera stolonifera</i> (Leafy Sundew)			
1237.	4458 <i>Drummondita ericoides</i> (Moresby Range Drummondita)		T	Y
1238.	1908 <i>Dryandra fraseri</i>			
1239.	6966 <i>Duboisia hopwoodii</i> (Pituri)			
1240.	31334 <i>Duperreya sericea</i>			
1241.	33597 <i>Dysphania melanocarpa</i> forma <i>melanocarpa</i> (Black Goosefoot)			
1242.	33480 <i>Dysphania pumilio</i> (Clammy Goosefoot)			
1243.	1066 <i>Ecdeiocolea monostachya</i>			
1244.	6681 <i>Echium plantagineum</i> (Paterson's Curse)	Y		
1245.	11485 <i>Ehrharta brevifolia</i> var. <i>cuspidata</i>	Y		
1246.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
1247.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
1248.	1644 <i>Elythranthera emarginata</i> (Pink Enamel Orchid)			
1249.	2510 <i>Enchylaena lanata</i>			
1250.	12064 <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Barrier Saltbush)			
1251.	29555 <i>Enekbatus bounites</i>		P2	Y
1252.	376 <i>Eragrostis curvula</i> (African Lovegrass)	Y		
1253.	378 <i>Eragrostis dielsii</i> (Mallee Lovegrass)			
1254.	393 <i>Eragrostis setifolia</i> (Neverfail Grass)			
1255.	5536 <i>Eremaea acutifolia</i> (Rusty Eremaea)		P2	
1256.	5537 <i>Eremaea beaufortoides</i>			
1257.	5538 <i>Eremaea brevifolia</i>			
1258.	14102 <i>Eremaea ebracteata</i> var. <i>ebracteata</i>			
1259.	5541 <i>Eremaea pauciflora</i>			
1260.	7185 <i>Eremophila brevifolia</i> (Spotted Eremophila)		P2	
1261.	7189 <i>Eremophila clarkei</i> (Turpentine Bush)			
1262.	7200 <i>Eremophila drummondii</i>			
1263.	7215 <i>Eremophila glabra</i> (Tar Bush)			
1264.	17175 <i>Eremophila glabra</i> subsp. <i>albicans</i>			
1265.	14193 <i>Eremophila glabra</i> subsp. <i>carcosa</i>			
1266.	14191 <i>Eremophila glabra</i> subsp. <i>tomentosa</i>			
1267.	7230 <i>Eremophila latrobei</i> (Warty Fuchsia Bush)			
1268.	7273 <i>Eremophila strongylophylla</i>			
1269.	17162 <i>Eremophila subfloccosa</i> subsp. <i>lanata</i>			
1270.	408 <i>Eriachne flaccida</i> (Claypan Grass)			
1271.	413 <i>Eriachne mucronata</i> (Mountain Wanderrie Grass)			
1272.	415 <i>Eriachne ovata</i>			
1273.	1646 <i>Eriochilus dilatatus</i> (White Bunny Orchid)			
1274.	30432 <i>Eriochilus dilatatus</i> subsp. <i>brevifolius</i>			
1275.	15410 <i>Eriochilus dilatatus</i> subsp. <i>dilatatus</i>			
1276.	15413 <i>Eriochilus dilatatus</i> subsp. <i>undulatus</i>			
1277.	4331 <i>Erodium aureum</i>	Y		
1278.	4335 <i>Erodium cygnorum</i> (Blue Heronsbill)			
1279.	4336 <i>Erodium moschatum</i> (Musky Crowfoot)	Y		
1280.	3013 <i>Eruca sativa</i> (Purplevein Rocket)	Y		
1281.	14376 <i>Erymophyllum ramosum</i> subsp. <i>involucratum</i>			
1282.	12740 <i>Erymophyllum tenellum</i>			
1283.	26823 <i>Erythroclonium sonderi</i>			
1284.	12896 <i>Eucalyptus arachnaea</i> (Black-stemmed Mallee)			
1285.	12895 <i>Eucalyptus arachnaea</i> subsp. <i>arachnaea</i>			
1286.	9141 <i>Eucalyptus baudiniana</i>			
1287.	13039 <i>Eucalyptus blaxellii</i>		P4	
1288.	-4900 <i>Eucalyptus blaxellii</i> / <i>loxophleba</i>			Y
1289.	-3984 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i>			Y
1290.	-7085 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i> subsp. <i>supralaevis</i>			Y
1291.	35345 <i>Eucalyptus camaldulensis</i> subsp. <i>obtusa</i> (Blunt-budded River Red Gum)			
1292.	15441 <i>Eucalyptus camaldulensis</i> var. <i>obtusa</i> (Blunt-budded River Red Gum)			
1293.	13510 <i>Eucalyptus cuprea</i> (Mallee Box)		T	
1294.	15494 <i>Eucalyptus diminuta</i>			
1295.	15804 <i>Eucalyptus dolichocera</i>			
1296.	13550 <i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>		P4	
1297.	5640 <i>Eucalyptus eudesmioides</i> (Malalie)			
1298.	5648 <i>Eucalyptus flocktoniae</i> (Merri)			
1299.	5673 <i>Eucalyptus horistes</i>			
1300.	5681 <i>Eucalyptus jucunda</i> (Yuna Mallee)			
1301.	11295 <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> (York Gum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1302.	13038 <i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i>			
1303.	5722 <i>Eucalyptus obtusiflora</i> (Dongara Mallee)			
1304.	5725 <i>Eucalyptus oldfieldii</i> (Oldfield's Mallee)			
1305.	5730 <i>Eucalyptus oraria</i> (Ooragmandee)			
1306.	5756 <i>Eucalyptus pyriformis</i> (Pear-fruited Mallee)			
1307.	5761 <i>Eucalyptus rigidula</i> (Stiff-leaved Mallee)			
1308.	5763 <i>Eucalyptus rudis</i> (Flooded Gum)			
1309.	12883 <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i>			
1310.	5793 <i>Eucalyptus transcontinentalis</i> (Redwood)			
1311.	11011 <i>Eulalia aurea</i>			
1312.	4617 <i>Euphorbia australis</i> (Namana)			
1313.	4620 <i>Euphorbia boophthona</i> (Gascoyne Spurge)			
1314.	4626 <i>Euphorbia drummondii</i> (Caustic Weed)			
1315.	17896 <i>Euphorbia drummondii</i> subsp. <i>drummondii</i>			
1316.	20014 <i>Euphorbia hyssopifolia</i>	Y		
1317.	4638 <i>Euphorbia peplus</i> (Petty Spurge)	Y		
1318.	4644 <i>Euphorbia sharkoensis</i>			
1319.	12097 <i>Euphorbia tannensis</i> subsp. <i>eremophila</i> (Desert Spurge)			
1320.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
1321.	-4286 <i>Euptilota</i> sp.			
1322.	10765 <i>Exocarpos sparteus</i> (Broom Ballart)			
1323.	1515 <i>Ferraria crispa</i> (Black Flag)	Y		
1324.	430 <i>Festuca arundinacea</i> (Tall Fescue)	Y		
1325.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
1326.	18392 <i>Freesia alba</i> x <i>leichtlinii</i>	Y		
1327.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
1328.	904 <i>Gahnia drummondii</i>			
1329.	906 <i>Gahnia lanigera</i> (Little Sedge)			
1330.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
1331.	7323 <i>Galium murale</i> (Small Goosegrass)	Y		
1332.	3907 <i>Gastrolobium laytonii</i> (Breelya)			
1333.	20482 <i>Gastrolobium nervosum</i>			
1334.	3912 <i>Gastrolobium oxylobioides</i> (Champion Bay Poison)			
1335.	3915 <i>Gastrolobium plicatum</i>			
1336.	3917 <i>Gastrolobium propinquum</i> (Hutt River Poison)		P3	
1337.	3924 <i>Gastrolobium spinosum</i> (Prickly Poison)			
1338.	19189 <i>Gastrolobium triangulare</i>			Y
1339.	16311 <i>Gazania linearis</i>	Y		
1340.	38241 <i>Geleznovia</i> sp. <i>Binnu</i> (K.A. Shepherd & J. Wege KS 1301)			
1341.	38242 <i>Geleznovia</i> sp. <i>Marchagee</i> (A. Crawford ADC 1353)			
1342.	4483 <i>Geleznovia verrucosa</i>			
1343.	12780 <i>Gilberta tenuifolia</i>			
1344.	33620 <i>Glischrocaryon angustifolium</i>			
1345.	6143 <i>Glischrocaryon aureum</i> (Common Popflower)			
1346.	7060 <i>Glossostigma diandrum</i>			
1347.	3938 <i>Glycine canescens</i> (Silky Glycine)			
1348.	8002 <i>Gnephosis tenuissima</i>			
1349.	19215 <i>Gompholobium glutinosum</i>			
1350.	10777 <i>Gompholobium gompholobioides</i>			
1351.	3951 <i>Gompholobium marginatum</i>			
1352.	19295 <i>Gompholobium pungens</i>			
1353.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
1354.	2677 <i>Gomphrena celosioides</i> (Gomphrena Weed)	Y		
1355.	11801 <i>Gonocarpus confertifolius</i> var. <i>helmsii</i>			
1356.	6159 <i>Gonocarpus nodulosus</i>			
1357.	6160 <i>Gonocarpus paniculatus</i>			
1358.	7495 <i>Goodenia berardiana</i>			
1359.	29362 <i>Goodenia coerulea</i>			
1360.	17806 <i>Goodenia drummondii</i> subsp. <i>drummondii</i>			
1361.	7513 <i>Goodenia hassallii</i>			
1362.	12551 <i>Goodenia micrantha</i>			
1363.	7527 <i>Goodenia mimuloides</i>			
1364.	7535 <i>Goodenia pinnatifida</i> (Cutleaf Goodenia)			
1365.	1951 <i>Grevillea amplexans</i>			
1366.	19357 <i>Grevillea amplexans</i> subsp. <i>amplexans</i>			
1367.	1956 <i>Grevillea argyrophylla</i> (Silvery-leaved Grevillea)			
1368.	15763 <i>Grevillea biformis</i> subsp. <i>biformis</i>			
1369.	1965 <i>Grevillea biternata</i>			
1370.	1968 <i>Grevillea bracteosa</i> (Bracted Grevillea)			
1371.	33579 <i>Grevillea bracteosa</i> subsp. <i>howatharra</i>		T	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1372.	1973 <i>Grevillea candelabroides</i>			
1373.	18116 <i>Grevillea commutata</i> subsp. <i>commutata</i>			
1374.	18130 <i>Grevillea commutata</i> subsp. <i>pinnatisecta</i>			
1375.	13453 <i>Grevillea didymobotrya</i> subsp. <i>didymobotrya</i>			
1376.	13454 <i>Grevillea didymobotrya</i> subsp. <i>involuta</i>			
1377.	1989 <i>Grevillea dielsiana</i> (<i>Diels Grevillea</i>)			
1378.	1999 <i>Grevillea erinacea</i>		P3	
1379.	2001 <i>Grevillea eriostachya</i> (<i>Flame Grevillea</i>)			
1380.	15816 <i>Grevillea filifolia</i>		P1	Y
1381.	15817 <i>Grevillea hirtella</i>		P3	
1382.	2022 <i>Grevillea integrifolia</i> (<i>Entire-leaved Grevillea</i>)			
1383.	2023 <i>Grevillea intricata</i>			
1384.	2032 <i>Grevillea leucopteris</i> (<i>White Plume Grevillea</i>)			
1385.	13416 <i>Grevillea petrophiloides</i> subsp. <i>petrophiloides</i>			
1386.	2063 <i>Grevillea phanerophlebia</i> (<i>Prominent Vein Grevillea</i>)		T	
1387.	8638 <i>Grevillea pinaster</i>			
1388.	15839 <i>Grevillea preissii</i> subsp. <i>preissii</i>			
1389.	-3994 <i>Grevillea</i> sp.			
1390.	2113 <i>Grevillea triloba</i>		P3	
1391.	17416 <i>Guichenotia angustifolia</i>			
1392.	5011 <i>Guichenotia ledifolia</i>			
1393.	5012 <i>Guichenotia macrantha</i> (<i>Large-flowered Guichenotia</i>)			
1394.	5013 <i>Guichenotia micrantha</i> (<i>Small Flowered Guichenotia</i>)			
1395.	-11458 <i>Guichenotia</i> sp.			
1396.	2807 <i>Gunnopsia quadrifida</i> (<i>Sturts Pigface</i>)			
1397.	2783 <i>Gyrostemon racemiger</i>			
1398.	2784 <i>Gyrostemon ramulosus</i> (<i>Corkybark</i>)			
1399.	2788 <i>Gyrostemon subnudus</i>			
1400.	1465 <i>Haemodorum discolor</i>			
1401.	1468 <i>Haemodorum laxum</i>			
1402.	1470 <i>Haemodorum paniculatum</i> (<i>Mardja</i>)			
1403.	1472 <i>Haemodorum simplex</i>			
1404.	1473 <i>Haemodorum simulans</i>			
1405.	-4252 <i>Haemodorum</i> sp.			
1406.	1474 <i>Haemodorum sparsiflorum</i>			
1407.	2131 <i>Hakea auriculata</i>			
1408.	2135 <i>Hakea bucculenta</i> (<i>Red Pokers</i>)			
1409.	2140 <i>Hakea circumalata</i>			
1410.	2146 <i>Hakea costata</i> (<i>Ribbed Hakea</i>)			
1411.	11924 <i>Hakea cygna</i> subsp. <i>cygna</i> (<i>Swan Fruit Hakea</i>)			
1412.	16908 <i>Hakea eneabba</i>			
1413.	2166 <i>Hakea incrassata</i> (<i>Marble Hakea</i>)			
1414.	2175 <i>Hakea lissocarpha</i> (<i>Honey Bush</i>)			
1415.	2190 <i>Hakea oldfieldii</i>		P3	
1416.	16901 <i>Hakea orthorrhyncha</i> var. <i>filiformis</i>			
1417.	2195 <i>Hakea platysperma</i> (<i>Cricket Ball Hakea</i>)			
1418.	2196 <i>Hakea preissii</i> (<i>Needle Tree</i>)			
1419.	2197 <i>Hakea prostrata</i> (<i>Harsh Hakea</i>)			
1420.	12233 <i>Hakea psilorrhyncha</i>			
1421.	2198 <i>Hakea pycnoneura</i>			
1422.	17557 <i>Hakea recurva</i> subsp. <i>recurva</i>			
1423.	2206 <i>Hakea stenocarpa</i> (<i>Narrow-fruited Hakea</i>)			
1424.	2214 <i>Hakea trifurcata</i> (<i>Two-leaf Hakea</i>)			
1425.	17485 <i>Halgania anagalloides</i>			
1426.	6685 <i>Halgania argyrophylla</i>			
1427.	10904 <i>Halgania bebrana</i>			
1428.	30294 <i>Halgania gustafsenii</i> var. <i>Mid West</i> (<i>G. Perry 370</i>)			
1429.	6696 <i>Halgania sericiflora</i>			
1430.	29716 <i>Halgania</i> sp. <i>Wongan Hills</i> (<i>K.F. Kenneally 2393</i>)			
1431.	13141 <i>Haliptilon roseum</i>			
1432.	-6317 <i>Halophila</i> sp.			
1433.	6180 <i>Haloragis trigonocarpa</i>			
1434.	17781 <i>Hannafordia quadrivalvis</i> subsp. <i>quadrivalvis</i>			
1435.	28253 <i>Hedynois rhagadioloides</i> subsp. <i>cretica</i>	Y		
1436.	8008 <i>Helianthus annuus</i> (<i>Sunflower</i>)	Y		
1437.	29594 <i>Helichrysum luteoalbum</i> (<i>Jersey Cudweed</i>)			
1438.	8027 <i>Helichrysum macranthum</i>			
1439.	17299 <i>Heliotropium ammophilum</i>			
1440.	6707 <i>Heliotropium curassavicum</i> (<i>Smooth Heliotrope</i>)			
1441.	26912 <i>Helminthocladia australis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1442.	11451 <i>Hemarthria uncinata</i> var. <i>uncinata</i>			
1443.	6840 <i>Hemiandra rubriflora</i>			
1444.	6849 <i>Hemigenia diplanthera</i>			
1445.	6869 <i>Hemigenia saligna</i>		P3	
1446.	26915 <i>Hennedya crispa</i>			
1447.	26925 <i>Heterocladia caudata</i>			
1448.	26927 <i>Heterodoxia denticulata</i>			
1449.	5108 <i>Hibbertia acerosa</i> (Needle Leaved Guinea Flower)			
1450.	5112 <i>Hibbertia aurea</i>			
1451.	5115 <i>Hibbertia conspicua</i> (Leafless Hibbertia)			
1452.	5116 <i>Hibbertia crassifolia</i>			
1453.	5120 <i>Hibbertia desmophylla</i>			
1454.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
1455.	5148 <i>Hibbertia mylnei</i>			
1456.	5158 <i>Hibbertia potentilliflora</i>			
1457.	5166 <i>Hibbertia rupicola</i>			
1458.	-10292 <i>Hibbertia</i> sp.			
1459.	5171 <i>Hibbertia spicata</i>			
1460.	11481 <i>Hibbertia spicata</i> subsp. <i>spicata</i>			
1461.	5177 <i>Hibbertia verrucosa</i>			
1462.	4927 <i>Hibiscus drummondii</i> (Drummond's Hibiscus)			
1463.	9085 <i>Hibiscus huegelii</i> (Lilac Hibiscus)			Y
1464.	-7172 <i>Hibiscus</i> sp.			
1465.	5807 <i>Homalocalyx chapmanii</i>		P2	
1466.	5812 <i>Homalocalyx inerrabundus</i>		P2	
1467.	8476 <i>Hordeum hystrix</i> (Mediterranean Region Barley Grass)	Y		
1468.	449 <i>Hordeum leporinum</i> (Barley Grass)	Y		
1469.	450 <i>Hordeum marinum</i>	Y		
1470.	3968 <i>Hovea trisperma</i> (Common Hovea)			
1471.	12741 <i>Hyalosperma cotula</i>			
1472.	12742 <i>Hyalosperma demissum</i>			
1473.	-12666 <i>Hyalosperma glutinosa</i> subsp. <i>glutinosa</i>			
1474.	12743 <i>Hyalosperma glutinosum</i>			
1475.	15447 <i>Hyalosperma glutinosum</i> subsp. <i>glutinosum</i>			
1476.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
1477.	5221 <i>Hybanthus floribundus</i>			
1478.	12007 <i>Hybanthus floribundus</i> subsp. <i>floribundus</i>			
1479.	6223 <i>Hydrocotyle alata</i>			
1480.	6226 <i>Hydrocotyle callicarpa</i> (Small Pennywort)			
1481.	11546 <i>Hydrocotyle pilifera</i> var. <i>glabrata</i>			
1482.	452 <i>Hyparrhenia hirta</i> (Tambookie Grass)	Y		
1483.	5180 <i>Hypericum gramineum</i> (Small St John's Wort)			
1484.	5181 <i>Hypericum japonicum</i> (Matted St John's Wort)			
1485.	26973 <i>Hypnea valentiae</i>			
1486.	5817 <i>Hypocalymma angustifolium</i> (White Myrtle)			
1487.	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
1488.	1070 <i>Hypolaena exsulca</i>			
1489.	11699 <i>Hypoxis glabella</i> var. <i>glabella</i>			
1490.	11604 <i>Hypoxis glabella</i> var. <i>leptantha</i>			
1491.	1503 <i>Hypoxis occidentalis</i>			
1492.	11736 <i>Hypoxis occidentalis</i> var. <i>occidentalis</i>			
1493.	14884 <i>Indigofera occidentalis</i>			
1494.	6620 <i>Ipomoea cairica</i> (Coast Morning Glory)	Y		
1495.	6622 <i>Ipomoea carnea</i>	Y		
1496.	6630 <i>Ipomoea indica</i> (Morning Glory)	Y		
1497.	8087 <i>Isoetopsis graminifolia</i> (Cushion Grass)			
1498.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
1499.	911 <i>Isolepis congrua</i>			
1500.	912 <i>Isolepis cyperoides</i>			
1501.	917 <i>Isolepis marginata</i> (Coarse Club-rush)	Y		
1502.	923 <i>Isolepis setiformis</i>			
1503.	2227 <i>Isopogon divergens</i> (Spreading Coneflower)			
1504.	2229 <i>Isopogon dubius</i> (Pincushion Coneflower)			
1505.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
1506.	3992 <i>Isotropis cuneifolia</i> (Granny Bonnets)			
1507.	19700 <i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			
1508.	-7160 <i>Isotropis</i> sp.			
1509.	3998 <i>Jacksonia angulata</i>			
1510.	14780 <i>Jacksonia arenicola</i>			
1511.	14783 <i>Jacksonia calcicola</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1512.	4006 <i>Jacksonia cupulifera</i>			
1513.	4010 <i>Jacksonia floribunda</i> (Holly Pea)			
1514.	4015 <i>Jacksonia hakeoides</i>			
1515.	14778 <i>Jacksonia nutans</i>			
1516.	14785 <i>Jacksonia rigida</i>			
1517.	-6184 <i>Jacksonia</i> sp.			
1518.	4029 <i>Jacksonia sternbergiana</i> (Stinkwood)			
1519.	-5319 <i>Jania</i> sp.			
1520.	6500 <i>Jasminum calcareum</i> (Poison Creeper)			
1521.	20454 <i>Juncus acutus</i> subsp. <i>acutus</i>	Y		
1522.	1178 <i>Juncus bufonius</i> (Toad Rush)	Y		
1523.	1180 <i>Juncus capitatus</i> (Capitate Rush)	Y		
1524.	11922 <i>Juncus kraussii</i> subsp. <i>australiensis</i>			
1525.	1194 <i>Juncus radula</i>			
1526.	4043 <i>Kennedia prorepens</i>			
1527.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
1528.	5022 <i>Keraudrenia hermanniifolia</i>			
1529.	12008 <i>Kickxia elatine</i> subsp. <i>crinita</i>	Y		
1530.	26994 <i>Kuetzingia angusta</i>			
1531.	26995 <i>Kuetzingia canaliculata</i>			
1532.	3667 <i>Labichea lanceolata</i> (Tall Labichea)			
1533.	11289 <i>Labichea lanceolata</i> subsp. <i>lanceolata</i>			
1534.	11545 <i>Labichea teretifolia</i> subsp. <i>grandistipulata</i>			
1535.	4046 <i>Lablab purpureus</i> (Lablab Bean)	Y		
1536.	20019 <i>Lachnagrostis filiformis</i>			
1537.	6780 <i>Lachnostachys eriobotrya</i> (Lambswool)			
1538.	6781 <i>Lachnostachys ferruginea</i> (Rusty Lambstail)			
1539.	-11593 <i>Lachnostachys</i> sp.			
1540.	17209 <i>Lachnostachys verbascifolia</i> var. <i>verbascifolia</i>			
1541.	18585 <i>Lagenophora huegelii</i>			
1542.	468 <i>Lamarckia aurea</i> (Goldentop)	Y		
1543.	6733 <i>Lantana camara</i> (Common Lantana)	Y		
1544.	-12044 <i>Lantana</i> sp.			Y
1545.	9099 <i>Lasiopetalum angustifolium</i> (Narrow Leaved Lasiopetalum)			
1546.	27001 <i>Laurencia filiformis</i>			
1547.	27002 <i>Laurencia forsteri</i>			
1548.	27005 <i>Laurencia majuscula</i>			
1549.	13284 <i>Lawrencella rosea</i>			
1550.	4959 <i>Lawrencia squamata</i>			
1551.	1305 <i>Laxmannia omnifertilis</i>			
1552.	11679 <i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i>			
1553.	11732 <i>Laxmannia sessiliflora</i> subsp. <i>sessiliflora</i>			
1554.	-10586 <i>Laxmannia</i> sp.			
1555.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
1556.	7580 <i>Lechenaultia linarioides</i> (Yellow Leschenaultia)			
1557.	19727 <i>Leiocarpa semicalva</i> subsp. <i>semicalva</i>			
1558.	27011 <i>Lenormandia latifolia</i>			
1559.	27013 <i>Lenormandia spectabilis</i>			
1560.	3018 <i>Lepidium africanum</i> (Rubble Pepperpress)	Y		
1561.	3030 <i>Lepidium lyratogynum</i>			
1562.	1073 <i>Lepidobolus chaetocephalus</i> (Bristle-headed Chaff Rush)			
1563.	1075 <i>Lepidobolus preissianus</i>			
1564.	18074 <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
1565.	-3273 <i>Lepidosperma</i> aff. <i>squamatum</i> (GJK & NG 5462)			
1566.	-3376 <i>Lepidosperma</i> aff. <i>tenuis</i>			
1567.	928 <i>Lepidosperma brunonianum</i>			
1568.	930 <i>Lepidosperma costale</i>			
1569.	936 <i>Lepidosperma leptostachyum</i>			
1570.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
1571.	944 <i>Lepidosperma scabrum</i>			
1572.	-10997 <i>Lepidosperma</i> sp.			
1573.	-3301 <i>Lepidosperma</i> sp. (NG 3944)			Y
1574.	-10998 <i>Lepidosperma</i> sp. <i>K</i>			
1575.	29147 <i>Lepidosperma</i> sp. <i>Moresby Range</i> (R.J. Cranfield 2751)		P1	Y
1576.	29145 <i>Lepidosperma</i> sp. <i>Zuytdorp</i> (G.J. Keighery & N. Gibson 1710)			
1577.	945 <i>Lepidosperma squamatum</i>			
1578.	947 <i>Lepidosperma tenuis</i>			
1579.	1653 <i>Leporella fimbriata</i> (Hare Orchid)			
1580.	19124 <i>Leptochloa fusca</i> subsp. <i>fusca</i>			
1581.	2350 <i>Leptomeria pauciflora</i> (Sparse-flowered Currant Bush)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1582.	15428 <i>Leptosema aphyllum</i>			
1583.	5853 <i>Leptospermum oligandrum</i>			
1584.	6354 <i>Leucopogon allittii</i>			
1585.	31794 <i>Leucopogon borealis</i>		P2	Y
1586.	6412 <i>Leucopogon marginatus</i>		T	
1587.	14832 <i>Leucopogon oblongus</i>			Y
1588.	6437 <i>Leucopogon psammophilus</i>		P1	
1589.	-7718 <i>Leucopogon</i> sp.			
1590.	20365 <i>Leucopogon</i> sp. Howatharra (D. & N. McFarland 1046)		P2	Y
1591.	31754 <i>Leucopogon</i> sp. Kojarena (J. Brooker 232)		P1	Y
1592.	20364 <i>Leucopogon</i> sp. Mid West (J.S. Beard 7388)			
1593.	20360 <i>Leucopogon</i> sp. Moresby Range (S. Patrick 2614)		P3	
1594.	-3306 <i>Leucopogon</i> sp. Morseby Range (GJK & NG 6526)			Y
1595.	37042 <i>Leucopogon</i> sp. Nabawa (M. Hislop 2765)			Y
1596.	34157 <i>Leucopogon</i> sp. Northern ciliate (R. Davis 3393)			
1597.	27018 <i>Leveillea jungermannioides</i>			
1598.	7670 <i>Levenhookia dubia</i> (Hairy Stylewort)			
1599.	7671 <i>Levenhookia leptantha</i> (Trumpet Stylewort)			
1600.	7676 <i>Levenhookia pusilla</i> (Midget Stylewort)			
1601.	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
1602.	6489 <i>Limonium sinuatum</i> (Perennial Sea Lavender)	Y		
1603.	7075 <i>Linaria maroccana</i>	Y		
1604.	4362 <i>Linum marginale</i> (Wild Flax)			
1605.	7400 <i>Lobelia alata</i> (Angled Lobelia)			
1606.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
1607.	7402 <i>Lobelia gibbosa</i> (Tall Lobelia)			
1608.	7407 <i>Lobelia rhytidospema</i> (Wrinkled-seeded Lobelia)			
1609.	16798 <i>Logania litoralis</i>			
1610.	6512 <i>Logania spermacocea</i>			
1611.	6515 <i>Logania vaginalis</i> (White Spray)			
1612.	10957 <i>Lolium perenne</i> x <i>rigidum</i>	Y		
1613.	478 <i>Lolium rigidum</i> (Wimmera Ryegrass)	Y		
1614.	11384 <i>Lolium temulentum</i> forma <i>temulentum</i>	Y		
1615.	1226 <i>Lomandra effusa</i> (Scented Matrush)			
1616.	1231 <i>Lomandra maritima</i>			
1617.	14542 <i>Lomandra micrantha</i> subsp. <i>micrantha</i>			
1618.	1234 <i>Lomandra nigricans</i>			
1619.	4060 <i>Lotus australis</i> (Austral Trefoil)			
1620.	4066 <i>Lupinus cosentinii</i>	Y		
1621.	6968 <i>Lycium ferocissimum</i> (African Boxthorn)	Y		
1622.	18049 <i>Lyginia imberbis</i>			
1623.	2396 <i>Lysiana casuarinae</i>			
1624.	36375 <i>Lysimachia arvensis</i> (Pimpernel)	Y		
1625.	34736 <i>Lysinema pentapetalum</i>			
1626.	5281 <i>Lythrum hyssopifolia</i> (Lesser Loosestrife)	Y		
1627.	2839 <i>Macarthuria australis</i>			
1628.	4070 <i>Macroptilium atropurpureum</i> (Purple Bean)	Y		
1629.	2539 <i>Maireana convexa</i> (Mulga Bluebush)			
1630.	2556 <i>Maireana planifolia</i> (Low Bluebush)			
1631.	-12679 <i>Maireana</i> sp.			
1632.	5861 <i>Malleostemon hursthousei</i>			
1633.	5864 <i>Malleostemon peltiger</i>			
1634.	14469 <i>Malleostemon</i> sp. Moonyoonooka (R.J. Cranfield 2947)		P2	Y
1635.	4961 <i>Malva parviflora</i> (Marshmallow)	Y		
1636.	19421 <i>Marianthus bicolor</i> (Painted Marianthus)			
1637.	17632 <i>Marianthus ringens</i>			
1638.	76 <i>Marsilea hirsuta</i> (Nardoo)			
1639.	-13015 <i>Marsilea</i> sp.			
1640.	11275 <i>Medicago laciniata</i> var. <i>laciniata</i>	Y		
1641.	4077 <i>Medicago minima</i> (Small Burr Medic)	Y		
1642.	4079 <i>Medicago polymorpha</i> (Burr Medic)	Y		
1643.	15064 <i>Melaleuca acuminata</i> subsp. <i>websteri</i>			
1644.	37580 <i>Melaleuca acutifolia</i>			
1645.	5876 <i>Melaleuca aspalathoides</i>			
1646.	19384 <i>Melaleuca bisulcata</i>			
1647.	19048 <i>Melaleuca campanae</i>			
1648.	5887 <i>Melaleuca cardiophylla</i> (Tangling Melaleuca)			
1649.	5893 <i>Melaleuca concreta</i>			
1650.	16088 <i>Melaleuca coroncarpa</i>			
1651.	5904 <i>Melaleuca depressa</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1652.	15602 <i>Melaleuca fulgens</i> subsp. <i>steadmanii</i>			
1653.	18129 <i>Melaleuca hollidayi</i>			
1654.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
1655.	19451 <i>Melaleuca huttensis</i>		P1	
1656.	5922 <i>Melaleuca lanceolata</i> (Rottnest Teatree)			
1657.	5930 <i>Melaleuca leiopyxis</i>			
1658.	18112 <i>Melaleuca leuropoma</i>			
1659.	18435 <i>Melaleuca longistaminea</i>			
1660.	5936 <i>Melaleuca megacephala</i>			
1661.	5958 <i>Melaleuca radula</i> (Graceful Honeymyrtle)			
1662.	5959 <i>Melaleuca rhapsiophylla</i> (Swamp Paperbark)			
1663.	-3184 <i>Melaleuca</i> sp.			
1664.	37660 <i>Melaleuca spectabilis</i>			Y
1665.	19449 <i>Melaleuca stereophloia</i>			
1666.	18598 <i>Melaleuca systema</i>			
1667.	5983 <i>Melaleuca trichophylla</i>			
1668.	-3611 <i>Melaleuca uncinata</i> group			
1669.	-9503 <i>Melaleuca urceolaris</i> x <i>zonalis</i>			
1670.	5987 <i>Melaleuca viminea</i> (Mohan)			
1671.	13280 <i>Melaleuca viminea</i> subsp. <i>viminea</i>			
1672.	4085 <i>Melilotus indicus</i>	Y		
1673.	14985 <i>Melinis repens</i>	Y		
1674.	6884 <i>Mentha spicata</i> (Spearmint)	Y		
1675.	2813 <i>Mesembryanthemum crystallinum</i> (Iceplant)	Y		
1676.	954 <i>Mesomelaena preissii</i>			
1677.	955 <i>Mesomelaena pseudostygia</i>			
1678.	27070 <i>Metamastophora flabellata</i>			
1679.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
1680.	37680 <i>Micromyrtus collina</i>		P1	
1681.	19855 <i>Micromyrtus rubricalyx</i>		P2	Y
1682.	8814 <i>Microtis brownii</i>			
1683.	17423 <i>Microtis graniticola</i>			
1684.	10954 <i>Microtis media</i> (Tall Mignonette Orchid)			
1685.	15419 <i>Microtis media</i> subsp. <i>media</i>			
1686.	-3881 <i>Microtis</i> sp.			
1687.	8105 <i>Millotia myosotidifolia</i>			
1688.	8107 <i>Minuria cunninghamii</i> (Bush Minuria)			
1689.	4089 <i>Mirbelia depressa</i>			
1690.	4091 <i>Mirbelia floribunda</i> (Purple Mirbelia)			
1691.	4097 <i>Mirbelia ramulosa</i>			
1692.	4100 <i>Mirbelia spinosa</i>			
1693.	4104 <i>Mirbelia trichocalyx</i>			
1694.	7085 <i>Misopates orontium</i> (Lesser Snapdragon)	Y		
1695.	33136 <i>Molineriella minuta</i> (Small Hairgrass)	Y		
1696.	29418 <i>Monoculus monstrosus</i>	Y		
1697.	7410 <i>Monopsis debilis</i>	Y		
1698.	37440 <i>Monopsis debilis</i> var. <i>depressa</i>	Y		
1699.	19584 <i>Monotaxis bracteata</i>			
1700.	4663 <i>Monotaxis lurida</i>			Y
1701.	19177 <i>Moraea setifolia</i>	Y		
1702.	2412 <i>Muehlenbeckia adpressa</i> (Climbing Lignum)			
1703.	7289 <i>Myoporum caprarioides</i> (Slender Myoporum)			
1704.	7291 <i>Myoporum insulare</i> (Blueberry Tree)			
1705.	17158 <i>Myoporum montanum</i> (Native Myrtle)			
1706.	10978 <i>Nemcia pauciflora</i>			
1707.	6243 <i>Neosciadium glochidiatum</i>			
1708.	492 <i>Neurachne alopecuroidea</i> (Foftail Mulga Grass)			
1709.	27100 <i>Neurymenia fraxinifolia</i>			
1710.	6974 <i>Nicotiana glauca</i> (Tree Tobacco)	Y		
1711.	11327 <i>Nicotiana occidentalis</i> subsp. <i>hesperis</i>			
1712.	11331 <i>Nicotiana occidentalis</i> subsp. <i>obliqua</i>			
1713.	6978 <i>Nicotiana rotundifolia</i> (Round-leaved Tobacco)			
1714.	4366 <i>Nitraria billardierei</i> (Nitre Bush)			
1715.	27103 <i>Nizymenia conferta</i>			
1716.	1381 <i>Nothoscordum gracile</i>	Y		
1717.	2401 <i>Nuytsia floribunda</i> (Christmas Tree)			
1718.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
1719.	15449 <i>Olearia dampieri</i> subsp. <i>dampieri</i>			
1720.	15450 <i>Olearia dampieri</i> subsp. <i>eremicola</i>			
1721.	8136 <i>Olearia homolepis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1722.	19801 <i>Oligochaetochilus sanguineus</i>			
1723.	19804 <i>Oligochaetochilus vittatus</i>			
1724.	-11061 <i>Opercularia</i> sp.			
1725.	18256 <i>Opercularia spermacocea</i>			
1726.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
1727.	-9864 <i>Opuntia</i> sp.			
1728.	7122 <i>Orobancha minor</i> (Lesser Broomrape)	Y		
1729.	11749 <i>Orthrosanthus laxus</i> var. <i>laxus</i> (Morning Iris)			
1730.	27107 <i>Osmundaria prolifera</i>			
1731.	4355 <i>Oxalis perennans</i>			
1732.	4356 <i>Oxalis pes-caprae</i> (Soursob)	Y		
1733.	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
1734.	36259 <i>Palisada cruciata</i>			
1735.	503 <i>Panicum decompositum</i> (Native Millet)			
1736.	516 <i>Parapholis incurva</i> (Coast Bargrass)	Y		
1737.	17114 <i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>			
1738.	7089 <i>Parentucellia latifolia</i> (Common Bartsia)	Y		
1739.	7090 <i>Parentucellia viscosa</i> (Sticky Bartsia)	Y		
1740.	12670 <i>Parietaria cardiostegia</i>			
1741.	1762 <i>Parietaria debilis</i> (Pellitory)			
1742.	10975 <i>Paspalidium basicladum</i>			
1743.	-12177 <i>Paspalidium</i> sp.			
1744.	-1528 <i>Paspalidium</i> sp. <i>indet</i>			
1745.	528 <i>Paspalum distichum</i> (Water Couch)	Y		
1746.	533 <i>Paspalum vaginatum</i> (Salt Water Couch)	Y		
1747.	1550 <i>Patersonia occidentalis</i> (Purple Flag)			
1748.	30476 <i>Patersonia occidentalis</i> var. <i>latifolia</i>			
1749.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
1750.	537 <i>Pennisetum glaucum</i> (Pearl Millet)	Y		
1751.	541 <i>Pennisetum setaceum</i> (Fountain Grass)	Y		
1752.	542 <i>Pennisetum villosum</i> (Feathertop)	Y		
1753.	7593 <i>Pentaptilon careyi</i>			
1754.	543 <i>Pentaschistis airoides</i> (False Hairgrass)	Y		
1755.	24022 <i>Pentaschistis airoides</i> subsp. <i>airoides</i>	Y		
1756.	11052 <i>Persicaria prostrata</i>			
1757.	2255 <i>Persoonia angustiflora</i>			
1758.	15629 <i>Persoonia hexagona</i>			
1759.	15632 <i>Persoonia stricta</i>			
1760.	2286 <i>Petrophile brevifolia</i>			
1761.	2290 <i>Petrophile conifera</i>			
1762.	2301 <i>Petrophile macrostachya</i>			
1763.	2303 <i>Petrophile megalostegia</i>			
1764.	29192 <i>Petrophile pilostyla</i> subsp. <i>pilostyla</i>			
1765.	10784 <i>Petrophile scabriuscula</i>			
1766.	19825 <i>Petrorhagia dubia</i>	Y		
1767.	27134 <i>Phacelocarpus peperocarpos</i>			
1768.	-12141 <i>Phaeoceros laevis</i>			
1769.	551 <i>Phalaris minor</i> (Lesser Canary Grass)	Y		
1770.	20460 <i>Pheladenia deformis</i>			
1771.	18505 <i>Philothea wonganensis</i>		T	
1772.	1173 <i>Philydrella pygmaea</i> (Butterfly Flowers)			
1773.	14306 <i>Philydrella pygmaea</i> subsp. <i>pygmaea</i>			
1774.	16825 <i>Phyllangium divergens</i>			
1775.	-3338 <i>Phyllangium paradoxum</i> complex.			
1776.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
1777.	4681 <i>Phyllanthus maitlandianus</i>			
1778.	4685 <i>Phyllanthus scaber</i>			
1779.	6009 <i>Pileanthus filifolius</i> (Summer Coppercups)			
1780.	20219 <i>Pileanthus peduncularis</i> subsp. <i>peduncularis</i>			
1781.	20220 <i>Pileanthus rubronitidus</i>			
1782.	18250 <i>Pileanthus vernicosus</i>			
1783.	5231 <i>Pimelea angustifolia</i> (Narrow-leaved Pimelea)			
1784.	5232 <i>Pimelea argentea</i> (Silvery Leaved Pimelea)			
1785.	5244 <i>Pimelea floribunda</i>			
1786.	5246 <i>Pimelea gilgiana</i>			
1787.	11402 <i>Pimelea imbricata</i> var. <i>piliger</i>			
1788.	11185 <i>Pimelea microcephala</i> subsp. <i>microcephala</i>			
1789.	19744 <i>Pittosporum angustifolium</i>			
1790.	19745 <i>Pittosporum ligustrifolium</i>			
1791.	3173 <i>Pittosporum phylliraeoides</i> (Weeping Pittosporum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1792.	6798 <i>Pityrodia atriplicina</i>			
1793.	6811 <i>Pityrodia hemigenioides</i>			
1794.	6814 <i>Pityrodia loxocarpa</i>			
1795.	6816 <i>Pityrodia oldfieldii</i> (Oldfields Foxglove)			
1796.	6824 <i>Pityrodia verbascina</i> (Golden Bush)			
1797.	11785 <i>Plantago coronopus</i> subsp. <i>commutata</i>	Y		
1798.	7299 <i>Plantago debilis</i>			
1799.	6247 <i>Platysace cirrosa</i> (Karna)			
1800.	6255 <i>Platysace juncea</i>			
1801.	14996 <i>Platysace</i> sp. <i>Eneabba</i> (R. Hnatiuk 770001)			
1802.	27156 <i>Plocamium mertensii</i>			
1803.	571 <i>Poa annua</i> (Winter Grass)	Y		
1804.	577 <i>Poa poliformis</i> (Coastal Poa)			
1805.	8172 <i>Podolepis canescens</i>			
1806.	8173 <i>Podolepis capillaris</i> (Wiry Podolepis)			
1807.	8177 <i>Podolepis lessonii</i>			
1808.	8182 <i>Podotheca angustifolia</i> (Sticky Longheads)			
1809.	8184 <i>Podotheca gnaphalioides</i> (Golden Long-heads)			
1810.	8188 <i>Pogonolepis stricta</i>			
1811.	29919 <i>Polianthion wichurae</i>			
1812.	2905 <i>Polycarpon tetraphyllum</i> (Fourleaf Allseed)	Y		
1813.	2419 <i>Polygonum aviculare</i> (Wireweed)	Y		
1814.	582 <i>Polypogon monspeliensis</i> (Annual Beardgrass)	Y		
1815.	27173 <i>Polysiphonia decipiens</i>			
1816.	4688 <i>Poranthera drummondii</i>			
1817.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
1818.	2884 <i>Portulaca oleracea</i> (Purslane)	Y		
1819.	111 <i>Potamogeton ochreateus</i> (Blunt Pondweed)			
1820.	1669 <i>Prasophyllum cyphochilum</i> (Pouched Leek Orchid)			
1821.	1671 <i>Prasophyllum elatum</i> (Tall Leek Orchid)			
1822.	1672 <i>Prasophyllum fimbria</i> (Fringed Leek Orchid)			
1823.	1674 <i>Prasophyllum giganteum</i> (Bronze Leek Orchid)			
1824.	16688 <i>Prasophyllum gracile</i>			
1825.	-1736 <i>Prasophyllum macrostachyum</i> var. <i>ringens</i>			
1826.	1682 <i>Prasophyllum sargentii</i>			
1827.	3620 <i>Prosopis pallida</i> (Algaroba)	Y		
1828.	6919 <i>Prostanthera magnifica</i> (Magnificent Prostanthera)			
1829.	8189 <i>Pseudognaphalium luteoalbum</i> (Jersey Cudweed)	Y		
1830.	57 <i>Pteridium esculentum</i> (Bracken)			
1831.	13255 <i>Pterochaeta paniculata</i>			
1832.	1690 <i>Pterostylis nana</i> (Snail Orchid)			
1833.	1693 <i>Pterostylis recurva</i> (Jug Orchid)			
1834.	12217 <i>Pterostylis sanguinea</i>			
1835.	18657 <i>Pterostylis</i> sp. <i>inland</i> (A.C. Beauglehole 11880)			
1836.	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
1837.	2710 <i>Ptilotus chortophytum</i>			
1838.	2716 <i>Ptilotus declinatus</i> (Curved Mulla Mulla)			
1839.	2717 <i>Ptilotus divaricatus</i> (Climbing Mulla Mulla)			
1840.	11251 <i>Ptilotus divaricatus</i> var. <i>divaricatus</i>			
1841.	2718 <i>Ptilotus drummondii</i> (Narrowleaf Mulla Mulla)			
1842.	11260 <i>Ptilotus drummondii</i> var. <i>drummondii</i> (Pussytail)			
1843.	11797 <i>Ptilotus drummondii</i> var. <i>minor</i>			
1844.	2719 <i>Ptilotus eriochichus</i>			
1845.	11225 <i>Ptilotus exaltatus</i> var. <i>exaltatus</i> (Tall Mulla Mulla)			
1846.	11577 <i>Ptilotus gaudichaudii</i> var. <i>gaudichaudii</i>			
1847.	12001 <i>Ptilotus gaudichaudii</i> var. <i>parviflorus</i>			
1848.	11311 <i>Ptilotus grandiflorus</i> var. <i>grandiflorus</i>			
1849.	11775 <i>Ptilotus humilis</i> subsp. <i>humilis</i>			
1850.	17962 <i>Ptilotus humilis</i> subsp. <i>parviflorus</i>			
1851.	2742 <i>Ptilotus manglesii</i> (Pom Poms)			
1852.	2747 <i>Ptilotus obovatus</i> (Cotton Bush)			
1853.	2751 <i>Ptilotus polystachyus</i> (Prince of Wales Feather)			
1854.	17657 <i>Ptilotus polystachyus</i> var. <i>polystachyus</i> (Prince of Wales Feather)			
1855.	28340 <i>Ptilotus</i> sp. <i>Northampton</i> (R. Davis 10952)			
1856.	11364 <i>Ptilotus stirlingii</i> var. <i>stirlingii</i>			
1857.	2766 <i>Ptilotus villosiflorus</i>			
1858.	16367 <i>Pyrorchis nigricans</i> (Red beaks)			
1859.	8195 <i>Quinetia urvillei</i>			
1860.	4964 <i>Radyera farragei</i> (Knobby Hibiscus)			
1861.	3061 <i>Raphanus raphanistrum</i> (Wild Radish)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1862.	8197 <i>Reichardia tingitana</i> (False Sowthistle)	Y		
1863.	3083 <i>Reseda alba</i> (White Mingonette)	Y		
1864.	3085 <i>Reseda luteola</i> (Wild Mingonette)	Y		
1865.	19183 <i>Retama raetam</i>	Y		
1866.	11930 <i>Rhagodia baccata</i> subsp. <i>dioica</i> (Sea Berry Saltbush)			
1867.	2583 <i>Rhagodia latifolia</i>			
1868.	11316 <i>Rhagodia latifolia</i> subsp. <i>recta</i>			
1869.	2584 <i>Rhagodia preissii</i>			
1870.	11240 <i>Rhagodia preissii</i> subsp. <i>obovata</i>			
1871.	11254 <i>Rhagodia preissii</i> subsp. <i>preissii</i>			
1872.	-7999 <i>Rhagodia</i> sp.			
1873.	13308 <i>Rhodanthe charsleyae</i>			
1874.	13241 <i>Rhodanthe chlorocephala</i> subsp. <i>rosea</i>			
1875.	13242 <i>Rhodanthe chlorocephala</i> subsp. <i>splendida</i>			
1876.	13300 <i>Rhodanthe citrina</i>			
1877.	15035 <i>Rhodanthe corymbosa</i>			
1878.	13294 <i>Rhodanthe laevis</i>			
1879.	13234 <i>Rhodanthe manglesii</i>			
1880.	13249 <i>Rhodanthe oppositifolia</i> subsp. <i>oppositifolia</i>			
1881.	13296 <i>Rhodanthe polycephala</i>			
1882.	13251 <i>Rhodanthe propinqua</i>			
1883.	13309 <i>Rhodanthe spicata</i>			
1884.	13254 <i>Rhodanthe stricta</i>			
1885.	27224 <i>Rhodymenia sonderi</i>			
1886.	4699 <i>Ricinocarpos psilocladus</i>			
1887.	19942 <i>Ricinocarpos undulatus</i>			
1888.	4705 <i>Ricinus communis</i> (Castor Oil Plant)	Y		
1889.	1556 <i>Romulea rosea</i> (Guildford Grass)	Y		
1890.	3066 <i>Rorippa nasturtium-aquaticum</i> (Watercress)	Y		
1891.	10970 <i>Rostraria cristata</i>	Y		
1892.	11151 <i>Rostraria pumila</i>	Y		
1893.	20419 <i>Rulingia borealis</i>			
1894.	5059 <i>Rulingia densiflora</i>			
1895.	2433 <i>Rumex crispus</i> (Curled Dock)	Y		
1896.	2438 <i>Rumex obtusifolius</i> (Broadleaf Dock)	Y		Y
1897.	-13100 <i>Ruppia</i> sp.			
1898.	30434 <i>Salsola australis</i>			
1899.	18599 <i>Salsola tragus</i>			
1900.	6929 <i>Salvia verbenaca</i> (Wild Sage)	Y		
1901.	79 <i>Salvinia molesta</i> (Salvinia)	Y		
1902.	6484 <i>Samolus repens</i> (Creeping Brookweed)			
1903.	14108 <i>Samolus repens</i> var. <i>floribundus</i>			
1904.	14107 <i>Samolus repens</i> var. <i>paucifolius</i>			
1905.	2356 <i>Santalum acuminatum</i> (Quandong)			
1906.	2359 <i>Santalum spicatum</i> (Sandalwood)			
1907.	2593 <i>Sarcocornia quinqueflora</i> (Beaded Samphire)			
1908.	27230 <i>Sarconema filiforme</i>			
1909.	7595 <i>Scaevola anchusifolia</i>			
1910.	7603 <i>Scaevola canescens</i> (Grey Scaevola)			
1911.	7606 <i>Scaevola crassifolia</i> (Thick-leaved Fan-flower)			
1912.	13068 <i>Scaevola globosa</i>		P3	
1913.	7614 <i>Scaevola globulifera</i>			
1914.	7618 <i>Scaevola humifusa</i> (Procumbent Scaevola)			
1915.	7619 <i>Scaevola lanceolata</i>			
1916.	7627 <i>Scaevola oldfieldii</i>		P3	
1917.	7634 <i>Scaevola phlebopetala</i> (Velvet Fanflower)			
1918.	7637 <i>Scaevola porocarya</i> (Striate-fruit Scaevola)			
1919.	7643 <i>Scaevola sericophylla</i>			
1920.	-8719 <i>Scaevola</i> sp.			
1921.	7644 <i>Scaevola spinescens</i> (Currant Bush)			
1922.	13152 <i>Scaevola thesioides</i> subsp. <i>thesioides</i>			
1923.	7648 <i>Scaevola tomentosa</i> (Raggedleaf Fanflower)			
1924.	12588 <i>Scaevola virgata</i>			
1925.	11027 <i>Schinus terebinthifolius</i>	Y		
1926.	8200 <i>Schoenia cassiniana</i> (Schoenia)			
1927.	13356 <i>Schoenia filifolia</i> subsp. <i>subulifolia</i>		T	
1928.	972 <i>Schoenus armeria</i>			
1929.	17571 <i>Schoenus badius</i>		P2	
1930.	982 <i>Schoenus clandestinus</i>			
1931.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrusher)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1932.	17606	<i>Schoenus griffinianus</i>		P3	
1933.	994	<i>Schoenus humilis</i>			
1934.	1002	<i>Schoenus nanus</i> (Tiny Bog Rush)			
1935.	1006	<i>Schoenus odontocarpus</i>			
1936.	1009	<i>Schoenus pleiostemoneus</i>			
1937.	1013	<i>Schoenus sculptus</i> (Gimlet Bog-rush)			
1938.	-8000	<i>Schoenus</i> sp.			
1939.	16254	<i>Schoenus</i> sp. G Broad Sheath (K.L. Wilson 2633)			
1940.	1026	<i>Schoenus unispiculatus</i>			
1941.	17409	<i>Schoenus varicellae</i>			
1942.	6030	<i>Scholtzia ciliata</i>			
1943.	6034	<i>Scholtzia laxiflora</i>			
1944.	6035	<i>Scholtzia leptantha</i>			
1945.	6036	<i>Scholtzia oligandra</i> (Pink Scholtzia)			
1946.	6037	<i>Scholtzia parviflora</i>			
1947.	-10542	<i>Scholtzia</i> sp.			
1948.	20092	<i>Scholtzia</i> sp. Burma Road (A.C. Burns 138)			
1949.	14655	<i>Scholtzia</i> sp. Kojarena (A.M. Ashby 1904)		P1	Y
1950.	17398	<i>Scholtzia</i> sp. Northampton (A. Strid 20714)			
1951.	15427	<i>Scholtzia spatulata</i>			
1952.	6041	<i>Scholtzia umbellifera</i>			
1953.	27274	<i>Sebdenia flabellata</i>			
1954.	6	<i>Selaginella gracillima</i> (Tiny Clubmoss)			
1955.	8207	<i>Senecio glossanthus</i> (Slender Groundsel)			
1956.	15678	<i>Senecio hispidulus</i> var. <i>hispidulus</i>			
1957.	20663	<i>Senecio multicaulis</i> subsp. <i>multicaulis</i>			
1958.	20161	<i>Senecio pinnatifolius</i>			
1959.	25884	<i>Senecio pinnatifolius</i> var. <i>latilobus</i>			
1960.	12276	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			
1961.	12279	<i>Senna artemisioides</i> subsp. <i>helmsii</i>			
1962.	12282	<i>Senna artemisioides</i> subsp. <i>stricta</i>			Y
1963.	18444	<i>Senna charlesiana</i>			
1964.	12305	<i>Senna glutinosa</i> subsp. <i>chatelainiana</i>			
1965.	-9409	<i>Senna</i> sp.			
1966.	31575	<i>Serichonus gracilipes</i>		P3	
1967.	4970	<i>Sida calyxhymenia</i> (Tall Sida)			
1968.	19712	<i>Sida</i> sp. dark green fruits (S. van Leeuwen 2260)			
1969.	15972	<i>Silene gallica</i> var. <i>gallica</i>	Y		
1970.	8225	<i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
1971.	14583	<i>Siloxerus multiflorus</i>			
1972.	3068	<i>Sinapis arvensis</i> (Charlock)	Y		
1973.	6988	<i>Solanum americanum</i> (Glossy Nightshade)	Y		
1974.	7006	<i>Solanum ellipticum</i> (Potato Bush)			
1975.	7018	<i>Solanum lasiophyllum</i> (Flannel Bush)			
1976.	7020	<i>Solanum linnaeanum</i>	Y		
1977.	7022	<i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
1978.	7023	<i>Solanum nummularium</i> (Money-leaved Solanum)			
1979.	7025	<i>Solanum oldfieldii</i>			
1980.	11241	<i>Solanum orbiculatum</i> subsp. <i>orbiculatum</i> (Round-leaved Solanum)			
1981.	7037	<i>Solanum symonii</i>			
1982.	27281	<i>Solleria robusta</i>			
1983.	8231	<i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
1984.	617	<i>Sorghum halepense</i> (Johnson Grass)	Y		
1985.	-9207	<i>Sorghum</i> sp.			
1986.	35236	<i>Sorghum x drummondii</i> (Sudan Grass)	Y		
1987.	1312	<i>Sowerbaea laxiflora</i> (Purple Tassels)			
1988.	2912	<i>Spergula arvensis</i> (Corn Spurry)	Y		
1989.	2915	<i>Spergularia rubra</i> (Sand Spurry)	Y		
1990.	-11526	<i>Spergularia</i> sp.			
1991.	4203	<i>Sphaerolobium gracile</i>			
1992.	625	<i>Spinifex longifolius</i> (Beach Spinifex)			
1993.	635	<i>Sporobolus virginicus</i> (Marine Couch)			
1994.	4828	<i>Spyridium globulosum</i> (Basket Bush)			
1995.	4730	<i>Stackhousia dielsii</i> (Yellow Stackhousia)			
1996.	4733	<i>Stackhousia monogyna</i>			
1997.	7102	<i>Stemodia viscosa</i> (Pagurda)			
1998.	16190	<i>Stenanthemum complicatum</i>			
1999.	15065	<i>Stenanthemum notiale</i> subsp. <i>notiale</i>			
2000.	13476	<i>Stenanthemum pomaderroides</i>			
2001.	2316	<i>Stirlingia latifolia</i> (Blueboy)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2002.	27318	<i>Struvea plumosa</i>			
2003.	7679	<i>Stylidium adpressum</i> (Trigger-on-stilts)			
2004.	30278	<i>Stylidium androsaceum</i>			
2005.	7694	<i>Stylidium bulbiferum</i> (Circus Triggerplant)			
2006.	7698	<i>Stylidium caricifolium</i> (Milkmaids)			
2007.	7709	<i>Stylidium crossocephalum</i> (Posy Triggerplant)			
2008.	7712	<i>Stylidium despectum</i> (Dwarf Triggerplant)			
2009.	7716	<i>Stylidium diuroides</i> (Donkey Triggerplant)			
2010.	12855	<i>Stylidium drummondianum</i>		P3	
2011.	7720	<i>Stylidium elongatum</i> (Tall Triggerplant)			
2012.	7721	<i>Stylidium emarginatum</i>			
2013.	17412	<i>Stylidium kalbarriense</i>			
2014.	7749	<i>Stylidium leptophyllum</i> (Needle-leaved Triggerplant)			
2015.	7759	<i>Stylidium macrocarpum</i> (Flagon Triggerplant)			
2016.	7773	<i>Stylidium petiolare</i> (Horn Triggerplant)			
2017.	25837	<i>Stylidium purpureum</i>			
2018.	7785	<i>Stylidium repens</i> (Matted Triggerplant)			
2019.	19247	<i>Stylidium septentrionale</i>			
2020.	17510	<i>Stylidium</i> sp. Kalbarri (A. Carr 145)			
2021.	17578	<i>Stylidium udusicola</i>			
2022.	3181	<i>Stylobasium australe</i>			
2023.	3182	<i>Stylobasium spathulatum</i> (Pebble Bush)			
2024.	1260	<i>Stypandra glauca</i> (Blind Grass)			
2025.	4220	<i>Swainsona canescens</i> (Grey Swainsona)			
2026.	19805	<i>Symphotrichum subulatum</i> (Bushy Starwort)	Y		
2027.	16861	<i>Synaphea recurva</i>			
2028.	-6840	<i>Synaphea</i> sp. ASG 34			
2029.	15533	<i>Synaphea spinulosa</i> subsp. <i>borealis</i>			Y
2030.	15532	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
2031.	20024	<i>Tagetes erecta</i>	Y		
2032.	15741	<i>Tamarix aphylla</i> (Athel Tree)	Y		
2033.	33319	<i>Tecticornia indica</i> subsp. <i>bidens</i>			
2034.	4256	<i>Templetonia retusa</i> (Cockies Tongues)			
2035.	2791	<i>Tersonia cyathiflora</i> (Button Creeper)			
2036.	2820	<i>Tetragonia decumbens</i> (Sea Spinach)	Y		
2037.	2823	<i>Tetragonia implexicoma</i> (Bower Spinach)			
2038.	1035	<i>Tetralia microcarpa</i>			
2039.	4528	<i>Tetralia confertifolia</i>			
2040.	-9994	<i>Thalassodendron</i> sp.			
2041.	1701	<i>Thelymitra antennifera</i> (Vanilla Orchid)			
2042.	-12431	<i>Thelymitra antennifera</i> x <i>macrophylla</i>			
2043.	10856	<i>Thelymitra benthamiana</i> (Cinnamon Sun Orchid)			
2044.	1707	<i>Thelymitra flexuosa</i> (Twisted Sun Orchid)			
2045.	20732	<i>Thelymitra petrophila</i>			
2046.	673	<i>Themeda triandra</i>			
2047.	10874	<i>Thinopyrum distichum</i>	Y		
2048.	5084	<i>Thomasia grandiflora</i> (Large Flowered Thomasia)			
2049.	2644	<i>Threlkeldia diffusa</i> (Coast Bonefruit)			
2050.	6051	<i>Thryptomene baeckeacea</i>			
2051.	6055	<i>Thryptomene denticulata</i>			
2052.	6057	<i>Thryptomene hyporhysis</i>			
2053.	6064	<i>Thryptomene racemulosa</i>			
2054.	-10092	<i>Thryptomene</i> sp.			
2055.	36097	<i>Thryptomene</i> sp. Greenough River (J. Docherty 169)			
2056.	19115	<i>Thryptomene</i> sp. Moresby Range (A.S. George 14873)		P3	Y
2057.	20366	<i>Thryptomene</i> sp. Red Bluff (A.G. Gunness 2358)			
2058.	17265	<i>Thryptomene</i> sp. Yuna Reserve (A.C. Burns 100)		P2	
2059.	6066	<i>Thryptomene stenophylla</i>		P2	
2060.	6067	<i>Thryptomene strongylophylla</i>			
2061.	1319	<i>Thysanotus arenarius</i>			
2062.	14387	<i>Thysanotus brittanii</i>			
2063.	1328	<i>Thysanotus dichotomus</i> (Branching Fringe Lily)			
2064.	1338	<i>Thysanotus manglesianus</i> (Fringed Lily)			
2065.	1343	<i>Thysanotus patersonii</i>			
2066.	1346	<i>Thysanotus pyramidalis</i>			
2067.	1348	<i>Thysanotus rectantherus</i>			
2068.	-9372	<i>Thysanotus</i> sp.			
2069.	1351	<i>Thysanotus sparteus</i>			
2070.	27335	<i>Tolypocladia calodictyon</i>			
2071.	27336	<i>Tolypocladia glomerulata</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2072.	1368 <i>Trachyandra divaricata</i>	Y		
2073.	19253 <i>Trachymene ceratocarpa</i>			
2074.	6268 <i>Trachymene cyanopetala</i>			
2075.	6279 <i>Trachymene ornata</i> (Spongefruit)			
2076.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
2077.	1485 <i>Tribonanthes violacea</i>			
2078.	-7030 <i>Tribulus</i> sp.			
2079.	6727 <i>Trichodesma zeylanicum</i> (Camel Bush)			
2080.	13559 <i>Trichodesma zeylanicum</i> var. <i>grandiflorum</i>			
2081.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
2082.	17542 <i>Trifolium arvense</i> var. <i>arvense</i>	Y		
2083.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
2084.	17763 <i>Trifolium campestre</i> var. <i>campestre</i> (Hop Clover)	Y		
2085.	4297 <i>Trifolium glomeratum</i> (Cluster Clover)	Y		
2086.	4298 <i>Trifolium hirtum</i> (Rose Clover)	Y		
2087.	4313 <i>Trifolium subterraneum</i> (Subterranean Clover)	Y		
2088.	142 <i>Triglochin calcitrapum</i>			
2089.	15821 <i>Triglochin huegelii</i>			
2090.	15820 <i>Triglochin linearis</i>			
2091.	147 <i>Triglochin mucronata</i>			
2092.	18587 <i>Triglochin nana</i>			
2093.	-8420 <i>Triglochin</i> sp.			
2094.	19175 <i>Triglochin</i> sp. <i>B Flora of Australia</i> (P.G. Wilson 4294)			
2095.	17885 <i>Triodia bromoides</i>		P4	
2096.	17882 <i>Triodia danthonioides</i>			
2097.	705 <i>Tripogon loliiformis</i> (Five Minute Grass)			
2098.	4737 <i>Tripterococcus brunonis</i> (Winged Stackhousia)			
2099.	708 <i>Triticum aestivum</i> (Wheat)	Y		
2100.	4360 <i>Tropaeolum majus</i> (Garden Nasturtium)	Y		
2101.	4840 <i>Trymalium daphnifolium</i>			
2102.	18326 <i>Urochloa panicoides</i>	Y		
2103.	9008 <i>Urodon dasyphyllus</i> (Mop Bushpea)			
2104.	8254 <i>Urospermum picroides</i> (False Hawkbit)	Y		
2105.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
2106.	38388 <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
2107.	1767 <i>Urtica urens</i> (Small Nettle)	Y		
2108.	7656 <i>Velleia cynopotamica</i>			
2109.	7664 <i>Velleia rosea</i> (Pink Velleia)			
2110.	8257 <i>Vellereophyton dealbatum</i> (White Cudweed)	Y		
2111.	15725 <i>Verbesina encelioides</i>	Y		
2112.	7666 <i>Verreauxia reinwardtii</i> (Common Verreauxia)			
2113.	12399 <i>Verticordia capillaris</i>		P4	
2114.	12401 <i>Verticordia centipeda</i>			
2115.	6073 <i>Verticordia chrysantha</i>			
2116.	12402 <i>Verticordia chrysanthella</i>			
2117.	14709 <i>Verticordia chrysostachys</i> var. <i>chrysostachys</i>			
2118.	12403 <i>Verticordia chrysostachys</i> var. <i>pallida</i>		P3	
2119.	-5117 <i>Verticordia chrysostachys</i> var. <i>pallida</i> x			Y
2120.	15432 <i>Verticordia densiflora</i> var. <i>densiflora</i>			
2121.	12413 <i>Verticordia densiflora</i> var. <i>roseostella</i>		P3	
2122.	12414 <i>Verticordia densiflora</i> var. <i>stelluligera</i>			
2123.	14712 <i>Verticordia dichroma</i> var. <i>dichroma</i>		P3	
2124.	6083 <i>Verticordia grandis</i> (Scarlet Featherflower)			
2125.	12430 <i>Verticordia huegelii</i> var. <i>stylosa</i>			
2126.	12437 <i>Verticordia laciniata</i>			
2127.	15622 <i>Verticordia lepidophylla</i> var. <i>lepidophylla</i>			
2128.	12443 <i>Verticordia monadelpha</i> var. <i>callitricha</i>			
2129.	15435 <i>Verticordia monadelpha</i> var. <i>monadelpha</i>			
2130.	12444 <i>Verticordia muelleriana</i> subsp. <i>minor</i>		P2	
2131.	10822 <i>Verticordia nobilis</i>			
2132.	6102 <i>Verticordia oculata</i>			
2133.	6106 <i>Verticordia penicillaris</i>		P4	
2134.	6107 <i>Verticordia pennigera</i>			
2135.	6109 <i>Verticordia picta</i> (Painted Featherflower)			
2136.	15615 <i>Verticordia spicata</i> subsp. <i>spicata</i>			
2137.	27360 <i>Vidalia spiralis</i>			
2138.	4325 <i>Viminaria juncea</i> (Swishbush)			
2139.	8262 <i>Vittadinia cervicalis</i>			
2140.	11387 <i>Vittadinia cervicalis</i> var. <i>cervicularis</i>			
2141.	11278 <i>Vittadinia cervicalis</i> var. <i>occidentalis</i>		P1	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2142.	8264 <i>Vittadinia dissecta</i>			
2143.	8266 <i>Vittadinia gracilis</i>			
2144.	-8692 <i>Vittadinia</i> sp.			
2145.	722 <i>Vulpia bromoides</i> (Squirrel Tail Fescue)	Y		
2146.	724 <i>Vulpia myuros</i> (Rat's Tail Fescue)	Y		
2147.	12052 <i>Vulpia myuros</i> forma megalura	Y		
2148.	33101 <i>Vulpia myuros</i> forma myuros	Y		
2149.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
2150.	7388 <i>Wahlenbergia multicaulis</i>			
2151.	7389 <i>Wahlenbergia preissii</i>			
2152.	7393 <i>Wahlenbergia tumidifruca</i>			
2153.	8275 <i>Waitzia acuminata</i> (Orange Immortelle)			
2154.	13331 <i>Waitzia acuminata</i> var. <i>acuminata</i>			
2155.	13330 <i>Waitzia acuminata</i> var. <i>albicans</i>			
2156.	13328 <i>Waitzia nitida</i>			
2157.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
2158.	32455 <i>Weissia controversa</i>			
2159.	6939 <i>Westringia dampieri</i>			
2160.	1391 <i>Wurmbea densiflora</i>			
2161.	1393 <i>Wurmbea dilatata</i>			
2162.	1394 <i>Wurmbea dioica</i> (Early Nancy)			
2163.	12072 <i>Wurmbea dioica</i> subsp. <i>alba</i>			
2164.	1398 <i>Wurmbea monantha</i>			
2165.	1401 <i>Wurmbea pygmaea</i>			
2166.	-9534 <i>Wurmbea</i> sp. <i>Nabawa</i> (T.D. Macfarlane et al. TDM 4408)			Y
2167.	1403 <i>Wurmbea tenella</i> (Eight Nancy)			
2168.	1404 <i>Wurmbea tubulosa</i> (Long-flowered Nancy)		T	
2169.	1252 <i>Xanthorrhoea drummondii</i>			
2170.	1256 <i>Xanthorrhoea preissii</i> (Grass tree)			
2171.	19938 <i>Xerochrysum bracteatum</i>			
2172.	7113 <i>Zaluzianskya divaricata</i> (Spreading Night Phlox)	Y		
2173.	4385 <i>Zygophyllum apiculatum</i> (Gallweed)			
2174.	4390 <i>Zygophyllum fruticosum</i> (Shrubby Twinleaf)			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX D - EPBC Act Protected Matters Search Results



EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 06/05/11 17:02:48

[Summary](#)

[Details](#)

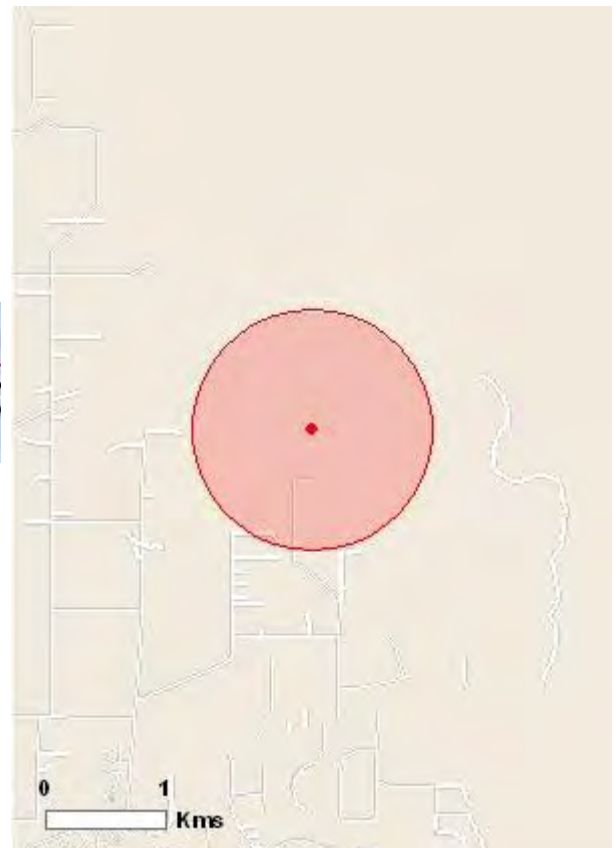
[Matters of NES](#)

[Other matters protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia (Geoscience
Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	3
Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	7
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

BIRDS

[Calyptorhynchus latirostris](#)

Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
---	------------	--

PLANTS

[Drummondita ericoides](#)

Morseby Range Drummondita [9193]	Endangered	Species or species habitat likely to occur within area
-------------------------------------	------------	--

[Eucalyptus cuprea](#)

Mallee Box [56773]	Endangered	Species or species habitat likely to occur within area
--------------------	------------	--

Migratory Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

Migratory Marine Birds

[Apus pacificus](#)

Fork-tailed Swift [678]		Species or species habitat may occur within area
-------------------------	--	--

[Ardea alba](#)

Great Egret, White Egret [59541]		Species or species habitat may occur within area
-------------------------------------	--	--

[Ardea ibis](#)

Cattle Egret [59542]		Species or species habitat may occur within area
----------------------	--	--

Migratory Terrestrial Species

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
-------------------------------	--	--

[Merops ornatus](#)

Rainbow Bee-eater [670]		Species or species habitat may occur within area
-------------------------	--	--

Migratory Wetlands Species

[Ardea alba](#)

Great Egret, White Egret
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species

[\[Resource Information \]](#)

Name

Status

Type of Presence

Birds

[Apus pacificus](#)

Fork-tailed Swift [678]

Species or species habitat may occur within area

[Ardea alba](#)

Great Egret, White Egret
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]

Species or species habitat likely to occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

Extra Information

Invasive Species

[\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name

Status

Type of Presence

Mammals

[Capra hircus](#)

Goat [2]

Species or species habitat likely to occur within area

[Felis catus](#)

Cat, House Cat, Domestic Cat
[19]

Species or species habitat likely to occur within area

[Oryctolagus cuniculus](#)

Rabbit, European Rabbit [128]

Species or species habitat likely to occur within area

[Vulpes vulpes](#)

Red Fox, Fox [18]

Species or species habitat likely to occur within area

Plants

[Cenchrus ciliaris](#)

Buffel-grass, Black Buffel-grass
[20213]

Species or species habitat may occur within area

[Lantana camara](#)

Lantana, Common Lantana,
Kamara Lantana, Large-leaf
Lantana, Pink Flowered
Lantana, Red Flowered Lantana,

Species or species habitat may occur within area

Red-Flowered Sage, White Sage, Wild Sage [10892]
[Lycium ferocissimum](#)
African Boxthorn, Boxthorn [19235]

Species or species habitat may occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.68636 114.6643

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

[Accessibility](#) | [Disclaimer](#) | [Privacy](#) | [© Commonwealth of Australia](#) | [Help](#)

Last updated: Thursday, 16-Sep-2010 09:13:25 EST

[Department of Sustainability, Environment, Water, Population and Communities](#)

GPO Box 787

Canberra ACT 2601 Australia

+61 2 6274 1111 [ABN](#)

| [Australian Government](#) |

APPENDIX E - DIA Registered Sites Search Results



Search Criteria

0 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6823202	270696
6826048	272100



Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

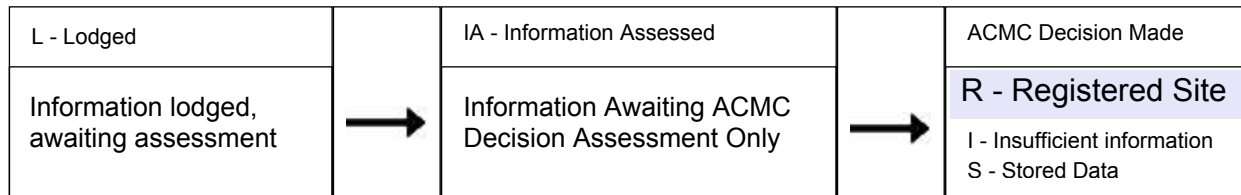
Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register of Aboriginal Sites established and maintained under the Aboriginal Heritage Act 1972 (AHA).

Legend

Restriction	Access	Coordinate Accuracy
N No restriction	C Closed	Accuracy is shown as a code in brackets following the site coordinates.
M Male access only	O Open	[Reliable] The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
F Female access	V Vulnerable	[Unreliable] The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status



*Explanation of Assessment

Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not the final assessment.

Final assessment and decisions will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

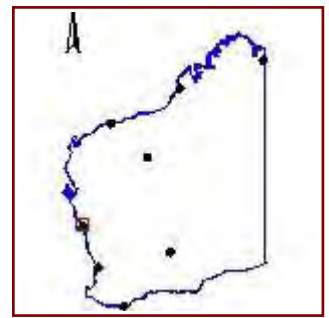
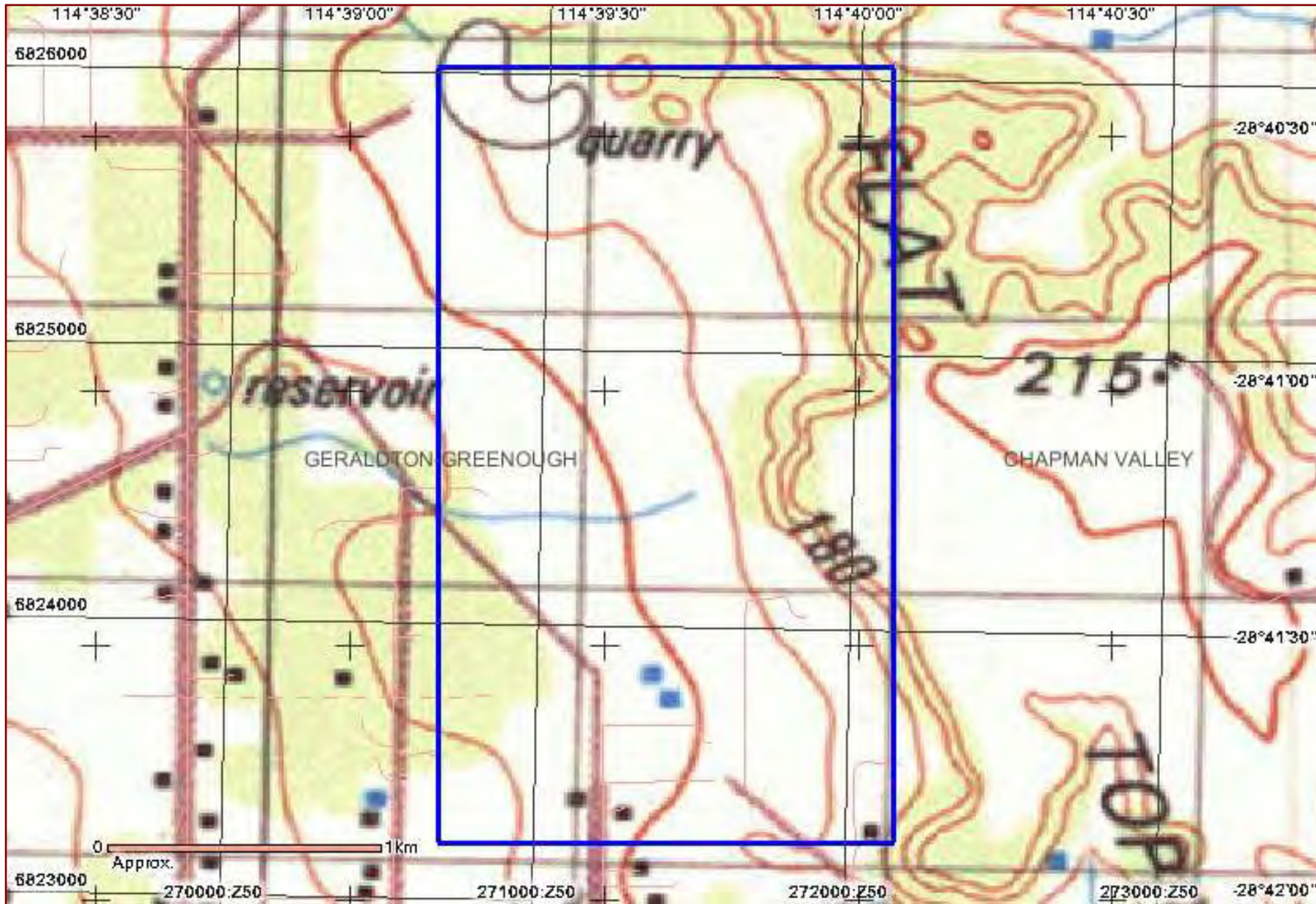
Sites Shown on Maps

Site boundaries may not appear on maps at low zoom levels



List of Registered Aboriginal Sites with Map

No results



Legend

- Selected Heritage Sites
 - Registered Sites
 - Town
 - Map Area
 - Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

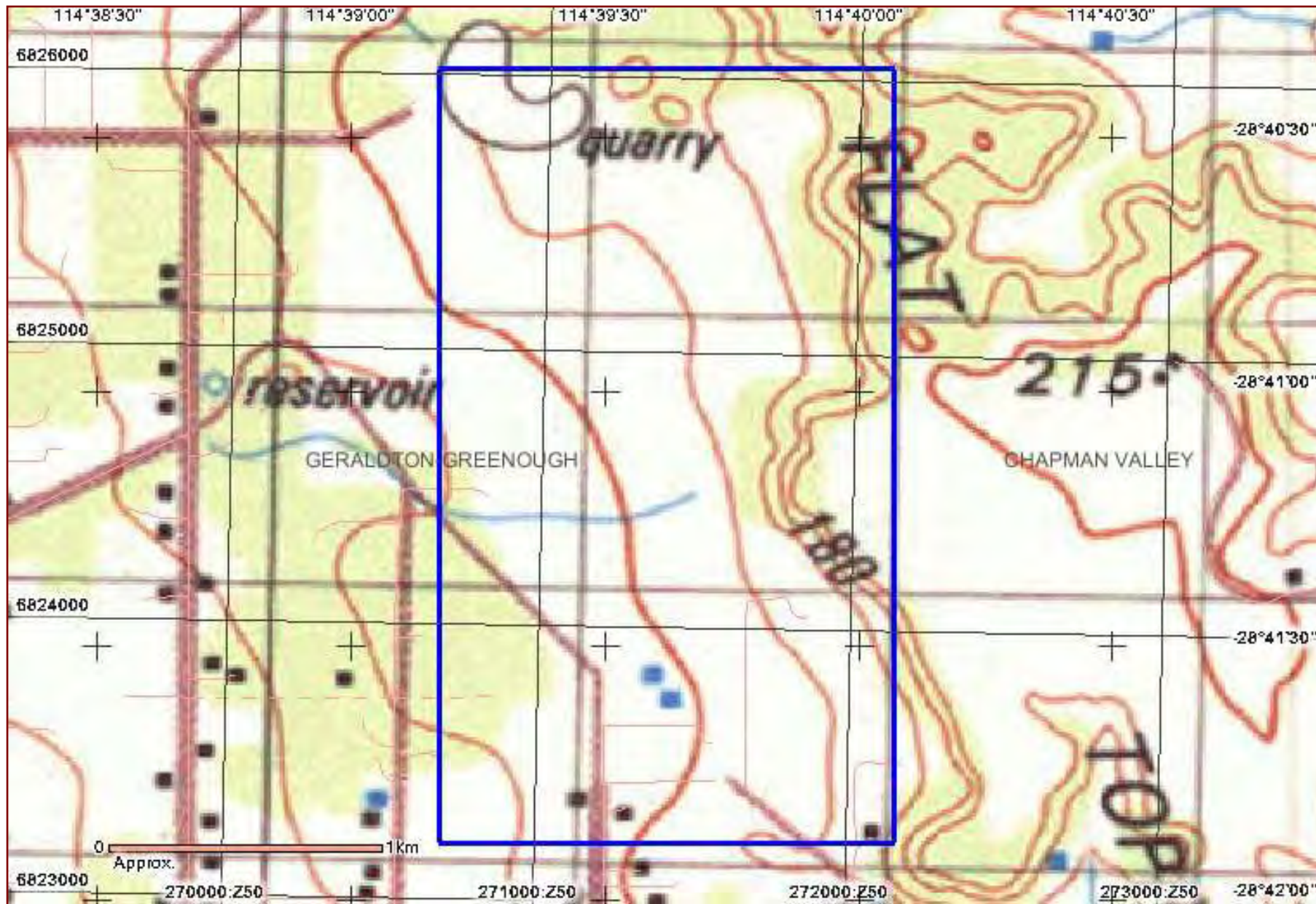
Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



List of Other Heritage Places with Map

No results



Legend

- Selected Heritage Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

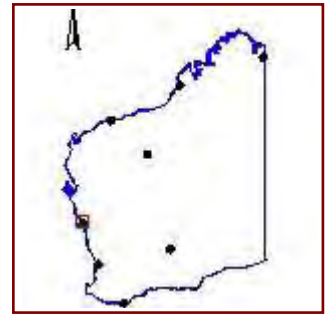
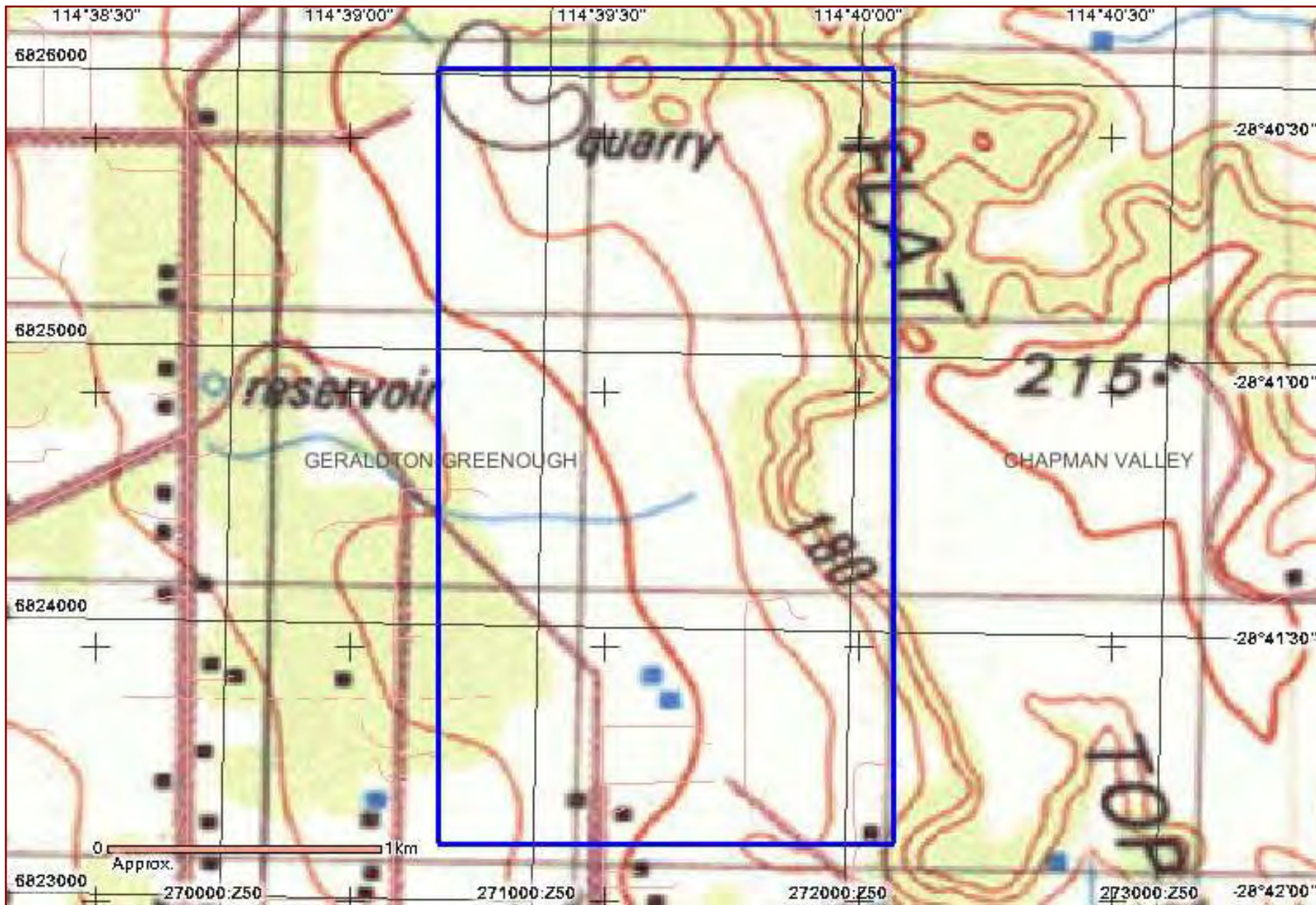
Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).






For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



Map Showing Registered Aboriginal Sites and Other Heritage Places



Legend

- Selected Heritage Sites
-  Registered Sites
-  Other Heritage Places
-  Town
-  Map Area
-  Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>

APPENDIX F - UXO Search Results and FESA Confirmation

IN REPLY, PLEASE QUOTE
605-05-01

GHD
76 Forrest Street
GERALDTON WA 6530

FESA Unexploded Ordnance Services
Telephone: (08) 9331 7218
Facsimile: (08) 9331 5928
E-mail: aarnold@fesa.wa.gov.au
ABN: 39 563 851 304

Attention: Ms C Miller

Dear Cathee

UNEXPLODED ORDNANCE RECONNAISSANCE OF LOTS 80 & 81 HACKETTS ROAD, WAGGRAKINE - GERALDTON

Further to the Unexploded Ordnance field reconnaissance carried out by FESA UXO Services on the 14th September 2006, on Lots 80 & 81 Hackett's Road, Geraldton.

As witnessed, a limited field investigation with the support of an electro magnetic Metal detector was carried out by myself over several areas of interest within the area of Lots 80 & 81 Hackett's Road. Those sites that I chose for the limited investigations I considered to be the most likely affected areas if the Department of Defence had in fact, fired explosive munitions onto the property during training exercises in WW11. The sites consisted of elevated features that would have represented good targets for artillery or infantry training exercises, however, after conducting the limited investigative searching, no such evidence (fragmentation from exploded munitions, actual artillery projectiles, mortars or other produce) was located to support this theory. Whilst several items of small arms munitions (a spent 410 shot gun cartridge, .22 calibre cartridge case and a .303 calibre projectile) were found, these were not of military origins, but from normal farm culling/shooting activities. Whilst .303 calibre projectiles would normally be associated with infantry training from the WW11 period, many ex service Lee Enfield .303 Rifles and ammunition stocks were released by the Commonwealth and widely used by farmers and other individuals in the post WW11 period, prior to more stringent licensing and gun controls introduced in the 60s and 70s. Had a quantity of these projectiles been found during the limited search, it would be reasonable to assume that infantry units may have conducted small arms training in the area. This may still be the case however, but as this type of munition is not considered UXO (ball ammunition in small arms manufacture does not contain explosives) no further searching will be required.

After careful consideration, I have now come to the conclusion that this particular region of the Red Peak Artillery Range as identified in the WA UXO Register of former Department of Defence Training Areas – WW11 (Site C-303, N126) poses a minimal risk as far as UXO Contamination is concerned. In this regard, no further searching for UXO is recommended prior to the development of this site. It would appear that the training activities as mentioned in the war Diaries from which the details of the Red Peak area were first identified, are that the risk areas lie more to the east of Lots 80 & 81, in the area stretching between Mount Fairfax, Red Peak and Wokatherra/Yetna on the eastern side of the Moresby Flat Topped Range.

Please be advised that this Office will make recommendations to the Department of Planning and Infrastructure (Geraldton Office) to apply a "UXO Advice Note" only to any referral received for the proposed development of Lots 80 & 81 Hackett's Road, Waggrakine, advising that the risk of UXO contamination is considered to be absolute minimal and that no further searching for UXO is necessary, nor required prior to the proposed development of the site. This "Advice note" will then be reflected in the WAPC Reference: Approval Subject to Conditions, and will be worded similar to the following:

The Fire and Emergency Services Authority of Western Australia (FESA) advises that historical research has revealed that during the past 100 years, former elements of the Australian Defence Forces may have conducted training and/or operational activities within or close to the area of the proposed subdivision. It is possible that as a result of these activities, the subject area may contain unexploded ordnance (UXO). Whilst it is considered that the possible risk from UXO on the land subject to this approval is minimal, an absolute guarantee that the area is free from UXO cannot be given. Should, during subdivisional works, or at any other time, a form or suspected form of UXO be located, FESA has advised that the following process should be initiated:

- 1. Do not disturb the site of the known or suspected UXO;*
- 2. Without disturbing the immediate vicinity, clearly mark the site of the UXO;*
- 3. Notify FESA of the circumstances/situation as quickly as possible; and*
- 4. Maintain a presence near the site until advised to the contrary by a member of FESA, the Western Australian Police Service or Defence Forces.*

Further advice on this issue may be obtained by contacting the Unexploded Ordnance Unit, Fire and Emergency Services Authority of Western Australia

Having said that and despite the sample searching conducted, no absolute guarantee can be given by this Office that Lots 80 & 81 are in fact, completely free of UXO. In the unlikely event that you and your Company locate a UXO or suspect UXO during your research site investigations, please follow the above process and let me know ASAP.

I have included a map on the following page showing the GPS track of most of the vehicle path, and the four search areas investigated for your records.

Again, I thank you for your company whilst on site and look forward to working with you again in the future as I am sure that the occasion will arise where GHD will be involved with other developments within potential UXO sites.

Yours sincerely

Andrew Arnold
FESA UXO LIAISON OFFICER
19 September 2006

**UXO Reconnaissance including limited detector search of several elevated areas
Lots 80 & 81 Hackett's Road, Waggrakine - Geraldton
Conducted by FESA UXO Services on the 14th September 2006**



Items of interest found



View looking south west over Lots 80-81 from top of ridge

Andrew Arnold
FESA UXO Liaison Officer

APPENDIX G - Draft Structure Plan Provisions

Appendix F – Proposed Local Structure Plan Provisions

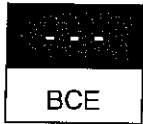
1 – Public Open Space Management Plan

1-1 The preparation of a Public Open Space (POS) Management Plan is required for the areas reserved for Public Open Space across the proposed development area, including the areas of existing vegetation retained in POS and the section of the Moresby Ranges outside the development area, within Lots 80 and 81 Hackett Road, Waggrakine. Implementation of the Plan shall be required as a condition of subdivision in the event that a subdivision application for urban development of Lots 80 and 81 Hackett Road, Waggrakine is approved by the Western Australian Planning Commission.

1-2: The POS Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission on advice of the City of Geraldton Greenough, the Environmental Protection Authority, and the Department of Environment and Conservation.

1-3: The POS Management Plan shall address:

- (1) minimisation of clearing and vegetation disturbance during construction,
- (2) access control (during construction and post-construction),
- (3) revegetation species and establishment,
- (4) weed control,
- (5) dieback control and management,
- (6) stormwater management,
- (7) ongoing maintenance and management of the vegetated areas,
- (8) protection of wetlands,
- (9) fire management, and
- (10) interface management.



BLACKTOP CONSULTING ENGINEERS

ACN: 150 023 868 ABN: 84 683 812 614
PO Box 918 Geraldton WA 6531
PHONE : (08) 9921 1878
FAX: (08) 9964 54590

10 October 2012

Sutcliffe Road Joint Venture
PO Box 1917
Geraldton WA 6531

Att: Mr Kel Turner

Job No: 12BCE226
Your Job ref:

DRAFT FOR COMMENT



Dear Kel

Investigation : Proposed Subdivision Development Moresby Heights Waggrakine

Geotechnical Report

EXECUTIVE SUMMARY

Blacktop Consulting Engineers (BCE) have completed a geotechnical investigation at the proposed Moresby Heights subdivision development in Waggrakine.

The purpose of the investigation is to confirm the ground type is suitable for subdivision purposes.

The investigation findings suggest that the site essentially comprises of sand, clay and silt soils. The study has found that the colluvial materials rest on weathered bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. The depth of soils above rock across the site varies from 0.6m to 3m. Excavation was generally achieved with backhoe to 2m depth at most sites. Some pockets along the west side of the site comprise of deep layers of residual yellow sand.

Material characteristics of the site soils were found to be favourable for land development purposes.

BACKGROUND

On instruction from Sutcliffe Road Joint Venture, Blacktop Consulting Engineers (BCE) conducted a geotechnical investigation at the proposed Moresby Heights subdivision development in Waggrakine.

A structure plan showing the planned subdivision is provided in Figure 1 – Appendix A.

The field investigation programme and all related studies were planned and supervised by a Civil & Structural Engineer from BCE. Blacktop Materials Engineering completed the materials testing of samples taken during the investigation at their Geraldton laboratory.

Guags backhoe hire provided the machine and operator required to undertake test pit excavation.

The site investigation was completed during September 2012.

SCOPE OF INVESTIGATION

BCE's proposal for this study was described in our letter dated 1 August 2012.

The scope of our work is to:

1. Provide some geological background on the site.
2. Provide the AS2870 site classification for the site for use in the design of buildings.
3. Provide recommendations to assist in constructing site earthworks such as a description of soil types, soil organic content, soil density, suitable compaction testing methods, suitable fill materials, earthworks compaction requirements.
4. A soil bearing capacity and settlement estimate will be provided for the site.
5. Suitable foundation and retaining wall options will be described.
6. Advice on completing earthworks including a procedure to complete earthworks, a description of the expected behaviour of the soils, site preparation, lift thickness, compaction requirements, acceptable compaction testing methods based on the soil types and compaction testing frequency will be provided.
7. Assess the composition, depth and extent of site material for use as structural fill purposes.
8. Stability criteria for open excavations will be provided.
9. Erosion and sediment control guidance.
10. Laboratory determined CBR pavement design parameters will be provided.
11. Recommend an appropriate earthquake site sub-soil class.
12. Recommend appropriate wind design criteria.
13. Complete an investigation to determine if acid sulphate soils exist at the site.
14. Recommendations for the construction of site drainage will be made.

INVESTIGATION LOCATIONS

The subdivision structure plan provided in Figure 2 Appendix A has been marked showing the 30 investigation locations.

The locations were selected to provide a representative description of the soils across the site.

The survey coordinates in datum GDA zone 50 for each investigation location are shown on the site plan. The survey coordinates are also provided on each test pit excavation log.

Photographs of the site are provided in Appendix B. As can be seen from the photographs site exists at the base of the Moresby Ranges and comprises of undulating land, most of which has formerly been cleared for agricultural purposes.

DESKTOP STUDY

Physiography of Geraldton Geological Sheet

Introduction

The area subject to investigation is contained in the Geraldton Geological sheet.

The Houtman Abrolhos Islands are also covered by the Geraldton sheet and were among the first features to be discovered and named on the Western Australian coast. First recorded sighting of the islands by ship was in 1619.

The main land around Geraldton was first explored in 1839 by George Grey, who reported favourably of its agricultural prospects. Geraldton was settled in 1951 and derived its name from the Geraldine lead mine located 120km to the north.

Pastoral blocks were first established inland from 1849 to 1862, and agricultural settlements were established on the Greenough Flats between 1853 and 1857. The Midland Railway, linking Perth to Geraldton, was completed in 1894.

The first town jetty was built in 1874, extending 244m north of Gregory St. In 1893 a new 290m jetty was built northwards from Durlacher St. Work on the present port began in 1924 and expansion continues to the present day with the recent land reclamation to construct No. 7 berth.

Climate

Geraldton has an Extra – dry Mediterranean climate and is characterised by mild, wet winters and hot, dry summers. Average rainfall is approximately 500mm with the lowest rainfall on the coast north of Geraldton and the highest on the hills around Chapman Valley.

Potential annual evaporation ranges between 1800mm and 2400mm.

Nearly all of the rain falls during the winter months. Maximum summer temperatures often exceed 40 degrees Celsius. The area is noted for its strong summer southerly winds.

Vegetation

Most of the area of the Geraldton sheet on the mainland is occupied by wheat and sheep farms. The natural vegetation has largely been removed from these properties, but in the drainage areas of the rivers the most abundant trees are Jam, York gum, Needle bush and She-oak. The sand plain flora is more extensively preserved. It consists largely of low Acacia scrub and Wattle with patches of Banksia and Christmas trees.

Geomorphology

The Geraldton sheet has been divided into five regolith-landform land systems plus a marine system.

Because the proposed subdivision study area is so large it encompasses areas of both the Moresby and Spearwood regolith-landform land systems.

The Moresby System is a plateau and side slopes composed of residual materials and colluvial deposits over weathered Jurassic rocks, with minor occurrences of Triassic and Proterozoic rocks.

The regolith materials of the Moresby System are derived from weathering and erosion of the underlying dominantly siliciclastic sedimentary rocks of the Jurassic Cattamarra Coal Measures river drainage system area.

Slopes comprise loose deposits of rock debris accumulated through the action of gravity range in thickness from 1m to more than 8m. These deposits comprise of rock debris, gravel, boulders and gravelly silty sand and rest on weathered bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone.

The Spearwood system is comprised of residual sand overlying calcarenite in a series of deflated dunes. The yellow sand is sourced for use in the building industry in some areas of the Spearwood system. The material is typically slightly silty medium sand composed of quartz. The calcarenite formed in the Pleistocene (which was about 2.5 million years ago). The limestone is composed of eolianite (which means sediments deposited by the wind). The sediments formed limestone by becoming compacted under pressure and expelling connate fluids, gradually becoming solid rock.

The findings of this study support the existence of colluvial deposits of sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. Some pockets along the west side of the site comprises of deep layers of residual yellow sand typical of the Spearwood system.

FIELD INVESTIGATION STUDIES

General

The field investigation programme included the following works:

- Initial site walkover and reconnaissance to establish opportunities for site access and establish the location of buried services.
- Complete test pit excavation logs for thirty test pits across the site which describe the soil types encountered and the presence of any unsuitable material at the site in accordance with AS1726-1993.
- Provide photographs of the site.
- Report the depth of the water table or rock if encountered.
- Take 25kg samples at selected geological layers encountered to allow Moisture Content (MC), Particle Size Distribution (PSD), Consistency Limits (PI), Soil Organic Content, Calcium Carbonate, Maximum Dry Density (MDD / OMC), and Californian Bearing Ratio (CBR) tests to be completed.
- Take samples from selected test pits at 0.25m depth increments for acid sulphate analysis.
- Backfill the test pits.

RESULTS OF INVESTIGATION

Soil Types

Test pit excavation at the site suggests that the site may be typified by either:

1. The site is typically comprised of deposits of quartz sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone.
2. Some areas on the west side of the site comprise of deep layers of residual yellow sand. The sand is typically silty medium sand composed of quartz. The material is generally not well compacted. Limestone was not encountered beneath the sand to the 3m depth of investigation.

Photographs of soil types exposed during test pit construction are provided in Appendix B.

Please find attached excavation logs completed for the constructed test pits in Appendix C, which describe the soil types encountered.

Shallow rock was encountered at test pits 7, 12, 16, 29 & 30.

A photograph of surface rock near test pit 16 is provided Figure 5 Appendix B.

Clay, clayey sand, gravel or rock was encountered at test pits 2,3,7,10 to 30.

Characteristics of the encountered soil materials are presented in summary form below.

Water Table

For this investigation, no specific data on the depth to the water table has been obtained for the area. The study has concentrated on soil properties. There was no evidence of the water table within the excavation depth of 3m of the soil surface.

Laboratory Materials Testing

The NATA endorsed test certificates for tests completed on samples are attached in Appendix D.

Results are summarised in the following section.

Unified Soil Classification Symbol (USC)

The Unified Soil Classification Symbol is calculated based upon results of particle size distribution and consistency limit testing.

The particle size distribution of a material is determined by screening a material over sieves and calculating the mass passing each. The effect of grading on density, internal friction (stability when wet) and permeability justifies its use as an indicator of likely performance.

Consistency limits are conceptual limits when it may be considered a material proceeds through a semi solid, plastic and liquid states as its moisture increases. These limits are determined using empirical procedures in the laboratory. The consistency limits are related to the type and amount of clay in a material. The objection to material with a high clay content is that clay increases in volume and decreases in strength with increase in moisture content. The volume change tends to destroy the mechanical interlock and reduce internal friction and stability and results in inferior performance.

The calculated Unified Soil Classification (USC) symbol for the site material is provided on the test certificates.

Results suggest that the USC symbol for the site materials are generally:

1. SC which is the classification symbol for a sand / clay mixture.
2. SM which is the classification symbol for a sand / silt mixture.

The site material is all very fine grained.

The samples were found to contain between 9% to 56% of material passing the 75micron sieve.

Silt and clay is defined as the sample fraction which passes the 75micron sieve.

As a guide, usually soils are preferred for foundation material which do not contain more than about 10% silt and clay. The objection to material with a high silt and clay content is that an excessive silt and clay fraction under soaked conditions reduces the soils bearing capacity.

The results of consistency limit testing generally suggested that most of the soils which contained clay had a moderate plasticity. It was typical of most sites that the clay fraction in the soil increased with depth.

Whilst the materials are suitable for construction purposes the reactive nature of the underlying soil types will need to be considered in the design of improvements to the site.

Soil Compaction Summary

To avoid the likelihood of settlement, it is required by the Building Code of Australia and Australian Design Standards that for domestic structures, soils shall be compacted to 95% Maximum Modified Dry Density (MMDD) in accordance with AS1289.

It is understood that soils at this level of compaction will resist further settlement, under residential construction loading, and hence provide a reliable and sound foundation.

In clean well graded sand soils it is generally accepted that the measurement of eight blows per 300mm depth of penetration using a 16 mm diameter 9.0 kg Perth Sand Penetrometer (PSP) in accordance with AS1289 6.3.3 is an acceptable indication that the sand exists at 95% modified maximum dry density.

For this reason, eight blows per 300mm depth of penetration using a PSP is the compaction requirement, which most local authorities stipulate a building pad shall achieve prior to building commencement.

AS 1289 6.3.3 provides the specific method for completing PSP tests.

AS1289 6.3.3 stipulates that the soil for PSP measurement shall be

1. Non cohesive.
2. Not contain particles greater than 2mm diameter.

Such material is classified as clean sand.

Blacktop suggest that a useful guide for identifying non cohesive material shall be the amount of silt and clay contained in the sample. Silt and clay is indicated by the fraction of sample passing the 75 micron sieve.

If the material exceeds 5% passing the 75micron sieve, then the material should be considered cohesive. It is not possible to guarantee that PSP compaction measurements completed in soils which exceed this silt content are accurate.

As can be seen from the Particle Size Distribution Test Certificates completed on the site soils, the silt and clay fraction far greater than the limits allowed by AS1289 6.3.3 for PSP measurement.

For this reason indicative measurement of the compaction of site soils was generally only undertaken at the areas found to comprise residual yellow sand during the site investigation.

Results at these locations indicate that the sands are generally very loose. Results of PSP testing are provided on the excavation logs.

Verification of soil compaction in the material types at the site is required be under taken by a NATA accredited agency using a nuclear densometer to Australian Standard 1289 5.8.1 "Soil compaction and density tests using nuclear density gauge".

Site Classification AS2879 – 2011

Calculation of estimation of characteristic surface movement derived using method prescribed in AS2870- from the soil sample test certificates suggest that the following surface movement may be predicted from soil shrinkage indices, based on soil reactivity with moisture.

The calculation of expected surface movement does not make any allowance for movements caused by soil densification settlement.

Calculations assume that the site is compacted to 95% modified maximum dry density in accordance with AS1289, and that the foundation soils are protected from excessive moisture ingress.

Calculations are based on the existing soil profile below the maximum depth of excavation for footing and slab. (This depth of this excavation is usually 370mm to the bottom of the footings).

Test Pit No.	Expected Surface Movement (mm) *	Site Classification in Accordance with AS2870 - 2011
1 – 30	From 0 to 22mm	M

* Estimation of the characteristic surface movement completed in accordance with AS2870 – 2011.

Table 1 : Estimation of Site Classification

As can be seen from the calculated surface movement the predicted shrinkage response of the clay contained in the soil to moisture change is significant in some areas across the site.

In accordance with classification method provided by determination of characteristic surface movement in AS2870 –2011, and based on the results of the soil samples, the site is classified as Class 'M'. This classification indicates a moderately reactive site. This classification is based on the most reactive area of the site. If the site was sub-classified many areas of the site would be classified as Class 'S'.

The calculated surface movement for each individual investigation site is provided in Table 1 Appendix E.

For reference:

1. AS 2870- stipulates that sites which experience between 0 – 20mm expected surface movement may be classified as Class "S". Essentially AS2870 – considers this to be a stable site.
2. AS 2870- stipulates that sites which experience between 20 – 40mm expected surface movement may be classified as Class "M". Essentially AS2870 – considers this to be a moderately reactive site.
3. AS 2870- stipulates that sites which experience between 40 – 60mm expected surface movement may be classified as Class "H1". Essentially AS2870 – considers this to be a highly reactive site.
4. AS 2870- stipulates that sites which experience between 60 – 75mm expected surface movement may be classified as Class "H2". Essentially AS2870 – considers this to be a highly reactive site.

The calculation of expected surface movement does not make any allowance for movements caused by soil densification settlement. Calculations assume that the foundation soils are protected from excessive moisture ingress.

Moisture Content

Results of field moisture content determined for 15 soil samples are presented in Appendix D. Results generally suggest that soil moisture contents are quite low in soils within 1m of the ground surface and that sandy soils tend to retain less moisture than materials containing clay.

Organic

When materials contain greater than 1% organic matter compaction can be very difficult to achieve. 1% of decomposed vegetation is a considerable quantity in soil and it can have a significant effect on the physical characteristics of the soil when it is mixed through the soil.

Organic matter which has entered the soil from stands of Wattle and Acacia species tends to suppress the ability of soils to take on moisture and hence can make the process of soil moisture conditioning and the achievement of 95% MMDD compaction very difficult.

BCE experience in the past suggests that if the material contains greater than 1% organic matter this could be grounds to replace the material or to entertain a compaction concession in the engineering specification.

10 field samples were tested to determine the organic content of the soil. Results indicate that the samples tested had an organic content of between 0.5% to 1.9%. Generally the near surface samples (within 0.5m of the surface) had an organic content equal to or less than 1% so organics are not expected to present a problem.

Calcium Carbonate

10 field samples were tested to determine the calcium carbonate content of the soil. All samples returned results of between 2.8% to 4.7% calcium carbonate content.

Maximum Dry Density / Optimum Moisture Content (t/m^3 / %)

The Maximum Modified Dry Density results are what might be expected for a silty sands and clayey sands.

The maximum dry density of the materials indicate that compaction of the materials is measurable with a nuclear densometer instrument.

Based on the results of the materials optimum moisture content, moisture quantities to be added to the soil to bring the soils to optimum can be calculated once the insitu moisture content of the soil is determined. For example if soil taken from Site 1 at 0.5m depth which was found to exist at 2.4% field moisture, is required to be conditioned to optimum, approximately 147 litres of water are required to be added per $1m^3$ of soil to condition the soil to optimum moisture content to assist in achieving compaction.

CBR value

The CBR is a strength test which describes the effort of a standard piston to penetrate a compacted confined soil specimen. The results are expressed as a ratio of the loads to cause the same penetration in a standard crushed rock material.

Where soils may be affected by moisture a soaked CBR test is completed. This test provides an indication of material strength when then the specimen is saturated. An Unsoaked CBR test indicates material strength at optimum moisture content, or an unsaturated state.

Samples were modelled at 95% maximum modified dry density and 100% optimum moisture content. This is in line with most land development guidelines. A 4.5kg surcharge was placed on the samples during modelling to replicate the basecourse layer.

As a reference, Main Roads Specification 501 "PAVEMENTS" stipulates that for **gravel basecourse**, suitable for all pavements except freeways and controlled access highways, the Soaked CBR (96%MDD & 100%OMC) shall be 80% minimum.

The City of Geraldton – Greenough land development guidelines stipulates that subgrade shall have a soaked CBR exceeding 7% and a PI less than 15.

4 samples taken from between the ground surface to 0.5m depth were tested to determine the soaked CBR value of the soil.

The results of the CBR testing indicate that the site material:

1. Exceeded the City of Geraldton – Greenough land development guidelines which requires subgrade to have a minimum soaked CBR of 7%.

CONCLUSIONS

Material characteristics of the site soils were found to be favourable for construction purposes. To ensure successful engineering design of site improvements BCE recommend that the following considerations be given to the site ground conditions during subdivision design and construction:

Site

The site includes both the Moresby and Spearwood regolith-landform land systems. The soils types which can be expected in these systems include colluvial deposits of sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. Some pockets along the west side of the site comprise of deep layers of residual yellow sand typical of the Spearwood system.

The subsurface clays may generally be described as containing moderately reactive clay.

Shallow rock was encountered at some sites.

The water table was not encountered during the investigation.

Site Materials

Compaction of site materials will be most effectively achieved by conditioning the materials to optimum, (and curing if possible) before compacting. The mandatory use of pad foot rollers to achieve compaction should be considered on cohesive soils and flat drum rollers on the sandy soil types.

It is suggested from the outset of construction that trials are completed to determine the most effective way to achieve compaction in the various site soil types. BCE would be pleased to assist with these trials if requested.

Prior to the commencement of site compaction excavative efforts shall ensure all visible deleterious materials such as grass roots etc are removed from site.

AS2870 Site Classification

In accordance with AS 2870- 2011 the site is classified as Class "M". This classification indicates a moderately reactive site.

This classification is based on the most reactive areas of the site. If the site was sub-classified the majority of the site would be classified as Class 'S'.

The reactive areas of the site are expected to experience significant volumetric changes due to expansion and contraction caused by variations in ground soil moisture content. Specific structural detailing and drainage requirements will be required by AS2870 for this classification.

Site Compaction

It was not possible during the site investigation to confirm the compaction of the soils at the site at most areas. The silt and clay content of the site soil requires compaction of the site soils to be verified by a NATA accredited agency using a nuclear densometer to Australian Standard 1289 5.8.1 "Soil compaction and density tests using nuclear density gauge".

Compaction of areas of the site found to comprise of residual yellow sand indicate that the sands are generally very loose. Results of PSP testing undertaken is provided on the excavation logs.

Without compaction verification, constructed premises risk settlement damage caused by consolidation of loose soil layers, should they be inadequately compacted.

Calculations of the Lot site classification assumes that the site is compacted to 95% modified maximum dry density in accordance with AS1289 to a depth of 600mm below building foundations.

Bearing Capacity & Settlement Estimates

The study area lends itself to the use of lightly loaded shallow footings. Presumptive allowable bearing pressures of 150kPa may be considered at the site on dry soils where ground improvement has been completed within the zone of influence of footings to 95%MMDD a depth of 600mm below building footings and pavements. This should ensure that total and differential settlements will be less than 10mm.

If footings are founded directly on underlying rock layers the rock is expected provide allowable bearing pressures in excess of 400kPa. The rock layer should ensure that total and differential settlements will be negligible.

The design of site drainage to ensure that foundation soils are kept dry will be important to achieving the stipulated bearing pressures.

Suitable Foundation and Retaining Options

Earth retaining systems shall be designed in accordance with AS4678.

Any conventional form of retaining system designed in accordance with AS4678 will be suitable at the site and will perform well. BCE would be please to supply certified retaining options if requested.

The suggested design parameters for temporary and permanent retaining wall design for the site soils are:

Yellow Sand

- Friction angle 32 degrees.
- Density 1.87t/m³.

Clay

- Cu – Required to be determined by further testing.
- Density 1.98t/m³ to 2.18t/m³

Construction Materials

Laterite gravel was encountered at Test Pit 11 at 0.3m to 0.7m depth and Test Pit 2 at 0.3m to 0.8m depth. To investigate the possibility that the gravel may be useful for use as basecourse construction material BCE had the samples tested.

Test certificates 12BME9474 & 12BME9479 are provided in Appendix D which show the PSD and PI content of the gravel. Upper and lower grading curves provided by MRWA Pavement Specification 501 for basecourse have been provided on the certificates. MRWA specifies basecourse gravel shall have a Liquid Limit 25% maximum and a Linear Shrinkage 3% maximum.

As can be seen on the test certificates the sample from Test Pit 2 contains too much clay and both samples are too sandy to meet the MRWA basecourse specification.

The materials would make suitable sub base. BCE suggest that consideration be given to further searching for potential gravel deposits on the property. Blacktop have specialist people to assist with gravel searching if requested.

Pockets along the west side of the site which comprise of deep residual yellow sand will provide sand suitable for use as structural fill material. Material for use as structural fill shall be selected which is non-plastic and does not contain more than 10% passing the 75 micron sieve.

Due to the difficulty in achieving and maintaining the moisture content required to achieve compaction the site materials containing clay are not recommended to use for structural fill. This material will be suitable for fill which is not load bearing.

Cut and Fill Slope Stability Criteria

The angle of repose of the site materials is estimated to be approximately 30 degrees.

Excavations for foundations may be required using standard earthmoving equipment. Where shoring will not be provided to excavations it is suggested that excavation batters be sloped at an angle of 1V:3H in soils and 1V:1.5H in rock to prevent collapse of trench walls.

Fill slopes should not be steeper than 1V:3H.

Soil Susceptibility to Scouring

Given the site receives significant run off from the nearby ranges, and contains clayey soils with low permeability in some areas, design of the development should make provision for water runoff flow without causing damage.

The soils at the site will be susceptible to scouring from medium to high velocity overland water flow or strong winds.

The site surface materials are very fined grained and will be easily transported by water and wind movement.

To avoid scouring, embankments receiving flow from significant catchments, should be stone pitched or otherwise armoured.

Provision to stop airborne sand shall be taken during windy periods.

Subgrade CBR

CBR results indicate that the site surface materials at the four areas sampled exceed City of Geraldton – Greenough local authority requirements for subgrade.

CBR results indicate that provided the near surface site materials are suitably compacted they will make suitable subgrade.

Once the design of the development can be confirmed CBR's in road pavement areas should be confirmed. Generally the depth of sand between the basecourse layer and underlying clayey soils (obviously depending on final road design horizontal alignment) should be adequate to protect the pavement from reflective cracking of underlying soils, provided the formations are well drained.

Earthquake Site Factor

In accordance with AS1170.4 (Seismic design loads) the site is classified as Ce.

Wind Classification

In accordance with AS1170.2 the site is classified as Region B Terrain Category 2.

In accordance with AS4055 the site is classified as N3.

Acid Sulfate Soils

Testing for acid sulfate soils suggests that the levels of acid sulfate content in soils at the site are below threshold levels which the DoE require the development of an acid sulfate management plan.

Please refer to Appendix F for acid sulfate report.

AS2870 Drainage Design Recommendations

Given that this site has been found to comprise of underlying clay soils, the following specific detailing requirements will be required by AS2870 during, and following the construction of premises on the subdivision, by the Builder.

The design methods provided in AS2870 are based on the performance requirements that significant damage can be avoided provided that foundation site conditions are properly maintained.

All soils are affected by water. Silts are weakened by water. Sands can settle if heavily watered, and clays shrink and swell with variations in moisture content. Site works should be completed which ensure building foundations are protected from moisture ingress.

Floor Level

To avoid the possibility of flooding in poorly drained soils AS2870 recommends that the minimum height of the slab above finished ground level should be 150mm.

This requirement together with the Shires requirements for finished floor level should also be used to establish the building floor height during site earthworks.

Drainage shall be designed and constructed to avoid water ponding against or near the footing. The ground in the immediate vicinity of the perimeter footing shall be graded to fall 50 mm minimum away from the footing over a distance of 3m.

Any paving shall also be suitably sloped away from the building.

For M class sites it is recommended that a polyethylene membrane be laid at 5% fall away from the building approximately 200mm below the graded ground surface. It is recommended that this membrane extend 3m from the edge of the building.

Plumbing trenches shall be sloped away from the house and shall be backfilled with native Lot soil in the top 300mm within 1.5m of the house. The soil used for backfilling should be compacted. Where

pipes pass under the footing system, the trench shall be backfilled with native Lot fill to restrict the ingress of moisture beneath the footing system.

Subsurface drains shall be free draining and shall be able to be inspected and maintained. Subsurface drains shall be protected by filters and geotextiles.

NOTE: Wherever practicable, subsurface drains should be avoided near footings.

Construction

Following construction of the sand pad it may be required to excavate and backfill trenches for plumbing and other services. The site classification provided in this report relies upon all trench backfill being compacted to 95% MMDD. If the builder has any doubts as to whether the reinstatement of trenches by service providers meets this compaction requirement then the builder shall engage Blacktop to verify the compaction of backfill prior to pouring the footings or slab.

Plumbing Requirements

The building shall be provided with an adequate system of plumbing detailed in accordance with the following:

- a) Septic tanks and associated soakage areas shall be located a minimum distance of 5m from the building, where possible, to minimise soil moisture increase within the foundation.
- b) Plumbing and drainage under a slab shall be avoided where practicable

NOTE: Methods used should comply with local plumbing and drainage regulations.

Additional Requirements

The following requirements apply to the building services and footing system in addition to the above:

- a) Water run-off shall be collected and channelled away from the building during construction.
- b) Excavations near the edge of the footing system shall be backfilled in such a way as to prevent access of water to the foundation. For example, excavations should be backfilled above or adjacent to the footing with material similar to native material compacted by hand-rodging or tamping. Porous material such as sand, gravel or building rubble should not be used.
- a) Water shall not be allowed to pond in trenches for a long period.

Foundation Maintenance

Garden beds adjacent to the building should be avoided. Care should be taken to avoid over watering of gardens close to the building footings.

Planting of trees should be avoided near the foundation of a building or neighbouring building. To reduce, but not eliminate, the possibility of damage, tree planting should be restricted to a distance from the building of the mature height of the plant.

Where rows or groups of trees are involved, the distance from the building should be increased.

Leaks in plumbing, including stormwater and sewerage drainage, should be repaired promptly.

Site drainage recommendations should be maintained for the economic life of the building.

SCOPE & LIMITS OF GEOTECHNICAL INVESTIGATION

This report presents the results of a geotechnical investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project and structures described herein.

The advice tendered in this report is based on information obtained from the investigation locations tests points and sample points and is not warranted in respect to the conditions that may be encountered across the site at other than these locations. It is emphasised that the actual characteristics of the subsurface materials may vary significantly between adjacent test points and sample intervals and at allocations other than where observations, explorations and investigations have been made. Subsurface conditions, including groundwater levels and contaminant concentrations can change in a limited time. This should be borne in mind when assessing the data.

It should be noted that because of the inherent uncertainties in subsurface evaluations, changed or unanticipated subsurface conditions may occur that could affect total project cost and/or execution. BCE does not accept responsibility for the consequences of significant variances in the conditions and the requirements for execution of the work.

Should you have any queries please do not hesitate to contact Mr Lester Smith of this office on 9921 1878.

Yours faithfully


Lester Smith
Engineering Manager

Attachment: Appendix A-F

REFERENCES

Geological Survey of Western Australia. GERALDTON. Bureau of Mineral Resources, Geology and Geophysics 1982.

Langford, R.L.,2000. Regolith-Landform Resources of the Geraldton 1:50 000 Sheet.

AS2870-2011 Residential slabs and footings – Construction. Standards Australia.

Varnes, D.J., 1978. Slope Movement Types and Processes. National Academy of Sciences.

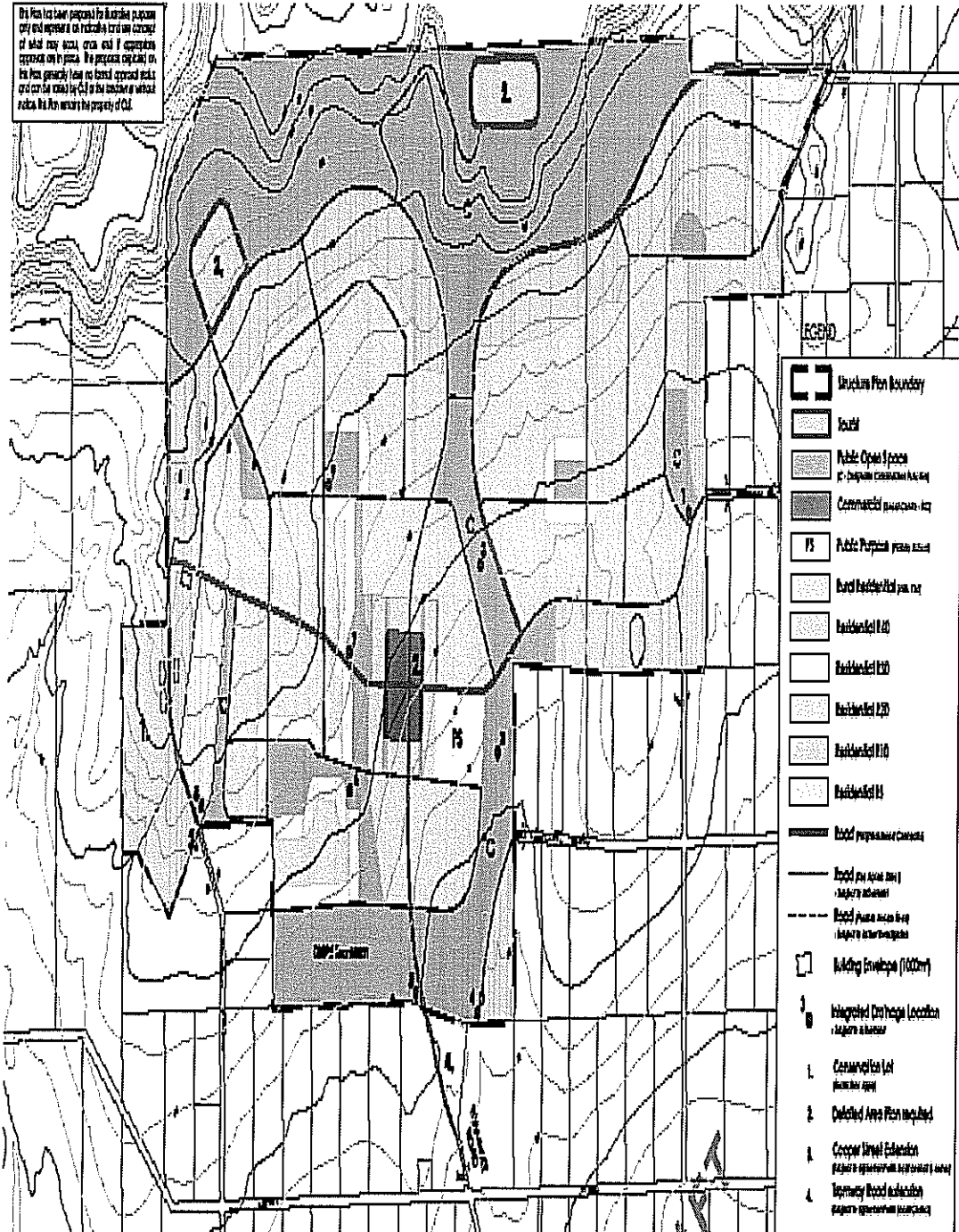
Scott, C. R., 1980. Soil Mechanics and Foundations. Applied Science Publishers Ltd.

Appendix A : Figure 1 : Subdivision structure plan.

www.cleplan.com.au



This Plan has been prepared for illustrative purposes only and represents a conceptual framework of what may occur, over and above the proposed development in this area. The proposed development on this Plan generally has no formal approval and can only be used by CLE or the Council or without notice to the owners of the property of CLE.



LEGEND

	Structure Plan Boundary
	Local
	Public Open Space or Community Recreation Area
	Commercial (medium density)
	Public Purpose (medium density)
	Local Residential (medium density)
	Residential R10
	Residential R20
	Residential R30
	Residential R40
	Residential R5
	Flood propagation channels
	Flood (see also map) (major flood channel)
	Flood (see also map) (minor flood channel)
	Building Envelope (1000m ²)
	Integrated Drainage Location (where a house)
	Commercial Lot (medium density)
	Deeded Area Plan required
	Cooper Street Extension (subject to agreement with adjacent landowner)
	Temporary Flood Collection (subject to agreement with adjacent landowner)

2118-P04-01 (16.08.2012).rd

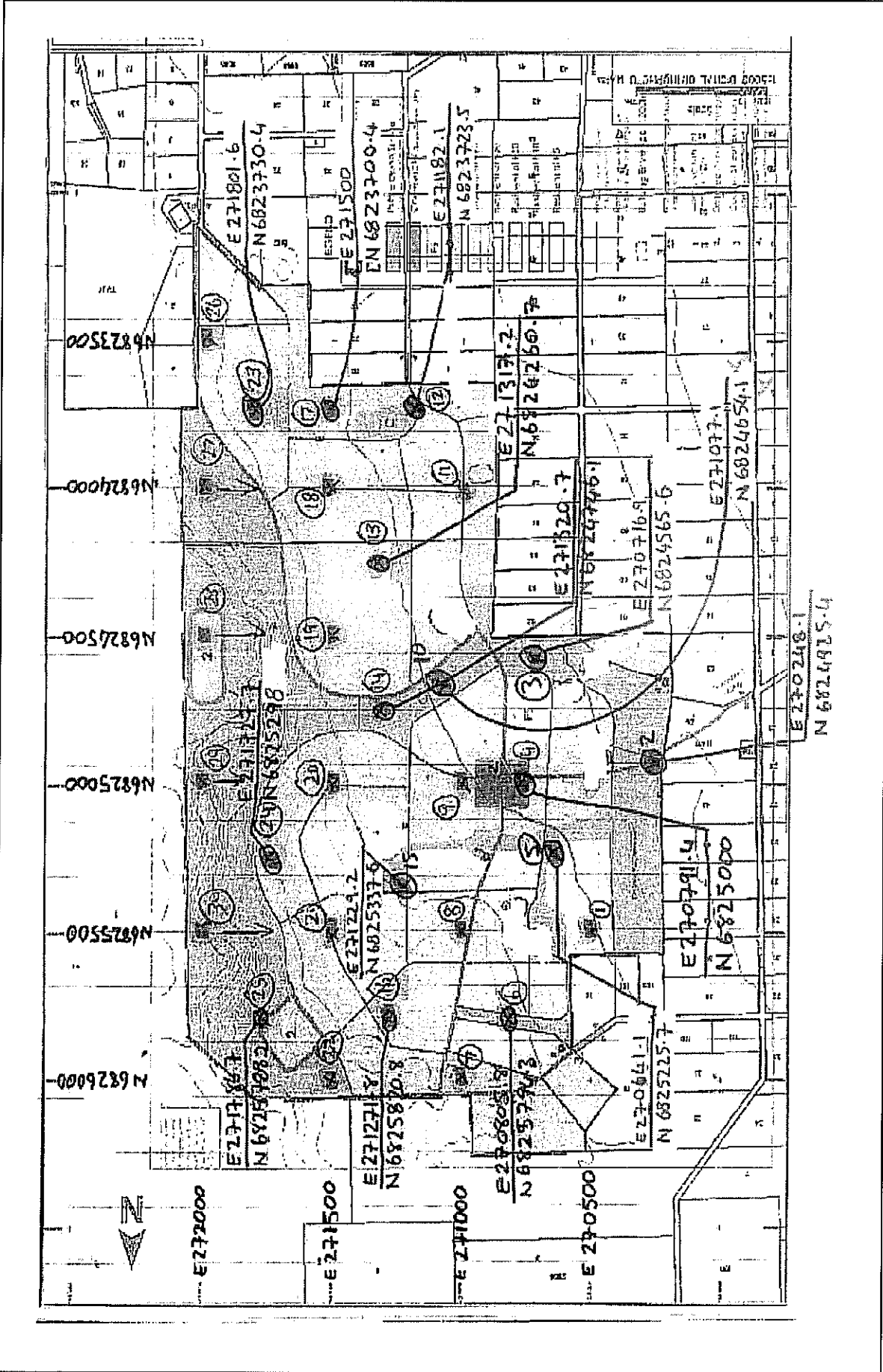


DRAFT

DRAFT LOCAL STRUCTURE PLAN

Moreley Heights, Geelong

Appendix B : Figure 2 : Subdivision plan indicating test locations & test location coordinates.



Appendix B : Photographs

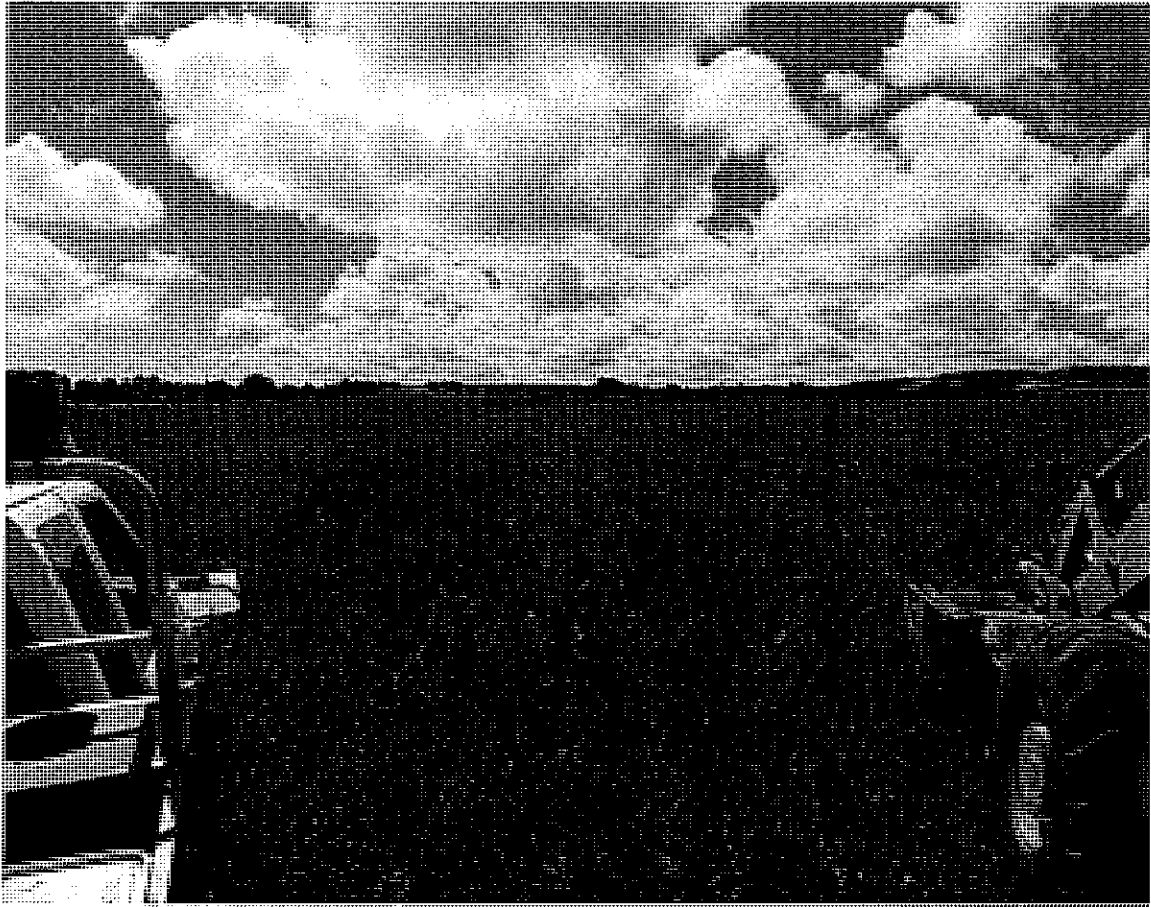


Figure 1 : Photograph of site looking north from site 10.



Figure 2 : Photograph of site looking east to the Moresby ranges.



Figure 3 : Photograph of site looking east to Moresby ranges.



Figure 4 : Photograph of site looking west from site 21.



Figure 5 : Photograph of rocks on surface near site 16.

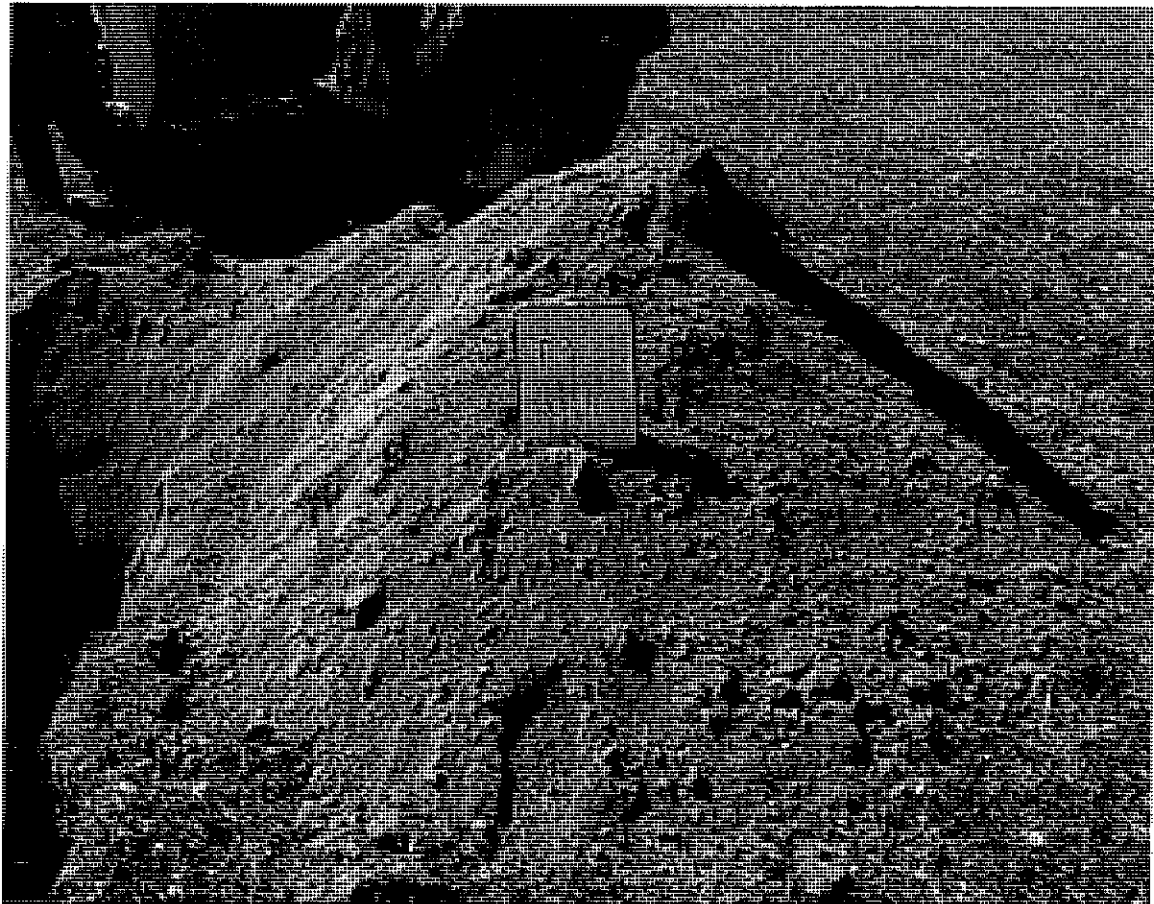


Figure 6 : Photograph of test site 1 excavation.



Figure 7 : Photograph of material excavated from test site 1.



Figure 8 : Photograph of test site 10 excavation.



Figure 9 : Photograph of material excavated from test site 10.



Figure 10 : Photograph of test site 20 excavation.

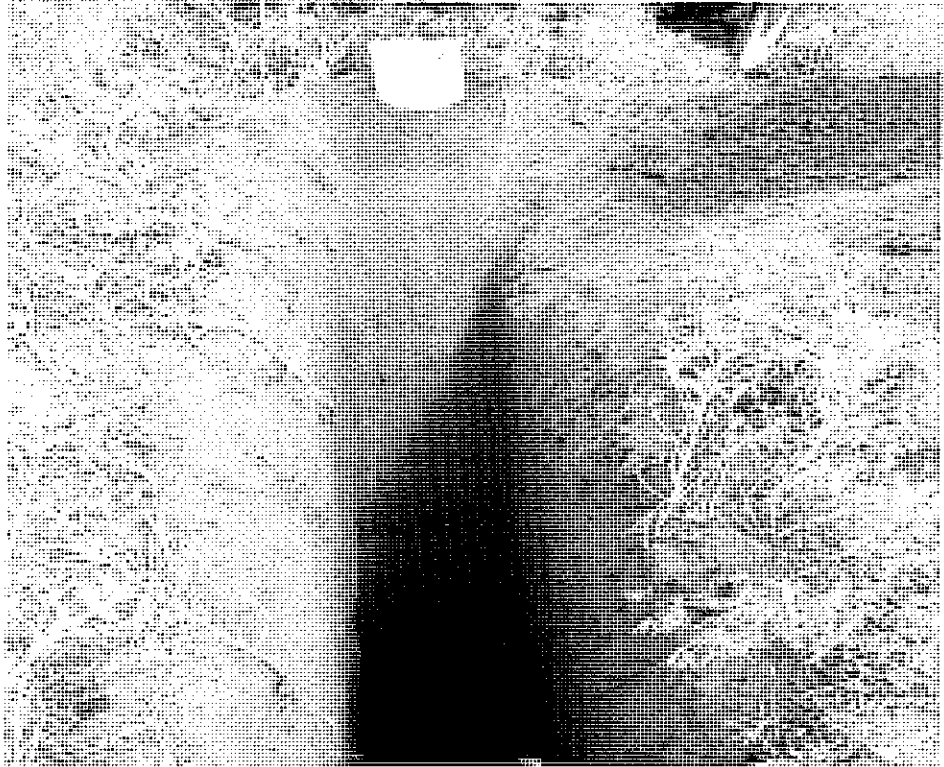


Figure 11 : Photograph of material excavated from test site 20.



Figure 12 : Photograph of test site 30 excavation.



Figure 13 : Photograph of material excavated from test site 30.

Appendix C : Excavation Logs

BCE

TEST PIT LOG

TP 01

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 1	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 270500E / 6825500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Moist	SP-SM	B	Top 200mm of soil contains rootlets. Sample taken at 0.5m depth. Sample No. 12BME9473. Tests for PSD, PI, MMDD, MC & CBR completed. Penetrometer testing from ground level indicates sand is very loose GL(4,4,4). Material lightly cemented when excavated.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 02

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 2	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 270248E / 6824925N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.3m: Clayey Gravelly SAND: Brown, laterite gravel and sand. Slightly plastic.	Dry	SC	B	Too gravelly for penetrometer testing. Sample taken at 0.8m depth. Sample No. 12BME9474. Tests for PSD, PI & MC completed.
	1.0	L	0.8m: Silty Clayey SAND: Brown, orange , red Slightly plastic.	Dry	SC	NS	Dry and cemented when excavated but material crumbles under finger pressure. Material looks like laterite particles but very soft. Acid sulfate testing completed at this site.
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 03

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 3
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 270716E / 6824565N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description	Moisture Condition	USC Symbol	Sample	Field Records/Comments
			type, colour, particle size, plasticity, minor components				in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Orange, quartz sand ls medium, non- plastic.	Dry	SM	B	Top 200mm of soil contains rootlets. Penetrometer testing from -300mm below ground level -300mm (7,10,7). Sample taken at 0.3m depth. Sample No. 12BME9475. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	0.5	L	0.6m: Silty Clayey SAND: Brown, orange , red Plastic. Contains slight gravel fraction.	Moist	SC	B	Lightly cemented when excavated. Sample taken at 2.5m depth. Sample No. 12BME9476. Tests for PSD & PI completed.
	1.0						
	1.5						
	2.0						
	2.5						
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 04

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 4
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 270791E / 6825000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Moist	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from ground level indicates sand is reasonably compact GL(6,9,9). Material lightly cemented when excavated.
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 05

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 5	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 270641E / 6825225N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Moist	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from ground level indicates sand is very loose GL(4,5,5). Material lightly cemented when excavated.
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 06

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 6
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 270805E / 6825794N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0		0.0m: Silty SAND: Yellow, sand is medium, non-plastic.	Dry	SM	NS	Top 200mm of soil contains rootlets. Sample taken at 0.5m depth. Sample No. 12BME9477. Tests for PSD, PI, MC, Organic & CaCO3 completed. Penetrometer testing from 300mm below ground level indicates sand is reasonably compact GL(10,10,10). Material lightly cemented when excavated.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 07

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED: 24/09/2012	
SITE: Test Pit 7	DATE COMPLETED: 24/09/2012	
LOCATION: Refer to test pit locality plan	LOGGED BY: L Smith	

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 0.6m	GDA Coordinate: 271183E / 6825935N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Light brown, sand is medium, non- plastic. Contains sandstone and quartz cobble to 200mm dia.	Dry	SM	NS	Top 200mm of soil contains rootlets.
	0.6	VD	0.6m: Moderately weathered, dark red and brown siliciclastic sedimentary rock. Test Pit Terminated at 600mm depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 8

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 8
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271000E / 6825500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description	Moisture Condition	USC Symbol	Sample	Field Records/Comments
			type, colour, particle size, plasticity, minor components				In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non-plastic.	Moist	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level indicates sand is quite loose GL(5,5,5).
	0.5						
	1.0						
	1.5						Material lightly cemented when excavated.
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 09

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 9	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271000E / 6825000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	B	Top 200mm of soil contains rootlets. Sample taken at 0.5m depth. Sample No. 12BME9478. Tests for PSD, PI, MC, Organic & CaCO3 completed. Penetrometer testing from ground level indicates sand is reasonably compact GL(13,13,13). Material lightly cemented when excavated.
	1.5			Moist			Material appears to have slightly higher moisture content from 1.5m depth.

			Test Pit Terminated at 3000mm depth.				
--	--	--	--------------------------------------	--	--	--	--

Produced By: L Smith
 Checked By: R Fawcett

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 10	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271077E / 6824654N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, sand is medium, non- plastic.	Dry	SM	NS	Top 200mm of soil contains rootlets.
	1.5	L	1.5m: Silty Clayey SAND: Red / brown, sand is medium, slightly plastic.	Moist	SC	NS	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth.
	3.0		Test Pit Terminated at 3000mm depth.				

BCE

TEST PIT LOG

TP 11

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 11
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe

RL: Natural Ground Surface

Excavation Depth: 3m

GDA Coordinate: 271000E / 682400N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand ls medium, non-plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.3m: Gravelly Silty SAND: Brown, orange, Non-plastic. Contains considerable laterite gravel fraction.	Dry	SP-SM	B	Sample taken at 0.5m depth. Sample No. 12BME9479. Tests for PSD & PI completed. Too rocky for Penetrometer testing.
	1.0	L	0.7m: Silty Clayey SAND: Brown, orange, red Plastic. Contains slight gravel fraction.	Moist	SC	NS	Cemented and difficult to excavate. Material cemented when excavated.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 12

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 12	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271182E / 6823723N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.4m: Silty SAND: Light grey, lightly cemented like a weathered sandstone but excavatable.	Dry	SM	NS	Too rocky for Penetrometer testing.
	1.0	L	0.7m: Silty Clayey SAND: Yellow, orange Moderately plastic. Contains slight gravel fraction.	Dry	SC	B	Cemented and difficult to excavate. Material cemented when excavated. Sample taken at 1.2m depth. Sample No. 12BME9480. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	2.0		Test Pit Terminated at 2000mm depth. Clay too hard.				
	2.5						
	3.0						

Produced By: L Smith
Checked By: R Fawcett

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 13	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271317E / 6824260N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Brown / orange, sand is medium, non- plastic.	Dry	SP-SM	B	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(14,14,14). Sample taken at 0.5m depth. Sample No. 12BME9481. Tests for MC, MMDD & CBR completed. Material lightly cemented when excavated.
	1.5	L	1.5m: Silty Clayey SAND: Brown / orange, sand is medium, slightly plastic.	Moist	SC	NS	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth. Material lightly cemented when excavated.
	3.0		Test Pit Terminated at 3000mm depth.				

BCE

TEST PIT LOG

TP 14

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 14	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271320E / 6824746N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, sand is medium, non- plastic.	Dry	SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL (10,10,10). Material lightly cemented when excavated.
	1.5	L	1.5m: Silty Clayey SAND: Red / brown, sand is medium, slightly plastic.	Moist	SC	B	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth. Sample taken at 2.0m depth. Sample No. 12BME9482. Tests for PSD & PI completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 15

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 15	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271229E / 6825337N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments In situ testing, additional observations
---------------------	-----------	------------------------------------	---	--------------------	------------	--------	--

Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / orange, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(9,12,12). Material lightly cemented when excavated.
---	---	---	---	-----	-------	----	--

Groundwater not encountered Natural ground	1.5	L	1.5m: Silty Clayey SAND:Red / Brown, sand is medium, slightly plastic.	Moist	SC	B	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth. Material lightly cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9483. Tests for PSD, PI, MC, Organic & CaCO3 completed.
---	-----	---	--	-------	----	---	---

Groundwater not encountered Natural ground	3.0		Test Pit Terminated at 3000mm depth.				
---	-----	--	--------------------------------------	--	--	--	--

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 16

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 16	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 1.1m	GDA Coordinate: 271271E / 6825820N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty Gravelly SAND : Brown, sand is medium, non- plastic. Contains laterite and quartz gravel to 30mm dia.	Dry	SM	NS	Top 200mm of soil contains rootlets. Surface rock outcrops nearby.
	0.5	L	0.5m: Silty Clayey SAND: Red / grey / brown, sand is medium, medium plasticity.	Moist	SC	B	Cemented when excavated. Difficult to excavate. Sample taken at 0.5m depth. Sample No. 12BME9484. Tests for MMDD, MC & CBR completed.
	1.1	VD	1.1m: Moderately weathered, dark red and brown siliciclastic sedimentary rock. Test Pit Terminated at 1.1m depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 17

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 17	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6823700N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Orange / Brown, sand is medium, non- plastic.	Moist	SM	B	Top 200mm of soil contains rootlets. Penetrometer testing from 300mm below ground level -300mm(11,11,11). Sample taken at 0.5m depth. Sample No. 12BME9485. Tests for PSD & PI completed. Acid sulfate testing completed. Material lightly cemented when excavated. Material appears to have slightly higher moisture content from 1.5m depth.
	0.5						
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 18

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 18	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6824000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Orange, quartz sand is medium, slightly plastic.	Dry	SC	B	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from 300mm below ground level -300mm (5,4,3) indicates sand is quite loose. Sample taken at 0.5m depth. Sample No. 12BME9486. Tests for PSD, PI, MC, Organic & CaCO3 completed. Material lightly cemented when excavated.
	1.0						Material appears to have slightly higher moisture content from 1.0m depth.
	1.5						
	2.0						
	2.5						
	3.0						

			Test Pit Terminated at 3000mm depth.				
--	--	--	--------------------------------------	--	--	--	--

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 19

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 19
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271500E / 6824500N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
									In situ testing, additional observations
Groundwater not encountered	Natural ground	0		L	0.0m: Silty SAND: Brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
		1.0		L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Moist	CL	B	Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9487. Tests for PSD & PI completed. Acid sulfate testing completed.
		3.0			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 20

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 20	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6825000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red, brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	B	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(20,20, ref). Sample taken at 0.5m depth. Sample No. 12BME9488. Tests for MMDD, MC & CBR completed.
	1.0	L	1.0m: Silty Clayey SAND: Red, brown. Plastic. Contains slight gravel fraction.	Moist	SC	NS	Material lightly cemented when excavated. Material appears to get more clayey with depth.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 21

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 21	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6825500N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
									in situ testing, additional observations
Groundwater not encountered	Natural ground	0	L		0.0m: Silty SAND: Red, brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(8,7,7) indicates quite loose.
		1.0	L		1.0m: Silty Clayey SAND: Red, brown. Moderately plastic. Contains slight gravel fraction.	Moist	SC	B	Material lightly cemented when excavated. Material appears to get more clayey with depth. Sample taken at 2.0m depth. Sample No. 12BME9489. Tests for PSD, PI, MC, CaCO3 & Organic Content completed.
		3.0			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 22

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 22	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 682600N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description	Moisture Condition	USC Symbol	Sample	Field Records/Comments
Groundwater not encountered	Natural ground	0		L	0.0m: Silty SAND: Red, sand is medium, non-plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
		1.0		L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Dry	SC	B	Material difficult to excavate. Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9490. Tests for PSD & PI completed. Acid sulfate testing completed.
		3.0			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 23

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 23	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271801E / 6823730N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, quartz sand is medium, slightly plastic. Contains fine rounded quartz particles.	Dry	SM	NS	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from 300mm below ground level -300mm (6,5,5) indicates sand is quite loose.
	1.0						
	1.5						Material appears to have slightly higher moisture content from 1.0m depth.
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 24

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 24	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271727E / 6825298N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Material lightly cemented when excavated.
	0.7	L	0.7m: Silty Clayey SAND: Red / brown. Moderately plastic. Contains slight gravel fraction.	Moist	SC	B	Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9491. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 25

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
PROJECT: Moresby Heights Subdivision
SITE: Test Pit 25
LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
DATE COMMENCED: 24/09/2012
DATE COMPLETED: 24/09/2012
LOGGED BY: L Smith

Machine: Backhoe
Excavation Depth: 3m

RL: Natural Ground Surface
GDA Coordinate: 271786E / 6825788N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered	0	L	0.0m: Silty Clayey SAND: Red / brown, sand is medium, moderately plastic. Rounded quartz particles. Contains slight gravel fraction.	Dry	SC	B	Top 200mm of soil contains rootlets. Material cemented when excavated. Penetrometer testing from ground level (16,16,ref). Material difficult to excavate. Sample taken at 1.5m depth. Sample No. 12BME9492. Tests for PSD & PI completed.
Natural ground	0.5						
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 26

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 26	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 272000E / 6823500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty Clayey SAND: Red / brown, sand is medium, moderately plastic. Rounded quartz particles. Contains slight gravel fraction.	Dry	SC	NS	Top 200mm of soil contains rootlets. Material cemented when excavated. Penetrometer testing from ground level GL(10,10,10). Material appears to have slightly higher moisture content from 1.0m depth.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 27

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 27	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271631E / 6824042N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Orange / brown, quartz sand is medium, non-plastic. Contains fine rounded quartz particles.	Dry	SM	B	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from ground level GL(5,4,10) indicates sand is quite loose.
	1.0						Sample taken at 0.5m depth. Sample No. 12BME9493. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	1.5						Material lightly cemented when excavated.
	2.0						Material appears to have slightly higher moisture content from 1.0m depth.
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 28

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 28	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271229E / 6825337N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(12,10,10).
	0.5	L	0.4m: Silty Clayey SAND: Red / Brown, sand is medium, moderately plastic.	Moist	SC	B	Material lightly cemented when excavated. Material appears to get more clayey with depth. Sample taken at 2.0m depth. Sample No. 12BME9494. Tests for PSD & PI completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE 226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED: 24/09/2012
SITE: Test Pit 29	DATE COMPLETED: 24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY: L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 1.5m	GDA Coordinate: 271821E / 6825004N

	Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description	Moisture Condition	USC Symbol	Sample	Field Records/Comments	
Groundwater not encountered		Natural ground	0		L	0.0m: Silty Gravelly SAND : Brown, sand is medium, non- plastic. Contains laterite and quartz gravel to 30mm dia.	Dry	SM	NS	Top 200mm of soil contains rootlets.	
			0.5								
			1.0		L	0.9m: Silty Clayey SAND: Red / brown, sand is medium, medium plasticity.	Dry	SC	NS	Cemented when excavated. Difficult to excavate.	
			1.5		VD	1.5m: Moderately weathered, dark red and blue siliciclastic sedimentary rock. Test Pit Terminated at 1.5m depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.	
			2.0								
			2.5								
			3.0								

BCE

TEST PIT LOG

TP 30

Sheet 1 of 1

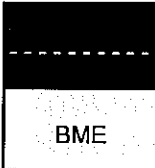
CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE 226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED: 24/09/2012
SITE: Test Pit 30	DATE COMPLETED: 24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY: L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 0.9m	GDA Coordinate: 271765E / 6825527N

	Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description	Moisture Condition	USC Symbol	Sample	Field Records/Comments
						type, colour, particle size, plasticity, minor components				in situ testing, additional observations
Groundwater not encountered		Natural ground	0		L	0.0m: Silty Gravelly Clayey SAND : Brown, sand is medium, moderately plastic. Contains laterite and quartz gravel to 30mm dia.	Dry	SM	B	Top 200mm of soil contains rootlets. Sample taken at 0.8m depth. Sample No. 12BME9495. Tests for PSD, PI, MC & CaCO3 completed.
			0.5							
			1.0		VD	0.9m: Moderately weathered, dark red and brown siliciclastic sedimentary rock. Test Pit Terminated at 0.9m depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.
			1.5							
			2.0							
			2.5							
			3.0							

Produced By: L Smith
Checked By: R Fawcett

Appendix D : Test Certificate Results
Moisture Content (MC), Particle Size
Distribution (PSD), Consistency Limits
(PI), Organic, Calcium Carbonate,
Maximum Dry Density (MDD / OMC), and
Soaked Californian Bearing Ratio (CBR).



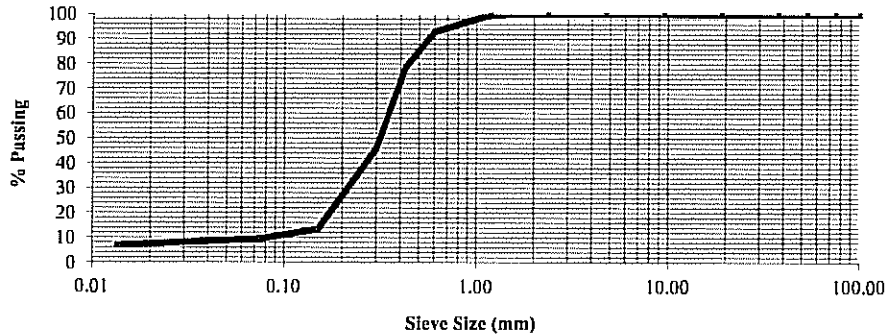
BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 1
LOCATION: Depth: 0.5m
DESCRIPTION: Yellow Sand with Silt
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9473
SAMPLE No.: 12BME9473
DATE SAMPLED 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No: Not Supplied
CLIENT ORDER No: Not Supplied
TEST REQUEST No: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	100
0.600	93
0.425	79
0.300	46
0.150	13
0.075	9
0.0135	7

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	18.5	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SP-SM

Field Moisture Content

In accordance with WA 110.1
2.4%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
7 % retained on 0.600mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



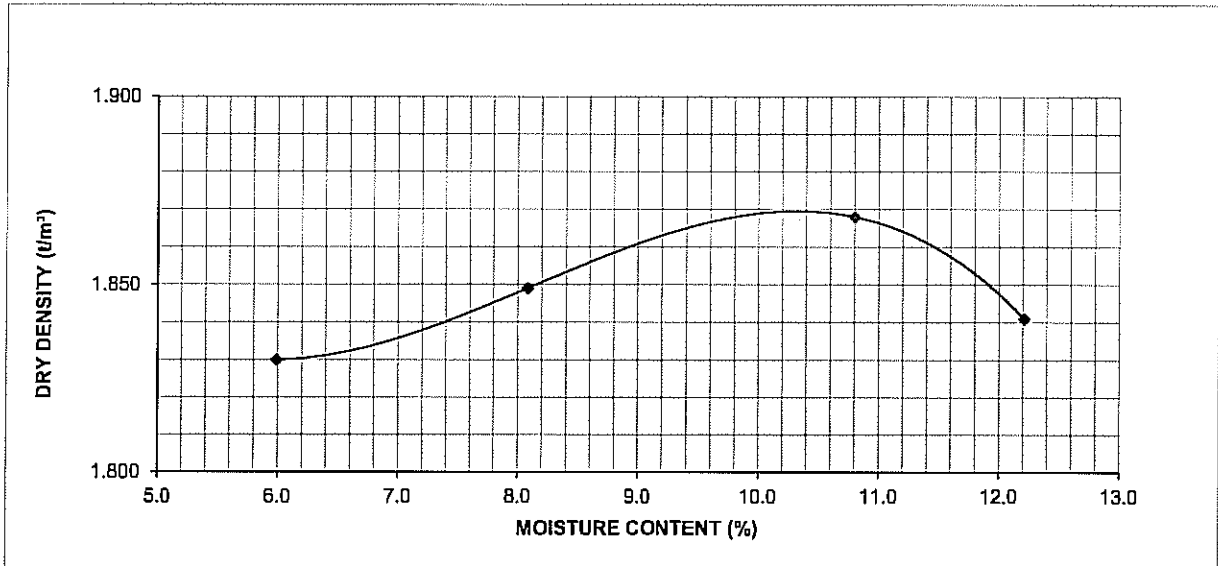
This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9473
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9473
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 1	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Yellow Sand with Silt	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method WA 133.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.869
OPTIMUM MOISTURE CONTENT (%) = 10.3

Note:
 Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 0 % retained on 19.0mm sieve.

Approved Signatory :  (R Fawcett) Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 3 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9473
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9473
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 1	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Yellow Sand with Silt	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method WA 141.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	2.7
Drop Height (mm):	300
No. of layers:	5
No. of blows / layer:	< 9
MOISTURE CONTENT : (%/OMC)	
At compaction:	10.2 / 99.0
After Penetration	
Top 30mm:	12.1 / 117.5
Entire Depth:	13.1 / 127.5
DRY DENSITY (t/m^3/%MDD)	
At compaction:	1.78 / 95.5
After soaking:	1.78 / 95.5
SURCHARGE (kg):	4.5
CONDITION OF SPECIMEN:	Soaked 4 days
SWELL (%):	0.0
MDD DATA (WA133.1)	
MAXIMUM DRY DENSITY (t/m^3):	1.869
OPTIMUM MOISTURE CONTENT (%):	10.3
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	20
At 5.0mm penetration:	

Note:

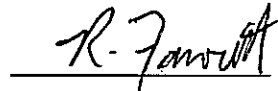
Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

0 % retained on 19.0mm sieve and excluded from test.

Non standard test. Less than 9 blows with the 2.7kg hammer. Tested at clients request.

Approved Signatory :



(R Fawcett)

Date :

3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

Form No. R-WA-06-03

BLACKTOP MATERIALS ENGINEERING

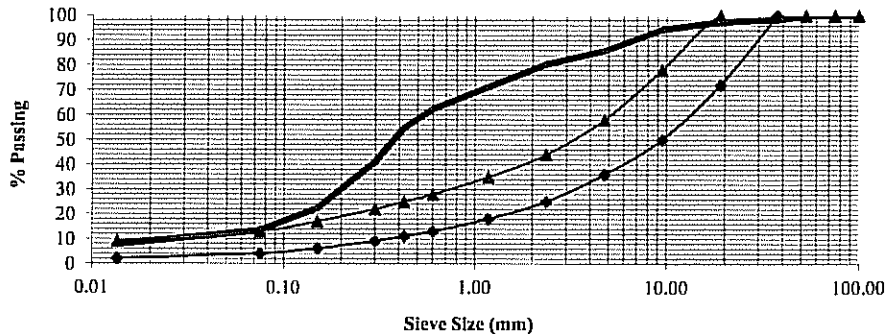
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9474
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9474
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 2	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.8m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Gravelly Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Material Suitability	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	98
19.0	97
9.5	94
4.75	86
2.36	80
1.18	71
0.600	62
0.425	55
0.300	41
0.150	22
0.075	13
0.0135	8

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit	29.8	%
(*120.2)		
Plastic Limit	19.4	%
(*121.1)		
Plasticity Index	10.4	%
(*122.1)		
Linear Shrinkage	4.4	%
(*123.1)		

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SC

Field Moisture Content

In accordance with WA 110.1
8.6%

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 Upper and lower grading curve guides provided as per MRWA Pavement Specification 501 (Table 501.08) for basecourse.
 No cracking, crumbling or curling with shrinkage.
 2 % retained on 37.5mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

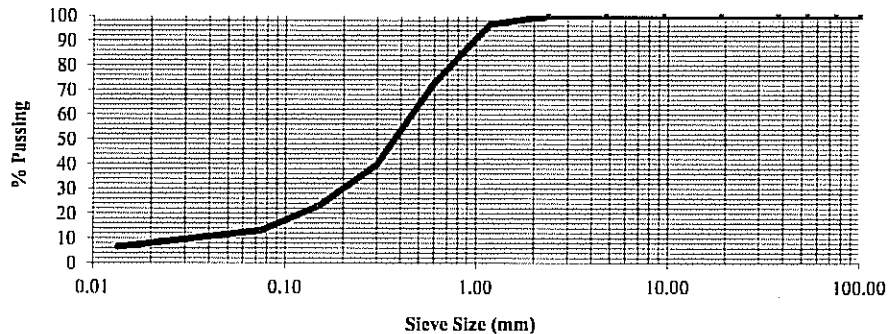
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9475
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9475
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 3	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.3m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	97
0.600	73
0.425	56
0.300	40
0.150	23
0.075	13
0.0135	6

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	18.2	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SM

Calcium Carbonate Content

In accordance with WA 915.1
4.7%

Field Moisture Content

In accordance with WA 110.1
2.4%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
3 % retained on 1.18mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

WORLD RECOGNISED
ACCREDITATION

BLACKTOP MATERIALS ENGINEERING

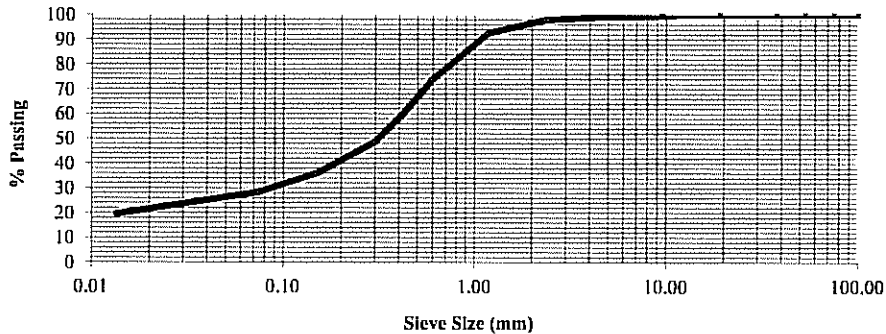
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9476
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9476
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 3	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 2.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	98
1.18	93
0.600	74
0.425	60
0.300	49
0.150	36
0.075	28
0.0135	20

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	23.9	%
Plastic Limit (*121.1)	11.7	%
Plasticity Index (*122.1)	12.2	%
Linear Shrinkage (*123.1)	6.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

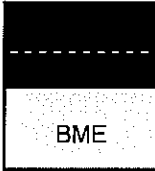
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



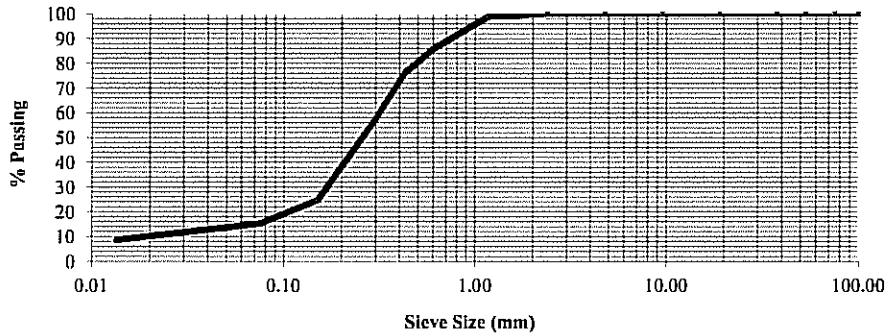
BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 6
LOCATION: Depth: 0.5m
DESCRIPTION: Silty Yellow Sand
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9477
SAMPLE No.: 12BME9477
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	99
0.600	86
0.425	76
0.300	57
0.150	25
0.075	15
0.0135	9

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	18.6	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SM

Calcium Carbonate Content

In accordance with WA 915.1
3.6%

Field Moisture Content

In accordance with WA 110.1
3.2%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 1.18mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

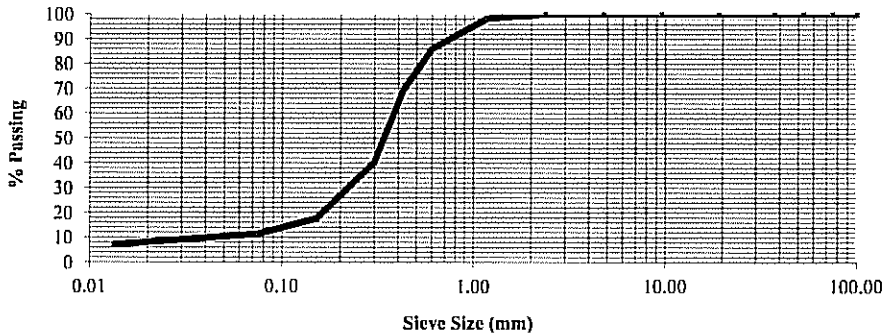
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 9
LOCATION: Depth: 0.5m
DESCRIPTION: Yellow Sand with Silt
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9478
SAMPLE No.: 12BME9478
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	98
0.600	86
0.425	69
0.300	40
0.150	17
0.075	11
0.0135	7

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	16.5	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2

SW-SM

Calcium Carbonate Content

In accordance with WA 915.1

2.8%

Field Moisture Content

In accordance with WA 110.1

2.2%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
2 % retained on 1.18mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

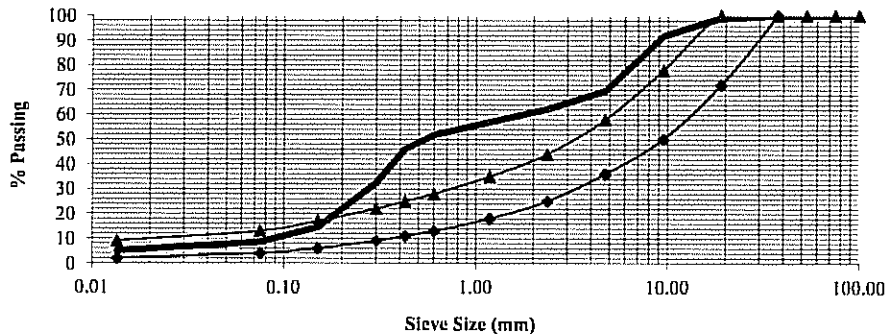
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au



TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9479
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9479
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED:	24/09/2012
LOCATION:	Test Pit 11	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Material Suitability	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	99
9.5	92
4.75	70
2.36	62
1.18	57
0.600	52
0.425	46
0.300	32
0.150	15
0.075	9
0.0135	5

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	20.8	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.8	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SP-SM

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 Upper and lower grading curve guides provided as per MRWA Pavement Specification 501 (Table 501.08) for basecourse.
 No cracking, crumbling or curling with shrinkage.
 1 % retained on 19.0mm sieve.

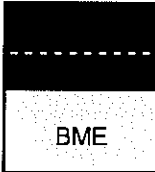
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

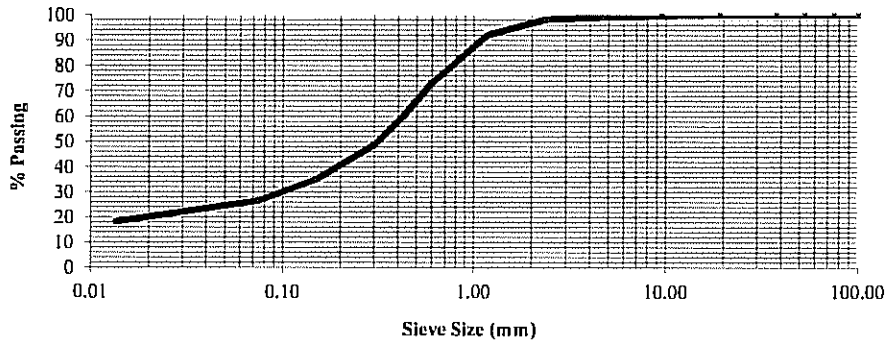


BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9480
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9480
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 12	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 1.2m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	98
1.18	92
0.600	73
0.425	60
0.300	49
0.150	35
0.075	27
0.0135	18

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	34.0	%
Plastic Limit (*121.1)	12.8	%
Plasticity Index (*122.1)	21.2	%
Linear Shrinkage (*123.1)	8.4	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

in accordance with WA 915.1
3.8%

Field Moisture Content

In accordance with WA 110.1
8.2%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

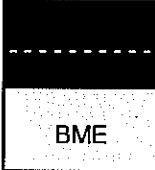
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9481
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9481
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 13	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

Field Moisture Content

in accordance with WA 110.1

2.9%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

Approved Signatory : *R. Fawcett* (R Fawcett)

Date : **3/10/2012**



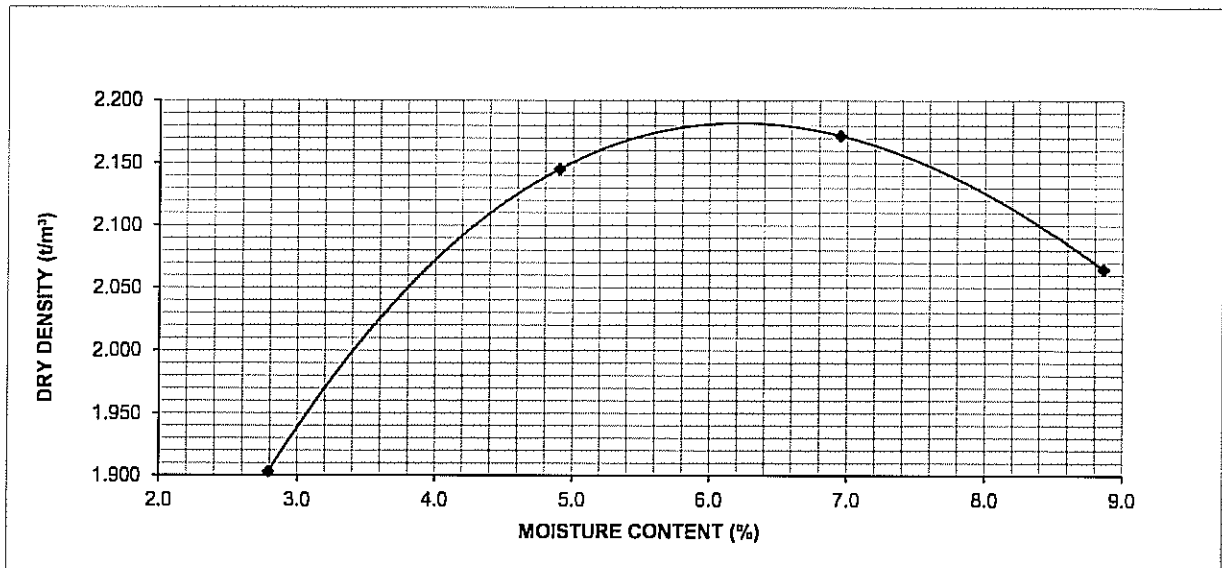
This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9481
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9481
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 13	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method WA 133.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 2.181

OPTIMUM MOISTURE CONTENT (%) = 6.3

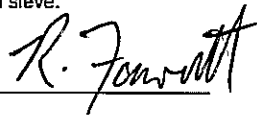
Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

0 % retained on 19.0mm sieve.

Approved Signatory :



(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 3 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9481
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9481
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 13	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method WA 141.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	2.7
Drop Height (mm):	300
No. of layers:	5
No. of blows / layer:	24
MOISTURE CONTENT : (%/OMC)	
At compaction:	6.4 / 102.0
After Penetration	
Top 30mm:	8.9 / 142.0
Entire Depth:	7.6 / 121.0
DRY DENSITY (t/m³/%MDD)	
At compaction:	2.07 / 95.0
After soaking:	2.07 / 95.0
SURCHARGE (kg):	4.5
CONDITION OF SPECIMEN:	Soaked 4 days
SWELL (%):	0.0
MDD DATA (WA133.1)	
MAXIMUM DRY DENSITY (t/m³):	2.181
OPTIMUM MOISTURE CONTENT (%):	6.3
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	35
At 5.0mm penetration:	

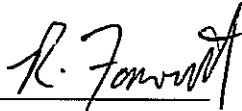
Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

0 % retained on 19.0mm sieve and excluded from test.

Approved Signatory :



(R Fawcett)

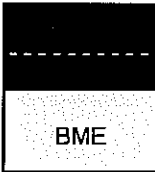
Date :

3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

Form No. R-WA-06-03



BLACKTOP MATERIALS ENGINEERING

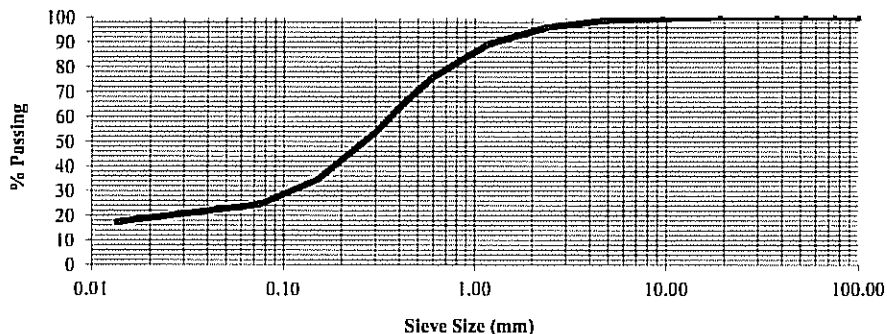
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 14
LOCATION: Depth: 2.0m
DESCRIPTION: Clayey Sand minor Gravel
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9482
SAMPLE No.: 12BME9482
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	96
1.18	89
0.600	76
0.425	66
0.300	54
0.150	35
0.075	25
0.0135	17

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	24.2	%
Plastic Limit (*121.1)	12.7	%
Plasticity Index (*122.1)	11.5	%
Linear Shrinkage (*123.1)	4.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

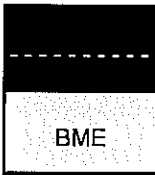
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

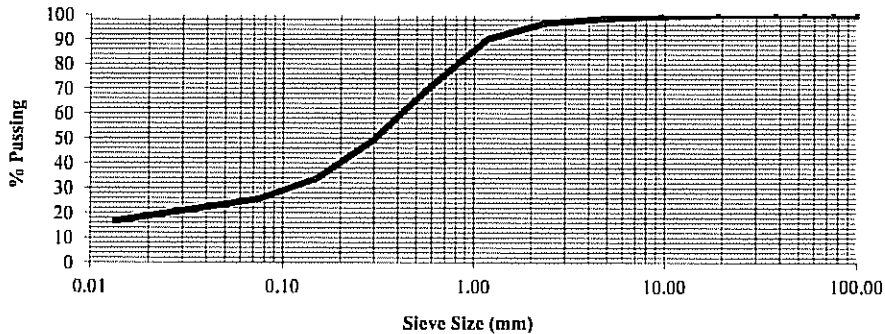
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 15
LOCATION: Depth: 2.0m
DESCRIPTION: Clayey Sand minor Gravel
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9483
SAMPLE No.: 12BME9483
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	97
1.18	90
0.600	71
0.425	61
0.300	49
0.150	34
0.075	25
0.0135	17

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	27.7	%
Plastic Limit (*121.1)	10.9	%
Plasticity Index (*122.1)	16.8	%
Linear Shrinkage (*123.1)	6.8	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

In accordance with WA 915.1
3.8%

Field Moisture Content

In accordance with WA 110.1
6.3%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

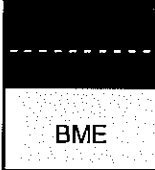
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9484
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9484
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 16	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

Field Moisture Content

in accordance with WA 110.1

7.2%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

Approved Signatory :

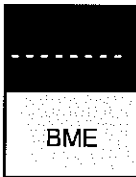
(R Fawcett)

Date : 3/10/2012



WORLD RECOGNISED
ACCREDITATION

This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531

ACN: 098 257 071 / ABN: 52 098 257 071

PHONE: (08) 9921 1878 / FAX: (08) 9965 5730

email: blacktop@westnet.com.au

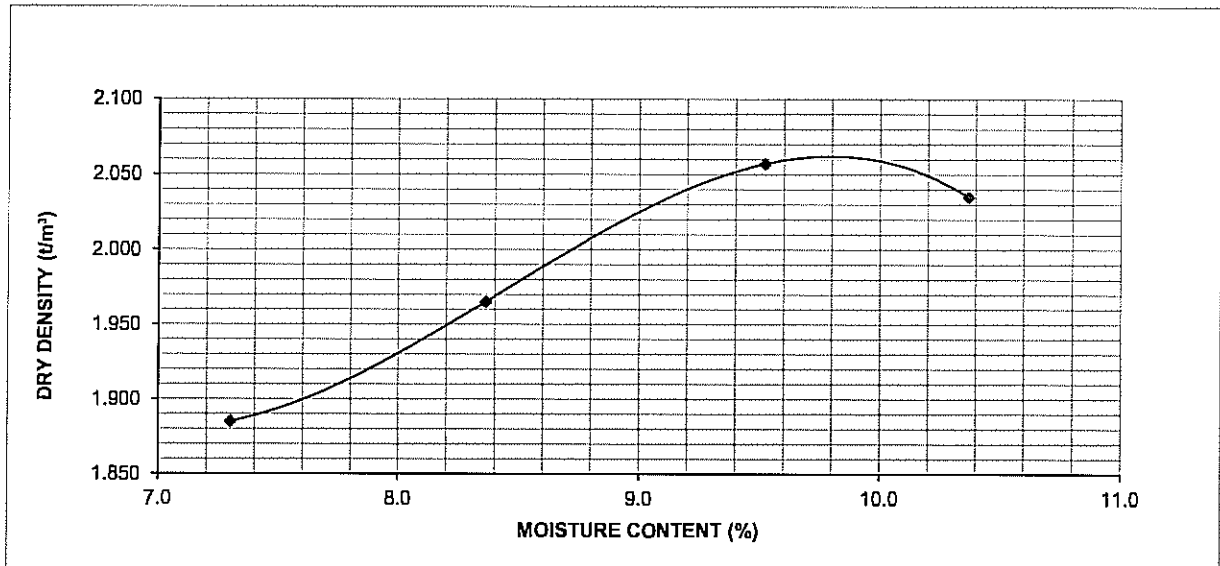
TEST CERTIFICATE

Page 2 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9484
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9484
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 16	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method WA 133.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 2.062

OPTIMUM MOISTURE CONTENT (%) = 9.8

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

1 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 3 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9484
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9484
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 16	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method WA 141.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	16
MOISTURE CONTENT : (%/OMC)	
At compaction:	10.1 / 103.5
After Penetration	
Top 30mm:	11.6 / 119.0
Entire Depth:	11.6 / 118.5
DRY DENSITY (t/m^3/%MDD)	
At compaction:	1.95 / 94.5
After soaking:	1.95 / 94.5
SURCHARGE (kg):	4.5
CONDITION OF SPECIMEN:	Soaked 4 days
SWELL (%):	0.0
MDD DATA (WA133.1)	
MAXIMUM DRY DENSITY (t/m^3):	2.062
OPTIMUM MOISTURE CONTENT (%):	9.8
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	25
At 5.0mm penetration:	

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

1 % retained on 19.0mm sieve and excluded from test.

Approved Signatory :



(R Fawcett)

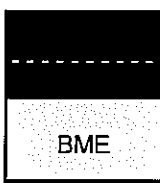
Date :

3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

Form No. R-WA-06-03



BLACKTOP MATERIALS ENGINEERING

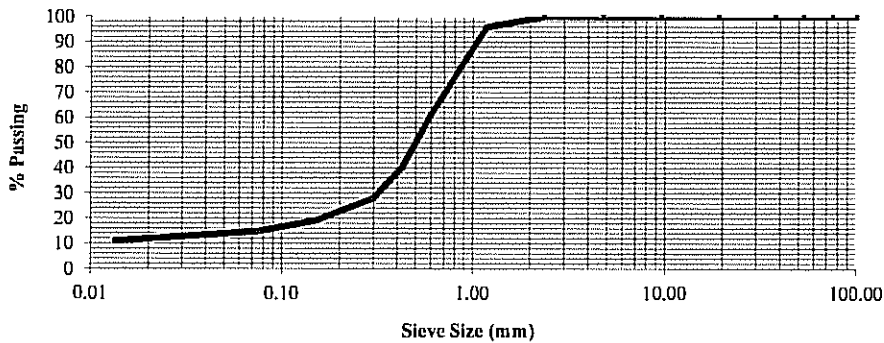
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 17
LOCATION: Depth: 0.5m
DESCRIPTION: Silty Sand
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9485
SAMPLE No.: 12BME9485
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	96
0.600	61
0.425	40
0.300	28
0.150	19
0.075	15
0.0135	11

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	17.0	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SM

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
4 % retained on 1.18mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

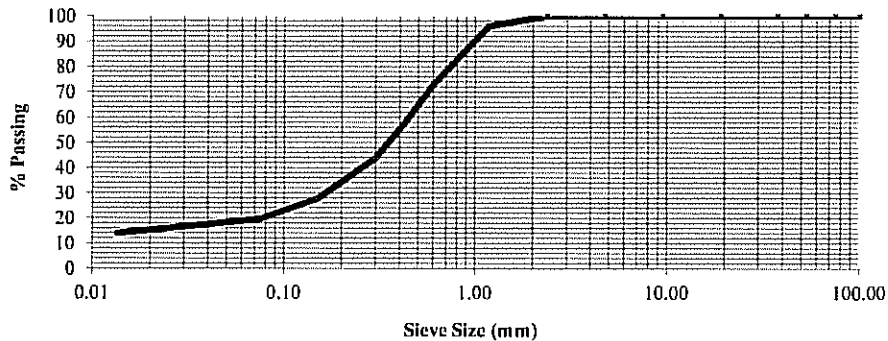
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9486
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9486
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 18	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	96
0.600	73
0.425	58
0.300	44
0.150	28
0.075	20
0.0135	14

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	21.0	%
Plastic Limit (*121.1)	13.8	%
Plasticity Index (*122.1)	7.2	%
Linear Shrinkage (*123.1)	2.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2

SC

Calcium Carbonate Content

In accordance with WA 915.1

3.3%

Field Moisture Content

In accordance with WA 110.1

3.8%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

No cracking, crumbling or curling with shrinkage.

4 % retained on 1.18mm sieve.

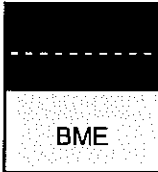
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

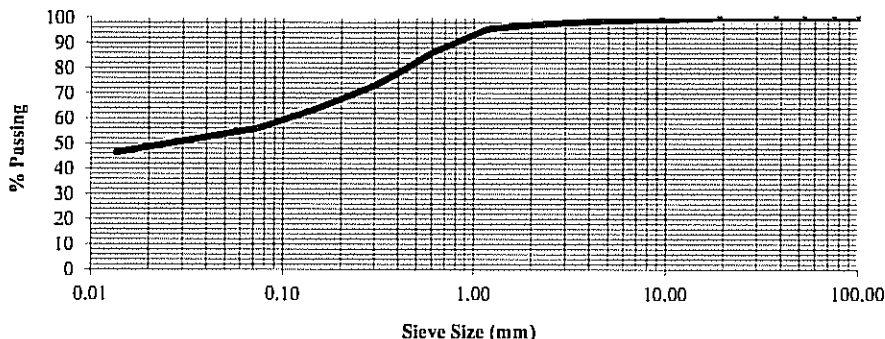
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 19
LOCATION: Depth: 2.0m
DESCRIPTION: Sandy Clay minor Gravel
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9487
SAMPLE No.: 12BME9487
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	99
4.75	99
2.36	98
1.18	96
0.600	86
0.425	79
0.300	73
0.150	64
0.075	56
0.0135	46

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	41.8	%
Plastic Limit (*121.1)	19.7	%
Plasticity Index (*122.1)	22.1	%
Linear Shrinkage (*123.1)	8.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
CL

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 9.5mm sieve.

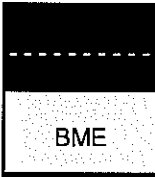
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9488
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9488
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 20	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

Field Moisture Content

in accordance with WA 110.1

2.3%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

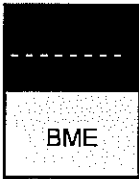
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531

ACN: 098 257 071 / ABN: 52 098 257 071

PHONE: (08) 9921 1878 / FAX: (08) 9965 5730

email: blacktop@westnet.com.au

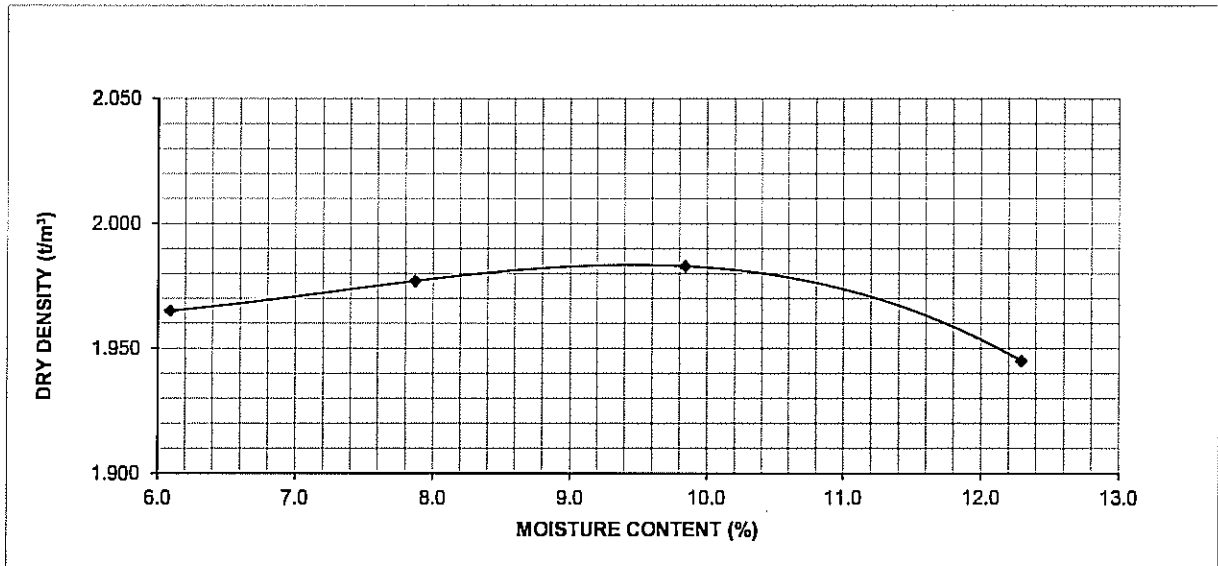
TEST CERTIFICATE

Page 2 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9488
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9488
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 20	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method WA 133.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.983

OPTIMUM MOISTURE CONTENT (%) = 9.4

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

2 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 3 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9488
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9488
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 20	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method WA 141.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	2.7
Drop Height (mm):	300
No. of layers:	5
No. of blows / layer:	< 9
MOISTURE CONTENT : (%/OMC)	
At compaction:	9.1 / 96.5
After Penetration	
Top 30mm:	11.7 / 125.0
Entire Depth:	11.1 / 118.0
DRY DENSITY (t/m³/MDD)	
At compaction:	1.89 / 95.5
After soaking:	1.89 / 95.5
SURCHARGE (kg):	4.5
CONDITION OF SPECIMEN:	Soaked 4 days
SWELL (%):	0.0
MDD DATA (WA133.1)	
MAXIMUM DRY DENSITY (t/m³):	1.983
OPTIMUM MOISTURE CONTENT (%):	9.4
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	35
At 5.0mm penetration:	

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

2 % retained on 19.0mm sieve and excluded from test.

Non standard test. Less than 9 blows with the 2.7kg hammer. Tested at clients request.

Approved Signatory :



(R Fawcett)

Date :

3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

Form No. R-WA-06-03

BLACKTOP MATERIALS ENGINEERING

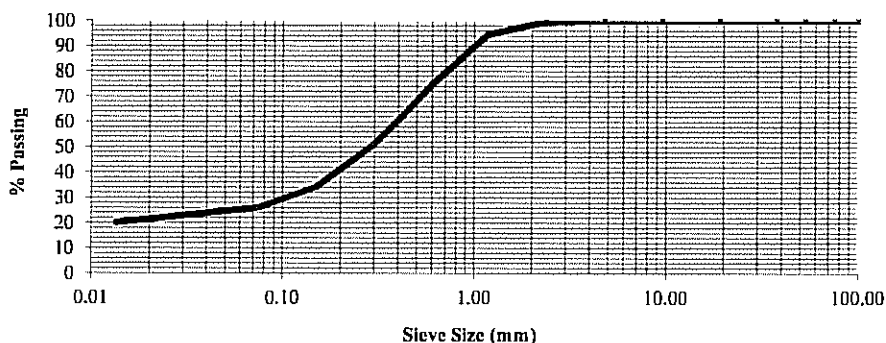
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9489
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9489
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 21	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 2.0m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	95
0.600	75
0.425	63
0.300	51
0.150	34
0.075	26
0.0135	20

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	25.0	%
Plastic Limit (*121.1)	11.8	%
Plasticity Index (*122.1)	13.2	%
Linear Shrinkage (*123.1)	6.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2

SC

Calcium Carbonate Content

In accordance with WA 915.1

3.7%

Field Moisture Content

In accordance with WA 110.1

6.8%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

No cracking, crumbling or curling with shrinkage.

5 % retained on 1.18mm sieve.

Approved Signatory :

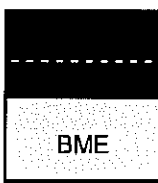
(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

WORLD RECOGNISED
ACCREDITATION



BLACKTOP MATERIALS ENGINEERING

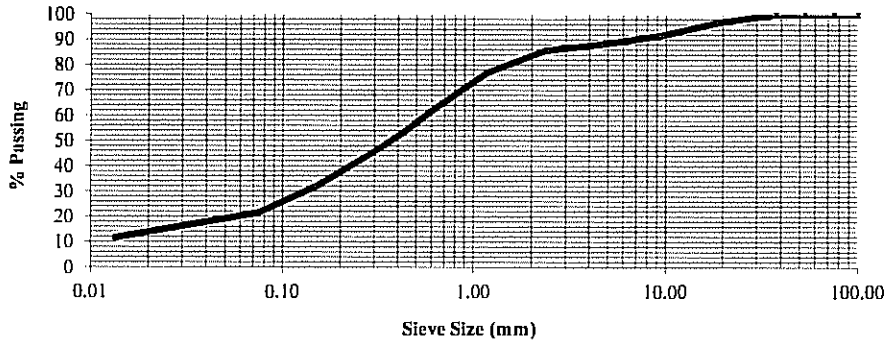
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 22
LOCATION: Depth: 2.0m
DESCRIPTION: Gravelly Clayey Sand
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9490
SAMPLE No.: 12BME9490
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	97
9.5	92
4.75	88
2.36	86
1.18	77
0.600	62
0.425	53
0.300	46
0.150	32
0.075	21
0.0135	12

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	39.1	%
Plastic Limit (*121.1)	21.5	%
Plasticity Index (*122.1)	17.6	%
Linear Shrinkage (*123.1)	7.2	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
3 % retained on 19.0mm sieve.

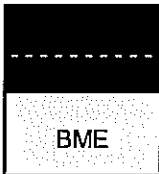
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



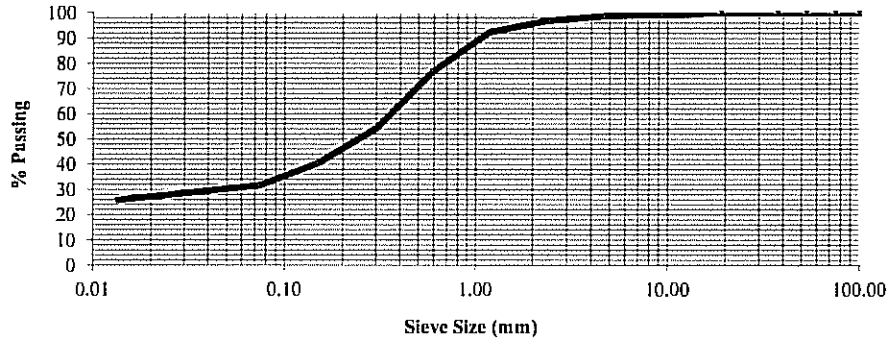
BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 24
LOCATION: Depth: 2.0m
DESCRIPTION: Clayey Sand minor Gravel
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9491
SAMPLE No.: 12BME9491
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	99
4.75	99
2.36	97
1.18	92
0.600	77
0.425	66
0.300	54
0.150	41
0.075	32
0.0135	26

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	31.0	%
Plastic Limit (*121.1)	14.4	%
Plasticity Index (*122.1)	16.6	%
Linear Shrinkage (*123.1)	5.6	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

In accordance with WA 915.1
 4.4%

Field Moisture Content

In accordance with WA 110.1
 8.3%

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 No cracking, crumbling or curling with shrinkage.
 1 % retained on 9.5mm sieve.

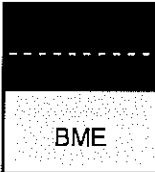
Approved Signatory : R. Fawcett

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



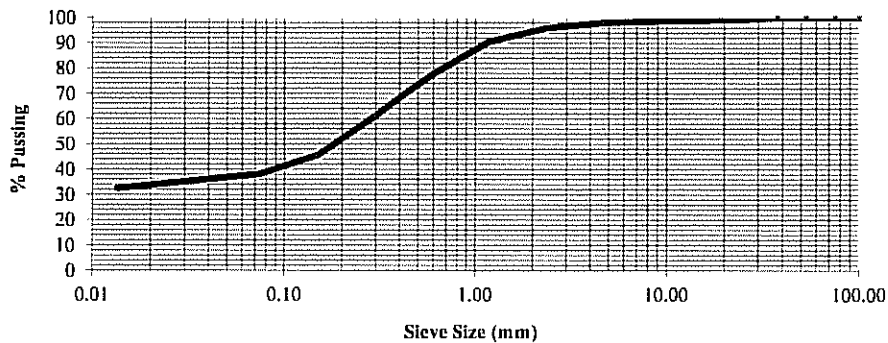
BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9492
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9492
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 25	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 1.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand with Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	99
9.5	99
4.75	98
2.36	96
1.18	91
0.600	78
0.425	70
0.300	61
0.150	46
0.075	38
0.0135	32

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	30.0	%
Plastic Limit (*121.1)	13.2	%
Plasticity Index (*122.1)	16.8	%
Linear Shrinkage (*123.1)	7.2	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

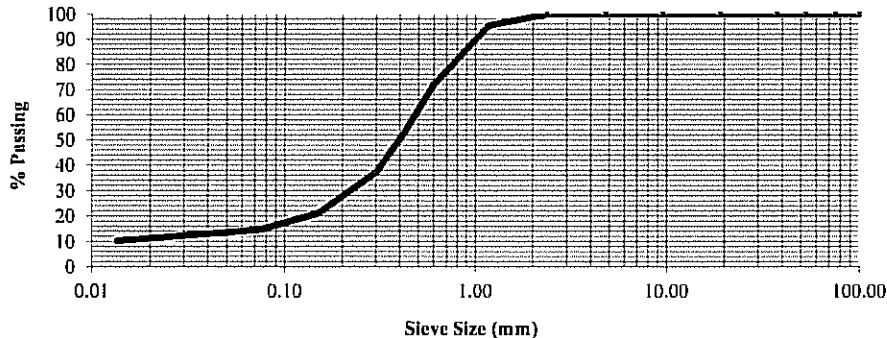
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9493
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9493
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 27	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	95
0.600	72
0.425	53
0.300	37
0.150	21
0.075	15
0.0135	10

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	18.8	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.4	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SM

Calcium Carbonate Content

In accordance with WA 915.1
3.3%

Field Moisture Content

In accordance with WA 110.1
3.0%

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 No cracking, crumbling or curling with shrinkage.
 5 % retained on 1.18mm sieve.

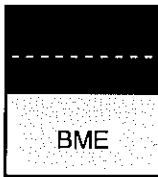
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025, Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

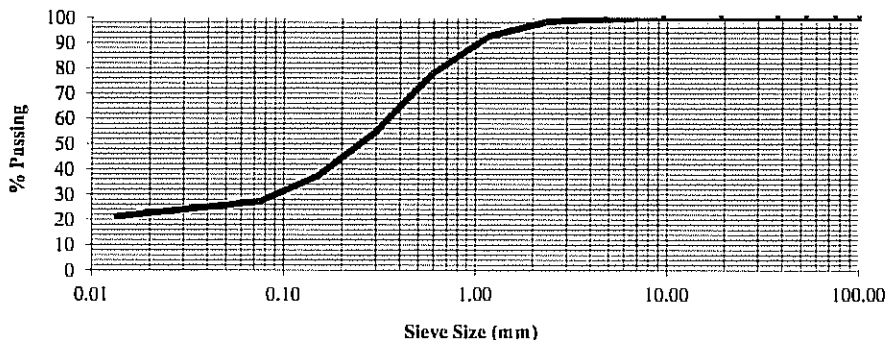
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 28
LOCATION: Depth: 2.0m
DESCRIPTION: Clayey Sand minor Gravel
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9494
SAMPLE No.: 12BME9494
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	98
1.18	93
0.600	78
0.425	67
0.300	55
0.150	37
0.075	27
0.0135	21

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	27.4	%
Plastic Limit (*121.1)	13.4	%
Plasticity Index (*122.1)	14.0	%
Linear Shrinkage (*123.1)	4.8	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
2 % retained on 2.36mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

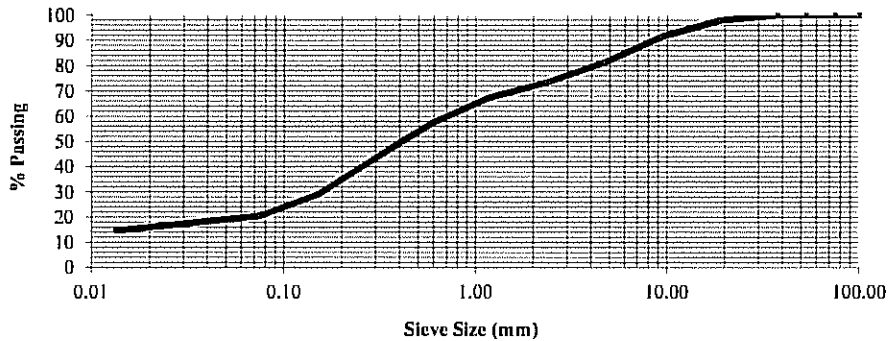
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9495
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9495
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED:	24/09/2012
LOCATION:	Test Pit 30	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.8m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Gravelly Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	98
9.5	92
4.75	81
2.36	73
1.18	67
0.600	58
0.425	51
0.300	43
0.150	29
0.075	20
0.0135	15

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	30.4	%
Plastic Limit (*121.1)	13.7	%
Plasticity Index (*122.1)	16.7	%
Linear Shrinkage (*123.1)	6.8	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

In accordance with WA 915.1
3.5%

Field Moisture Content

In accordance with WA 110.1
7.1%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
2 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

**Mining &
Civil
Geotest Pty Ltd**

**Organic content of Soils
ASTM: D 2974-07a
Test Method C**

Ph (08) 9414 8022 Fax (08) 9414 8011

Email kevin@mcgeotest.com.au

Unit 1/1 Pusey Road, JANDAKOT WA 6164

Job No: 60023

Report No: 60023-P12/3364-3373

Date of issue: 28 September 2012

Client:	Blacktop Materials Engineering	Date tested:	27 September 2012
Project:	Routine Testing	Tested by:	M Carmichael
Location:	Moresby Height Subdivision	Checked:	M van Herk

Sample Number	Location	Ash content %	Organic content %
P12/3364	12BME9475 TP3 0.5 Moresby Height Subdivision	99.5	0.5
P12/3365	12BME9477 TP6 0.5 Moresby Height Subdivision	99.1	0.9
P12/3366	12BME9478 TP9 0.5 Moresby Height Subdivision	99.4	0.6
P12/3367	12BME9480 TP12 1.2 Moresby Height Subdivision	98.1	1.9
P12/3368	12BME9483 TP15 2.0 Moresby Height Subdivision	98.9	1.1
P12/3369	12BME9486 TP18 0.5 Moresby Height Subdivision	99.0	1.0
P12/3370	12BME9489 TP21 2.0 Moresby Height Subdivision	98.3	1.7
P12/3371	12BME9491 TP24 2.0 Moresby Height Subdivision	98.1	1.9
P12/3372	12BME9493 TP27 0.5 Moresby Height Subdivision	98.8	1.2
P12/3373	12BME9495 TP30 0.8 Moresby Height Subdivision	98.2	1.8
Tested as received	Samples oven dried prior to test Furnace temperature 440 ^o C		

Client address: 111 Anderson St, Geraldton

Organic content April 2009



Approved Signature Kevin M Jones

Appendix E : Calculation of expected surface movement for each investigation location

Investigation Location	Expected Surface Movement (mm) *
1	0
2	9
3	10
4	0
5	0
6	0
7	0
8	0
9	0
10	4
11	10
12	13
13	6
14	4
15	5
16	12
17	0
18	8
19	17
20	14
21	8
22	10
23	17
24	12
25	22

26	22
27	1
28	13
29	8
30	8

Table 1 : Estimation of the characteristic surface movement.

* Estimation of the characteristic surface movement completed in accordance with AS2870 – 2011.

Appendix F : Acid sulfate investigation report.

Appendix C

BME Infiltration Test Certificate



BLACKTOP MATERIALS ENGINEERING

ACN: 098 257 071 ABN: 52 098 257 071
PO BOX 1018 GERALDTON WA 6531
PHONE: (08) 9921 1878
FAX: (08) 99655730

TEST CERTIFICATE

Page 1 of 2

CLIENT:	AECOM, Unit 8, 273 Foreshore Drive, Geraldton, WA 6530	JOB NO.:	83
PROJECT:	Moreseby Heights	CLIENT ORDER NO.:	Not Supplied
LOCATION:	Various locations across subdivision - For test locations refer to attached plan.	DATE FIELD TESTED	28&29/11/11
		DATE LAB	30/11/11
		CALCULATED	
SAMPLE NO:	11BME8278	CERTIFICATE No.	11BME8278

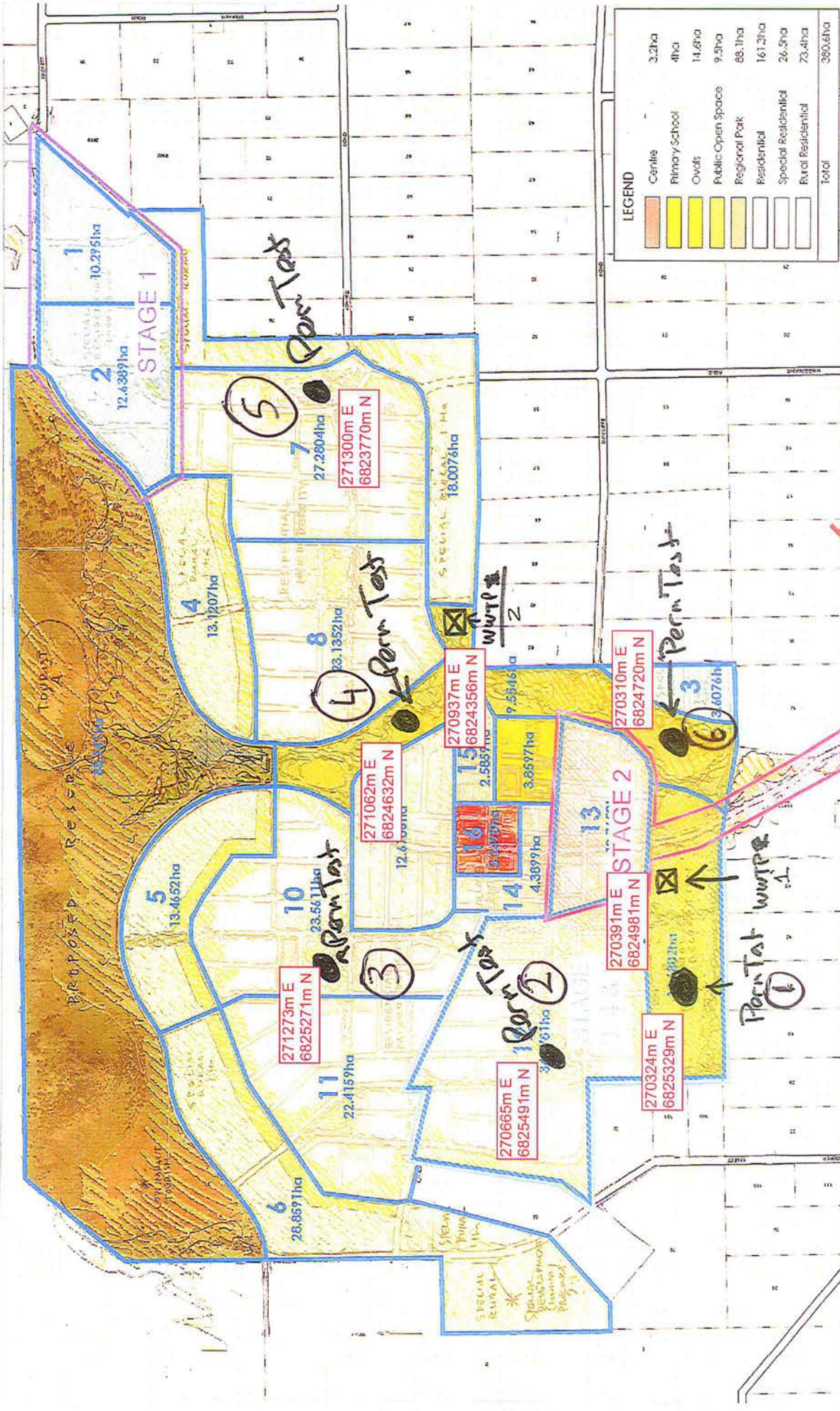
Method for determining the absorptive capacity of a soil in accordance with Schedule 8 – Health Regulations 1974

Test Site Location	Soil Description	Moisture condition of soil prior to soaking	Time taken for water level to fall 25mm after soaking	Calculated infiltration rate (m/s)
Test Site 1 @ 0.3m depth. 270324E 6825329N	Yellow Quartz Sand	Dry	1 Minute 20 Seconds	3.13×10^{-4} m/s
Test Site 2 @ 0.3m depth. 270665E 6825491N	Yellow Quartz Sand	Dry	1 Minute Nil Seconds	4.17×10^{-4} m/s
Test Site 3 @ 0.3m depth. 271273E 6825271N	Red Quartz Sand	Dry	2;Minutes 45 Seconds	1.52×10^{-4} m/s
Test Site 4 @ 0.3m depth. 271062E 6824632N	Red Quartz Sand	Dry	4 Minutes 45 Seconds	8.77×10^{-5} m/s
Test Site 5 @ 0.3m depth. 271300E 6823770N	Grey Silty Quartz Sand	Dry	7 Minutes 30 Seconds	5.56×10^{-5} m/s
Test Site 6 @ 0.3m depth. 270310E 6824720N	Pale Orange Quartz Sand	Dry	50 Seconds	5.00×10^{-4} m/s

Notes: Test sites soaked over 8 hrs to establish saturated flow conditions.

Authorised Signatory :  (L. Smith)

Date : 30/11/11



TEST LOCALITY PLAN

LOT 80 & 81 HACKETT ROAD
MORESBY HEIGHTS

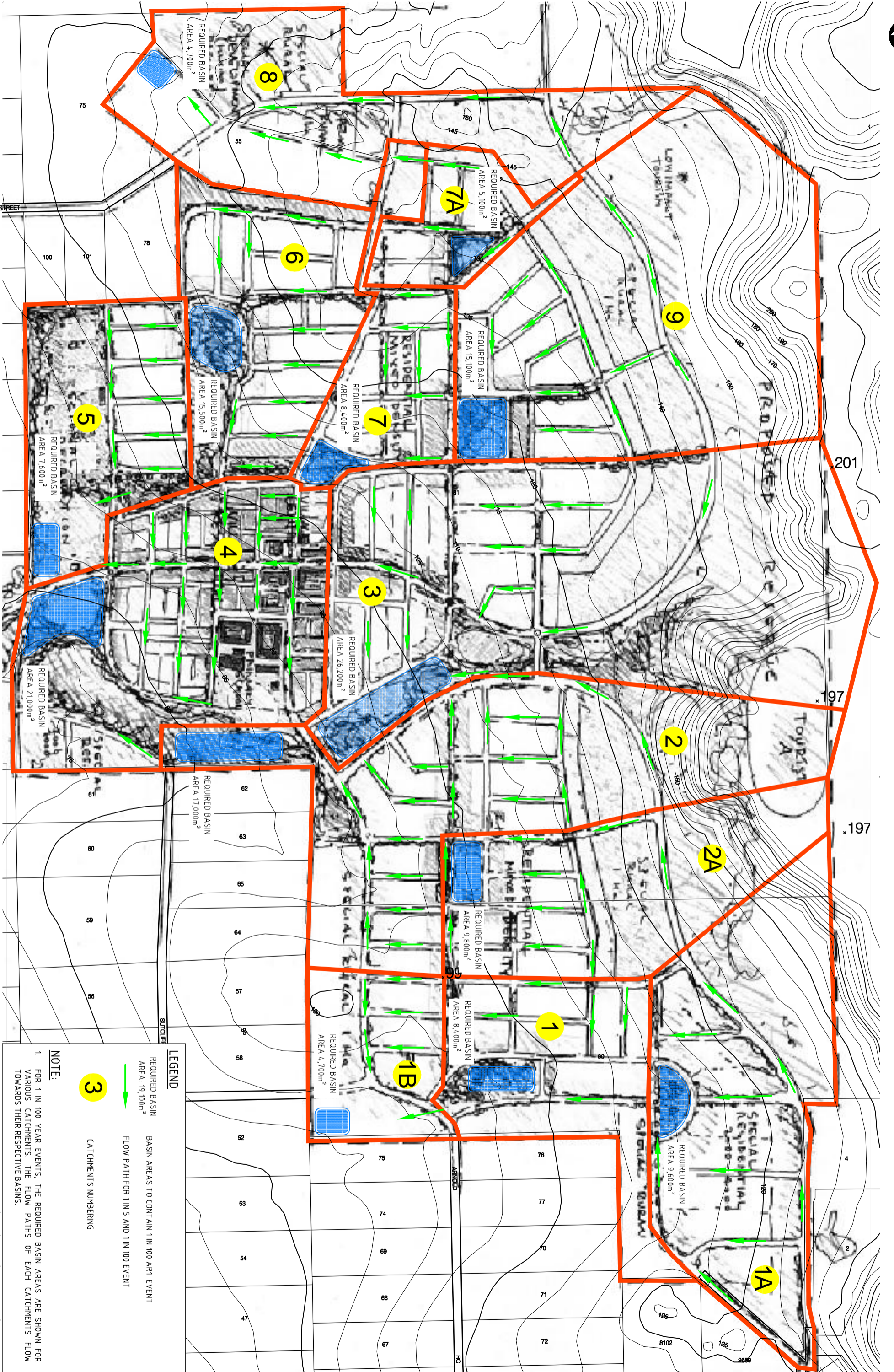
CONCEPT STAGING PLAN

Appendix D

Stormwater Catchments and Event Plan



202



LEGEND

- REQUIRED BASIN AREA: 19,100m²
- FLOW PATH FOR 1 IN 5 AND 1 IN 100 EVENT
- CATCHMENTS NUMBERING

NOTE:
1. FOR 1 IN 100 YEAR EVENTS, THE REQUIRED BASIN AREAS ARE SHOWN FOR VARIOUS CATCHMENTS. THE FLOW PATHS OF EACH CATCHMENT'S FLOW TOWARDS THEIR RESPECTIVE BASINS.

Appendix E

PC Sump Results

--

Project Details	
Project	Moresby Heights LWMS - Catchment 1
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	47932	1	47932	
Lots	89018	0.5	44509	
Reserve	68600	0.1	6860	
TOTAL	205550		99301	

INPUT DATA	
Location	Geraldton
A _{Impervious}	9.9301 ha
GWL	0.000 m AHD
Depth to GWL from base	88.500 m
Max Allowable TWL	90.000 m AHD
Sump Base Level	88.500 m AHD
Sump Width at base	40 m
Sump Length at base	140 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	12202	3861.28	3861	8341	1.197	89.697	0.303	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 1A
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	86071	1	86071	
Lots	159847	0.1	15985	
Reserve	122000	0.1	12200	
TOTAL	367918		114256	

INPUT DATA	
Location	Geraldton
A _{impervious}	11.4256 ha
GWL	0.000 m AHD
Depth to GWL from base	113.500 m
Max Allowable TWL	115.000 m AHD
Sump Base Level	113.500 m AHD
Sump Width at base	55 m
Sump Length at base	125 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	14040	4510.07	4510	9530	1.162	114.662	0.338	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 1B
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	27811	1	27811	
Reserve	54249	0.1	5425	
Lots	37929	0.5	18965	
TOTAL	119989		52200	

INPUT DATA	
Location	Geraldton
A _{Impervious}	5.2200 ha
GWL	0.000 m AHD
Depth to GWL from base	83.500 m
Max Allowable TWL	85.000 m AHD
Sump Base Level	83.500 m AHD
Sump Width at base	45 m
Sump Length at base	65 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	6414	2021.55	2022	4393	1.167	84.667	0.333	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 2
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	104685	1	104685	
Lots	173633	0.5	86817	
Lots & Reserve	185739	0.1	18574	
TOTAL	464057		210075	

INPUT DATA	
Location	Geraldton
A _{Impervious}	21.0075 ha
GWL	0.000 m AHD
Depth to GWL from base	78.500 m
Max Allowable TWL	80.000 m AHD
Sump Base Level	78.500 m AHD
Sump Width at base	50 m
Sump Length at base	250 m
Side Slope	6.0 1 in --
Soil Permeability, K	2.5 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	25814	8284.69	8285	17529	1.191	79.691	0.309	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 2A
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	65089	1	65089	
Lots	80725	0.5	40363	
Lots & Reserve	134866	0.1	13487	
TOTAL	280680		118938	

INPUT DATA	
Location	Geraldton
A _{Impervious}	11.8938 ha
GWL	0.000 m AHD
Depth to GWL from base	95.500 m
Max Allowable TWL	97.000 m AHD
Sump Base Level	95.500 m AHD
Sump Width at base	54 m
Sump Length at base	130 m
Side Slope	6.0 1 in --
Soil Permeability, K	2.5 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	14615	4676.24	4676	9939	1.183	96.683	0.317	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 3
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	177338	1	177338	
Lots	113859.5	1	113860	
Lots & Reserve	324450	0.1	32445	
TOTAL	615647.5		323643	

INPUT DATA	
Location	Geraldton
A _{Impervious}	32.3643 ha
GWL	0.000 m AHD
Depth to GWL from base	88.500 m
Max Allowable TWL	90.000 m AHD
Sump Base Level	88.500 m AHD
Sump Width at base	300 m
Sump Length at base	70 m
Side Slope	6.0 1 in --
Soil Permeability, K	2.5 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	39769	13019.59	13020	26750	1.134	89.634	0.366	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 4
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	182769	1	182769	
Lots	130483	0.5	65242	
Reserve	69938	0.1	6994	
TOTAL	383190		255004	

INPUT DATA	
Location	Geraldton
A _{Impervious}	25.5004 ha
GWL	0.000 m AHD
Depth to GWL from base	68.500 m
Max Allowable TWL	70.000 m AHD
Sump Base Level	68.500 m AHD
Sump Width at base	100 m
Sump Length at base	170 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	36	3.90	35803	8855.94	13284	22519	1.186	69.686	0.314	Shallow water table log model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 5
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	39060	1	39060	
Lots	44746	0.5	22373	
Reserve	108337	0.1	10834	
TOTAL	192143		72267	

INPUT DATA	
Location	Geraldton
A _{Impervious}	7.2267 ha
GWL	0.000 m AHD
Depth to GWL from base	98.800 m
Max Allowable TWL	100.000 m AHD
Sump Base Level	98.800 m AHD
Sump Width at base	50 m
Sump Length at base	115 m
Side Slope	6.0 1 in --
Soil Permeability, K	4.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	8880	3038.34	3038	5842	0.877	99.677	0.323	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 6
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	96580	1	96580	
Lots	111359	0.5	55680	
Reserve	33871	0.1	3387	
TOTAL	241810		155647	

INPUT DATA	
Location	Geraldton
A _{impervious}	15.5647 ha
GWL	0.000 m AHD
Depth to GWL from base	101.300 m
Max Allowable TWL	102.500 m AHD
Sump Base Level	101.300 m AHD
Sump Width at base	100 m
Sump Length at base	130 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	19126	6620.60	6621	12505	0.877	102.177	0.323	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 7
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	59532	1	59532	
Lots	79818	0.5	39909	
Reserve	0	0.1	0	
TOTAL	139350		99441	

INPUT DATA	
Location	Geraldton
A _{Impervious}	9.9441 ha
GWL	0.000 m AHD
Depth to GWL from base	103.500 m
Max Allowable TWL	105.000 m AHD
Sump Base Level	103.500 m AHD
Sump Width at base	75 m
Sump Length at base	80 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	12219	3926.74	3927	8293	1.160	104.660	0.340	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 7A
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	33188	1	33188	
Lots	48712	0.5	24356	
Lots and Reserve	0	0.1	0	
TOTAL	81900		57544	

INPUT DATA	
Location	Geraldton
A _{Impervious}	5.7544 ha
GWL	0.000 m AHD
Depth to GWL from base	113.500 m
Max Allowable TWL	115.000 m AHD
Sump Base Level	113.500 m AHD
Sump Width at base	65 m
Sump Length at base	50 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	7071	2233.62	2234	4837	1.172	114.672	0.328	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 8
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	23203	1	23203	
Lots	0	0.5	0	
Lots and Reserve	290114	0.1	29011	
TOTAL	313317		52214	

INPUT DATA	
Location	Geraldton
A _{impermious}	5.2214 ha
GWL	0.000 m AHD
Depth to GWL from base	98.500 m
Max Allowable TWL	100.000 m AHD
Sump Base Level	98.500 m AHD
Sump Width at base	50 m
Sump Length at base	60 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	6416	2033.58	2034	4383	1.146	99.646	0.354	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 9
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	89412	1	89412	
Lots	122432	0.5	61216	
Reserve	364447	0.1	36445	
TOTAL	576291		187073	

INPUT DATA	
Location	Geraldton
A _{Impervious}	18.7073 ha
GWL	0.000 m AHD
Depth to GWL from base	113.500 m
Max Allowable TWL	115.000 m AHD
Sump Base Level	113.500 m AHD
Sump Width at base	125 m
Sump Length at base	95 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	22987	7485.98	7486	15502	1.151	114.651	0.349	Clogged base model	

Appendix F

Acid Sulfate Investigation



BLACKTOP CONSULTING ENGINEERS

ACN: 150 023 868 ABN: 84 683 812 614

PO Box 918 Geraldton WA 6531

PHONE : (08) 9921 1878

FAX: (08) 9964 2869

15 October 2012

Sutcliffe Road Joint Venture
PO Box 1917
Geraldton WA 6531

Job No: 12BCE226
Your Job ref:

Att: Mr Kel Turner

Dear Kel

Investigation : Proposed Subdivision Development Moresby Heights Waggrakine

Acid Sulfate Study

Executive Summary

Blacktop Consulting Engineers (BCE) have completed an acid sulfate investigation at the proposed Moresby Heights subdivision development in Waggrakine.

The purpose of the investigation is to determine if the DEC will require an acid sulfate management plan to be submitted when the land is developed.

The study has found that the colluvial materials comprising of sand, clay and silt rest on weathered bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. The depth of soils above rock across the site varies from 0.6m to 3m. Some pockets along the west side of the site comprise of deep layers of residual yellow sand.

The DEC ASS Risk Mapping for ASS on the site suggests that the development area is classified as C3 which is extremely low probability / low confidence.

Samples from the site have reported results lower than the action criteria for acid sulfate soils, and which also suggest that there is an inherent neutralising capacity in the samples.

Actual or potential acid sulfate conditions were found to be below threshold levels which the DEC require the development of a acid sulfate management plan.

Scope of Work

On instruction from Sutcliffe Road Joint Venture, Blacktop Consulting Engineers (BCE) completed an acid sulfate investigation at the proposed Moresby Heights subdivision development in Waggrakine.

A structure plan showing the planned subdivision is provided in Figure 1 – Appendix A.

The purpose of the investigation is to determine if the DEC will require the development of a acid sulfate management plan when the land is subdivided.

The investigation has been completed in accordance with guidelines provided by IDENTIFICATION AND INVESTIGATION OF ACID SULFATE SOILS AND ACIDIC LANDSCAPES, May 2009, Department of Environment and Conservation (DEC).

Background

Acid sulfate soil (ASS) is the common name given to soils and sediments containing iron sulfides, the most common being pyrite.

Pyrite is formed when seawater or sulfate rich water mixes with land sediments containing iron oxides and organic matter in a water logged situation, in the absence of oxygen.

For pyrite to form, it requires:

- A supply of sulfur (usually from seawater).
- Anaerobic (oxygen free) conditions.
- A supply of energy for bacteria (usually rotting organic matter eg mangrove leaves).
- A system to remove reaction products (ie tidal flushing of the system).
- A source of iron (most often from terrestrial sediments).
- Temperatures greater than 10 degrees celsius.

When ASS are exposed to air the iron sulfides in the soil react with oxygen and water to produce sulphuric acid and iron compounds.

Soils containing acid sulfate are most commonly found in low-lying land bordering the coast or estuarine and saline wetlands, and freshwater groundwater dependent wetlands throughout the state. As defined by the DEC the term 'acid sulfate soils' or 'ASS' includes both potential acid sulfate soils and actual acid sulfate soils.

- Potential acid sulfate soils (PASS) are soils or sediments which contain iron sulfides and/or other sulfidic minerals that have **not** been oxidised by exposure to air. The field pH of these soils in their undisturbed state is more than pH 4 and is commonly neutral to alkaline (pH 6.5 to pH 7.5). These soils or sediments are invariably saturated with water in their natural state. The waterlogged layer may be peat, clay, loam, silt or sand and is usually dark grey and soft but may also be dark brown, or medium to pale grey to white.
- Actual acid sulfate soils (AASS) are soils or sediments which contain iron sulfides and/or other sulfidic minerals that have previously undergone some oxidation to produce sulfuric acid. This results in existing acidity (pH <4) and often a yellow and/or red mottling (jarosite/iron oxide) in the soil profile. AASS commonly also contain residual un-oxidised iron sulfides, or potential acidity, as well as existing acidity.

Activities that have the potential to disturb ASS, either directly, or by affecting the elevation of the water table, need to be managed appropriately to avoid environmental harm.

Successful management requires that an acid sulfate soil management plan should be prepared and implemented. Management measures should be governed by the guiding principle of avoidance of disturbance over any other measure.

Assessment Criteria

The assessment criteria adopted for this study of ASS are the *Texture-based ASS Action Criteria* as developed by QASSIT and outlined in the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland 1998*.

Desktop Study

BCE have consulted the DEC ASS Risk Maps for Geraldton to determine the potential for acid sulphates at the site.

The ASS Risk Mapping suggests that the development is classified as C3 which is extremely low probability / low confidence.

This is supported by 1:50,000 regolith and landform mapping which suggests that the site covers an area comprising of colluvium soils which are not considered to present an ASS risk.

Site Location

Four locations within the site were investigated.

The test pit locations are shown marked on the structure plan provided in Figure 1 Appendix A and are described as:

- Site 2
- Site 17
- Site 19
- Site 22

Sampling was undertaken by BCE on 24 September 2012.

Site Inspection

The sites comprise of silt, sand, clay and gravel.

The water table was not encountered to 3m depth and is expected to exist well below the surface of the site.

Soil Sampling

Samples were taken at 0.25m intervals from each test pit.

Samples were taken from the following depths:

- Site 2 -: RL -0.25m to RL -3.0m
- Site 17 -: RL -0.25m to RL -3.0m
- Site 19 -: RL -0.25m to RL -3.0m
- Site 22 -: RL -0.25m to RL -3.0m

Photographs of the test pits are provided in Appendix B.

Test pit logs for the four test pits are provided in Appendix C.

Field Tests - determining presence of Acid Sulphate Soils (ASS) & Potential Acid Sulphate Soils (PASS)

Field pH tests have been conducted on the soil samples using a field pH meter. A calibration certificate for the meter is provided in Appendix D.

The pH test is an indicative exploratory tool to determine the presence of ASS.

The pH_{Fox} test is used to indicate the presence of iron sulfides or PASS. This test involves adding 30% hydrogen peroxide (pH adjusted to 4.5 – 5.5) to a sample of soil

A description of the field tests and their usefulness in identifying ASS and PASS is as follows.

1. Laboratory pH test (pH_f) i.e. pH of soil and water paste

The pH_f test measures the existing acidity of a "soil:water" paste, and is therefore used to help identify if ASS are present. If the measured pH of the soil paste is $pH_f < 4$, oxidation of sulfides has probably occurred in the past, indicating the presence of actual acid sulphate soils. Highly organic or heavily fertilised soils may also return a pH_f close to 4. A $pH_f > 4$ but < 5 indicates an acid soil, but the cause of the acidity will need to be further investigated by laboratory analysis. The pH_f test does not detect any unoxidised sulfides (i.e. potential acid sulphate soils (PASS)). For this reason this test must be used in conjunction with the pH_{Fox} test.

2. Laboratory pH peroxide test (pH_{FOX}) i.e. pH of soil and peroxide mix and reaction with peroxide

The pH_{FOX} test is used to indicate the presence of iron sulfides or PASS. This test involves adding 30% hydrogen peroxide (pH adjusted to 4.5 – 5.5) to a sample of soil. The testing of pH following addition of the soil to H_2O_2 is a qualitative method only and gives an indication of the intensity of acidification. If sulfides are present a reaction will occur. The reaction can be influenced by the amount of sulfides present in the sample, the presence of organic matter and the presence of manganese. Once the reaction has occurred the pH is measured.

The pH of the 30% H_2O_2 was measured at 5.1, which is within the normal range of 4.5 to 5.5, prior to the addition of any soil.

A combination of three factors is considered in arriving at a “positive field sulfide identification”:

A reaction with hydrogen peroxide. The strength of the reaction with peroxide is a useful indicator but cannot be used alone. Organic matter, coffee rock and other soil constituents such as manganese oxides can also cause a reaction. Care should be exercised in interpreting a reaction on surface soils and high organic matter soils such as peats and coffee rock and some marine clays. This reaction is rated NR = No reaction, VS = Very small reaction, S = Small reaction, M = Medium reaction, H = High.

The actual value of pH_{FOX} . If the $\text{pH}_{\text{FOX}} < 3$, and a significant reaction occurred, then it strongly indicates a PASS. The more the pH_{FOX} drops below 3 the more positive the presence of inorganic sulfides.

A much lower pH_{FOX} than field pH_{FOX} .

The lower the final pH_{FOX} value the greater the difference between the pH_{FOX} compared to the pH_f , the more indicative the presence of PASS. This difference may not be as great if starting with an already very acid pH_f (close to 4), but if the starting pH is neutral or alkaline then a larger change in pH should be expected.

Where fine shell, coral or carbonate, is present the change in pH may not be as large due to buffering. The “fizz test” (effervescence with 1 M HCl) should be used to test for carbonates and shell.

Laboratory Analysis

Two samples from each test pit were submitted to SGS laboratory for analysis. The SPOCAS standard analytical suite for ASS was completed on the samples.

Samples were retrieved from the following field locations:

- Site 2 : RL –0.25m : Sample No. 12BME9496
- Site 2 : RL –1.25m : Sample No. 12BME9496
- Site 17 : RL –0.25m : Sample No. 12BME9497
- Site 17 : RL –1.25m : Sample No. 12BME9497
- Site 19 : RL –0.25m : Sample No. 12BME9498
- Site 19 : RL –1.25m : Sample No. 12BME9498

- Site 22 : RL -0.25m : Sample No. 12BME9499
- Site 22 : RL -1.25m : Sample No. 12BME9499

Results

Results of Field Tests

The results of field tests completed on samples are contained in Appendix E.

Discussion of the results is as follows:

Field pH test (pH_f) i.e. pH of soil and water paste

The pH_f test results which all measured pH of the soil paste pH_f > 5.37 suggest that the soils tested are not acidic.

Field pH peroxide test (pH_{FOX}) i.e. pH of soil and peroxide mix and reaction with peroxide

The field samples tested generally registered either very minor or no reaction when 30% hydrogen peroxide (pH adjusted to 5.1) was added to the soil samples, indicating that sulfides are unlikely to be present.

The lowest value of pH_{FOX} of 5.13 suggests that the soil is not PASS.

A much lower pH_{FOX} than field pH_{FOX}.

Given that there was not a significant change between the pH_{FOX} compared to the pH_f, it would suggest that the soil is not PASS.

The "fizz test" (effervescence with 1 M HCl) registered only slight reaction with some samples indicating that the samples do not contain large amounts of carbonates and shell.

Results of Laboratory Tests

The acid sulfate test certificates supplied from SGS for the 8 samples are contained in Appendix F.

The key analytical parameters related to the determination of whether a disturbed site will need to be managed based on the presence of acid sulfate soils are:

- Titratable Actual Acidity (TAA)
- Equivalent Sulfur (S_{POS} / %S) and
- ANCE.

Titratable Actual Acidity (TAA):

The results of Titratable Actual Acidity indicate that actual or existing acidity is not an issue.

Equivalent Sulfur (S_{POS} / %S).

Action criteria as to when a disturbed site will need to be managed is stipulated at 0.03 % S for coarse-textured soils (sands to loamy sands), 0.06 % S for medium texture soils (sandy loams to light clays) and 0.1 % S for fine texture soils (medium to heavy clays and silty clays), where 1 to 1000 tonnes of material is to be disturbed.

Visual inspection of the particle size distribution of the silty clayey sand samples suggest that the soil type would most likely be considered a fine texture soil.

The results of the submitted samples are all below the permissible level for a fine texture soils (0.1%). These results are less than the action criteria and indicate that a Acid Sulfate Management Plan is not required be developed.

ANCE;

ANCE is the Acid Neutralising Capacity (Excess). It is a measure of net alkalinity, or a measure of the remaining neutralising capacity after all the potential acid has been neutralised. The *ANCE* results suggest that this soil does have some neutralising capacity.

In Acid-Base accounting terms:

Net Acidity = Potential Acidity +(Actual and Retained Acidity) – (S_{POS} +ANCE/FF)

(where FF= 2 = safety or fineness factor to allow for incomplete reaction of natural shell (CaCO₃) material.

Actual and Retained Acidity are either absent (as determined by the TAA analyses) or not present at the pH values indicated (ie Retained Acidity is not generally an issue at pH > 4.5). So, the equation above is reduced to:

Net Acidity = Potential Acidity– (S_{POS} +ANCE/FF)

For sample No. 12BME9496

Net Acidity = 0.01– (0.01 +(0.01/2))

Net Acidity = - 0.005

A negative term for net Acidity indicates that there is no net Acidity, and that the soil is net neutralising. Such soils will not require liming in the event of their being disturbed.

Conclusions

Samples from the four sites have reported results less than the action criteria for acid sulfate soils, but which also suggest that there is some inherent neutralising capacity in the samples. These results indicate that there should not be any concern related to the disturbance of these soils during development.

Actual or potential acid sulfate conditions are below threshold levels which the DEC require the development of an acid sulfate management plan.

If you require any further information please contact Mr Lester Smith on 99 211 878.

Yours faithfully


Lester Smith
Manager Engineering Services

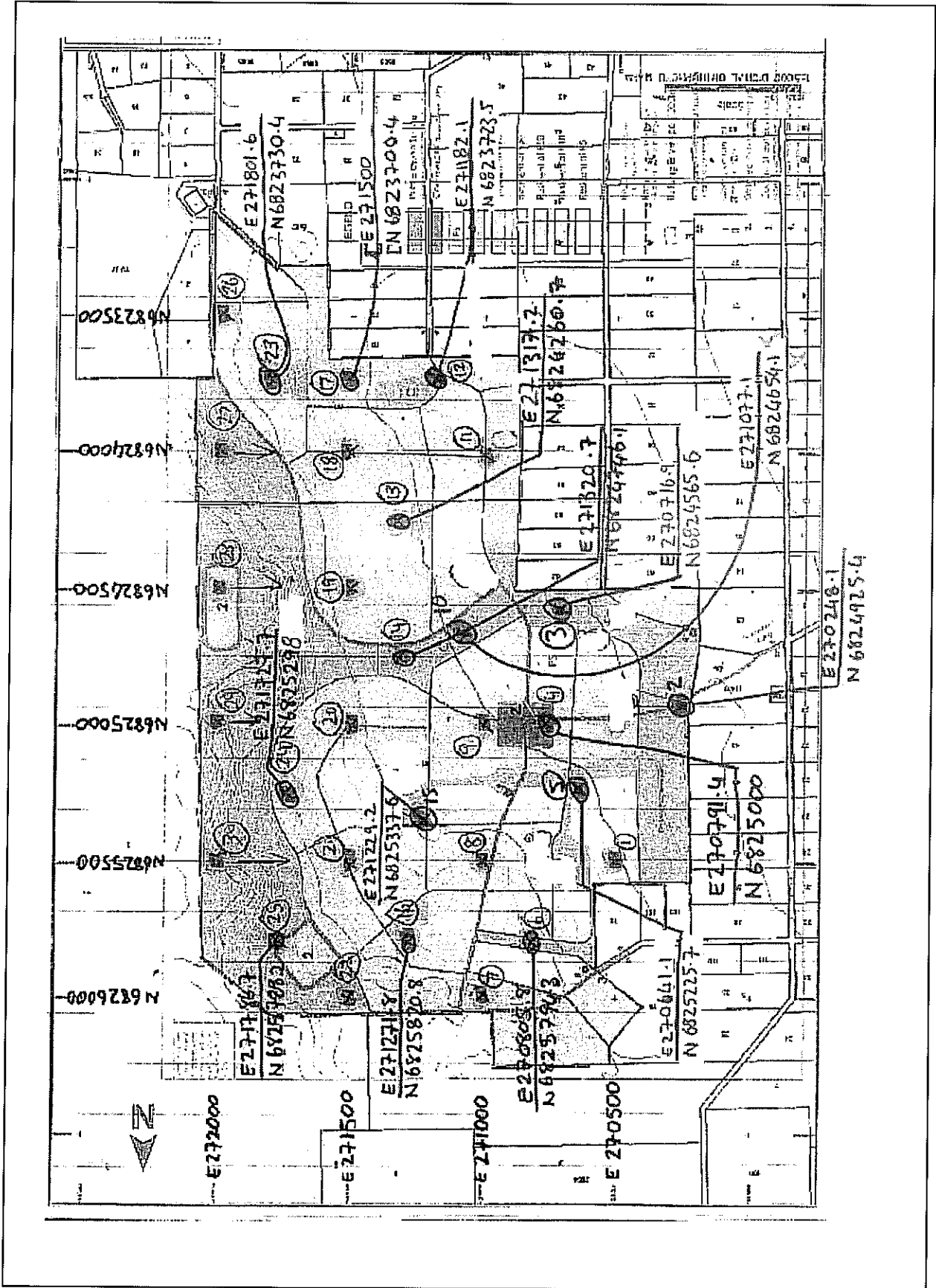
Att: Appendix A – F

REFERENCES

Department of Environment and Conservation. IDENTIFICATION AND INVESTIGATION OF ACID SULFATE SOILS AND ACIDIC LANDSCAPES, May 2009.

Geological Survey of Western Australia. Geraldton. Bureau of Mineral Resources, Geology and Geophysics 1970.

Appendix A : Site Plan showing test locations



Appendix B : Photographs



Figure 1 : Photograph of material excavated from Test Site 2.



Figure 2 : Photograph of material excavated from Test Site 17.



Figure 3 : Photograph of material excavated from Test Site 19.



Figure 4 : Photograph of material excavated from Test Site 22.

Appendix C : Excavation Logs

BCE

TEST PIT LOG

TP 02

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 2	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 270248E / 6824925N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.3m: Clayey Gravelly SAND: Brown, laterite gravel and sand. Slightly plastic.	Dry	SC	B	Too gravelly for penetrometer testing. Sample taken at 0.8m depth. Sample No. 12BME9474. Tests for PSD, PI & MC completed.
	1.0	L	0.8m: Silty Clayey SAND: Brown, orange , red Slightly plastic.	Dry	SC	NS	Dry and cemented when excavated but material crumbles under finger pressure. Material looks like laterite particles but very soft. Acid sulfate testing completed at this site.
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 17

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 17
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271500E / 6823700N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
									In situ testing, additional observations
Groundwater not encountered	Natural ground	0	L		0.0m: Silty SAND: Orange / Brown, sand is medium, non- plastic.	Moist	SM	B	Top 200mm of soil contains rootlets.
		0.5							Penetrometer testing from 300mm below ground level -300mm(11,11,11).
		1.0							Sample taken at 0.5m depth. Sample No. 12BME9485. Tests for PSD & PI completed.
		1.5							Acid sulfate testing completed.
		2.0							Material lightly cemented when excavated.
		2.5							Material appears to have slightly higher moisture content from 1.5m depth.
		3.0							
					Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 19

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 19	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6824500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	1.0	L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Moist	CL	B	Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9487. Tests for PSD & PI completed. Acid sulfate testing completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 22

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 22	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6826000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red, sand is medium, non-plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5						
	1.0	L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Dry	SC	B	Material difficult to excavate. Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9490. Tests for PSD & PI completed. Acid sulfate testing completed.
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

Appendix D : pH Meter Calibration Certificate.



Ttechrentals

Certificate of Calibration Conformance

Certificate Number : 21486

Reference : 457751

Model : TPS,WP-80

Asset Number : 200147

Description : TPS WP-80 pH and Temperature Meter

Date Calibrated : 23/05/12

Technician : Mark Civelli

Serial No. : U6888

Calibration valid for : 365 days.

The performance of the above listed equipment has been verified for measurement accuracy to the manufacturers relevant published specification, in accordance with our Quality Assurance Procedures, using the appropriate calibrated equipment, traceable to nationally recognised standards.

SOURCE ASSET 130245 CAL.SOLUTIONS REPORT 397088

DUE 10/09/13

Service Manager

QSF 326-1/B

Offices throughout Australia, New Zealand and Malaysia
TR Pty Ltd (Box 1185) 6 Joseph Street Blackburn North 3130 VIC Australia
Freecall 1800 632 652 P 03 9896 3000 F 03 9896 3099
www.techrentals.com.au
ABN 99 005 499 721

TR0147

Appendix E : Results of Acid Sulfate Field Testing.

Tested 28/08/12

Acid Sulfate pH Test

Site	Depth Of Sample													
	RL-0.25		RL-0.5		RL-0.75		RL-1.00		RL-1.25		RL-1.50		RL-1.75	
	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity
2	6.55	NR	6.84	NR	7.11	NR	7.30	NR	7.24	VS	7.52	NR	7.48	NR
17	6.43	VS	6.81	VS	6.62	VS	6.84	VS	6.98	VS	6.76	VS	6.60	VS
19	5.37	VS	5.42	S	6.16	S	6.17	VS	7.46	VS	7.46	VS	7.41	NR
22	5.63	S	6.53	S	6.10	S	6.20	NR	7.64	VS	7.45	NR	7.44	NR
Site 2 Sample No. 12BME 9496														
Site 17 Sample No. 12BME 9497														
Site 19 Sample No. 12BME 9498														
Site 22 Sample No. 12BME 9499														

Site	Depth Of Sample											
	RL-2.00		RL-2.25		RL-2.50		RL-2.75		RL-3.00		RL-3.00	
	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity	Water	Hydrogen Peroxide Reactivity
2	7.65	NR	7.53	NR	7.53	NR	7.18	NR	7.67	NR	7.67	NR
17	6.78	NR	6.76	VS	5.61	VS	5.48	VS	6.70	NR	6.70	NR
19	7.40	NR	7.56	NR	7.41	NR	7.35	NR	7.59	NR	7.59	NR
22	7.50	NR	7.56	NR	7.43	NR	6.04	NR	7.25	NR	7.25	NR

Acid Sulfate: Hydrochloric Acid Test

Site	Depth Of Sample											
	RL-0.25	RL-0.5	RL-0.75	RL-1.0	RL-1.25	RL-1.5	RL-1.75	RL-2.0	RL-2.25	RL-2.5	RL-2.75	RL-3.0
2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
17	NR	NR	NR	NR	NR	NR	NR	VS	VS	NR	NR	NR
19	NR	NR	NR	NR	VS	VS	VS	VS	VS	VS	VS	VS
22	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS

Legend (Reactivity)	
High	H
Medium	M
Small	S
Very Small	VS
None	NR

REQUIRED RANGE
 H₂O₂ buffers to 5.12 (4.5 to 5.5)

Appendix F : Results of Acid Sulfate Laboratory Testing.

CLIENT DETAILS

Contact **Lester Smith**
 Client **Blacktop Materials Engineering**
 Address **111 Anderson St Geraldton
WA**

Telephone **(08) 9921 1878**
 Facsimile **99655 730**
 Email **blacktop@westnet.com.au**

Project **Moresby Height Subdivision**
 Order Number **1096**
 Samples **8**

LABORATORY DETAILS

Manager **Ros Ma**
 Laboratory **SGS Newburn Environmental**
 Address **10 Reid Rd
Newburn WA 6105**

Telephone **(08) 9373 3500**
 Facsimile **(08) 9373 3556**
 Email **au.environmental.perth@sgs.com**

SGS Reference **PE071299 R0**
 Report Number **0000048064**
 Date Reported **15 Oct 2012**
 Date Received **04 Oct 2012**

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

SIGNATORIES



Michael McKay
Inorganic Team Leader - Waters



TAA (Titratable Actual Acidity) Method: AN219

	pH Units	-	6.1	5.5	6.0	5.8
pH KCl*						
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	1.1	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	23	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	0.04	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	0.006	<0.005
Calcium (CaKCl)	%w/w	0.005	0.009	0.043	0.022	0.023
Magnesium (MgKCl)	%w/w	0.005	<0.005	0.021	<0.005	0.009

Act.

TPA (Titratable Peroxide Acidity) Method: AN218

	pH Units	-	5.9	5.9	5.7	5.9
Peroxide pH (pH Ox)						
TPA as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	0.50	<0.25	<0.25
TPA as moles H+/tonne	moles H+/T	5	<5	10	<5	<5
TPA as S % W/W	%w/w S	0.01	<0.01	0.02	<0.01	<0.01
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Sulfidic Acidity as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Sulfidic Acidity as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as % CaCO3	% CaCO3	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
ANCE as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Peroxide Oxidisable Sulphur (Spas)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Peroxide Oxidisable Sulphur as moles H+/tonne*	moles H+/T	5	<5	<5	<5	<5
Sulphur (Sp)	%w/w	0.005	<0.005	0.006	<0.005	<0.005
Calcium (Cap)	%w/w	0.005	0.009	0.044	0.021	0.025
Reacted Calcium (CaA)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Reacted Calcium (CaA)*	moles H+/T	5	<5	<5	<5	<5
Magnesium (Mgp)	%w/w	0.005	<0.005	0.022	<0.005	0.010
Reacted Magnesium (MgA)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Reacted Magnesium (MgA)*	moles H+/T	5	<5	<5	<5	<5
Net Acid Soluble Sulphur as % w/w*	%w/w	0.005	-	-	-	-
Net Acid Soluble Sulphur as moles H+/tonne*	moles H+/T	5	-	-	-	-

Pot

Sic

ANCE

SPOCAS Net Acidity Calculations Method: AN220

	%w/w S	0.01	<0.01	0.05	<0.01	<0.01
s-Net Acidity	%w/w S	0.01	<0.01	0.05	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	30	<5	6
Liming Ratio*	kg CaCO3/T	0.1	<0.1	2.3	<0.1	NA
Verification s-Net Acidity*	%w/w S	0.01	-	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	23	<5	6
Liming Ratio without ANCE*	kg CaCO3/T	0.1	<0.1	1.8	<0.1	NA

Sample Name	Sample No.	Sample Date	Sample Type	Sample Location	Sample Description
...

TAA (Titratable Actual Acidity) Method: AN219

Parameter	Unit	Result	5.5	5.7	5.9	5.7
pH KCl*	pH Units	-	5.5	5.7	5.9	5.7
Titratable Actual Acidity	kg H2SO4/T	0.25	0.37	0.74	<0.25	0.74
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	8	15	<5	15
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	0.01	0.02	<0.01	0.02
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Calcium (CaKCl)	%w/w	0.005	0.009	0.033	0.014	0.024
Magnesium (MgKCl)	%w/w	0.005	<0.005	0.043	<0.005	0.037

TPA (Titratable Peroxide Acidity) Method: AN218

Parameter	Unit	Result	5.7	6.5	5.5	6.4
Peroxide pH (pH Ox)	pH Units	-	5.7	6.5	5.5	6.4
TPA as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	0.62	<0.25	0.50
TPA as moles H+/tonne	moles H+/T	5	<5	13	<5	10
TPA as S % WW	%w/w S	0.01	<0.01	0.02	<0.01	0.02
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Sulfidic Acidity as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Sulfidic Acidity as S % WW	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as % CaCO3	% CaCO3	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
ANCE as S % WW	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Peroxide Oxidisable Sulphur (Spos)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Peroxide Oxidisable Sulphur as moles H+/tonne*	moles H+/T	5	<5	<5	<5	<5
Sulphur (Sp)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Calcium (Cap)	%w/w	0.005	0.010	0.032	0.017	0.031
Reacted Calcium (CaA)*	%w/w	0.005	<0.005	<0.005	<0.005	0.008
Reacted Calcium (CaA)*	moles H+/T	5	<5	<5	<5	<5
Magnesium (Mgp)	%w/w	0.005	<0.005	0.046	<0.005	0.051
Reacted Magnesium (MgA)*	%w/w	0.005	<0.005	<0.005	<0.005	0.014
Reacted Magnesium (MgA)*	moles H+/T	5	<5	<5	<5	12
Net Acid Soluble Sulphur as % w/w*	%w/w	0.005	-	-	-	-
Net Acid Soluble Sulphur as moles H+/tonne*	moles H+/T	5	-	-	-	-

SPOCAS Net Acidity Calculations Method: AN220

Parameter	Unit	Result	0.01	0.04	<0.01	0.04
a-Net Acidity	%w/w S	0.01	0.01	0.04	<0.01	0.04
a-Net Acidity	moles H+/T	5	9	24	<5	23
Liming Ratio*	kg CaCO3/T	0.1	NA	1.8	<0.1	1.7
Verification a-Net Acidity*	%w/w S	0.01	-	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	9	18	<5	18
Liming Ratio without ANCE*	kg CaCO3/T	0.1	NA	NA	<0.1	NA

MB blank results are compared to the Limit of Reporting
 LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared to the amount of analyte spiked into the sample.
 DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

TAA (Titratable Actual Acidity) Method: ME-(AU)-(ENV)AN219

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH KCl*	LB051217	pH Units	-	6.0	0%	99%
Titratable Actual Acidity	LB051217	kg H2SO4/T	0.25	<0.25	0%	NA
Titratable Actual Acidity (TAA) moles H+/tonne	LB051217	moles H+/T	5	<5	0%	93%
Titratable Actual Acidity (TAA) S%w/w	LB051217	%w/w S	0.01	<0.01	0%	93%
Sulphur (SKCl)	LB051217	%w/w	0.005	<0.005	0%	108%
Calcium (CaKCl)	LB051217	%w/w	0.005	<0.005	20%	116%
Magnesium (MgKCl)	LB051217	%w/w	0.005	<0.005	22%	110%

TPA (Titratable Peroxide Acidity) Method: ME-(AU)-(ENV)AN218

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Peroxide pH (pH Ox)	LB051217	pH Units	-	6.3	1%	98%
TPA as kg H2SO4/tonne	LB051217	kg H2SO4/T	0.25	<0.25	2%	91%
TPA as moles H+/tonne	LB051217	moles H+/T	5	<5	2%	91%
TPA as S % WW	LB051217	%w/w S	0.01	<0.01	2%	91%
Titratable Sulfidic Acidity as moles H+/tonne	LB051217	moles H+/T	5		0%	
Titratable Sulfidic Acidity as kg H2SO4/tonne	LB051217	kg H2SO4/T	0.25		0%	
Titratable Sulfidic Acidity as S % WW	LB051217	%w/w S	0.01		0%	
ANCE as % CaCO3	LB051217	% CaCO3	0.01	<0.01	0%	NA
ANCE as moles H+/tonne	LB051217	moles H+/T	5	<5	0%	NA
ANCE as S % WW	LB051217	%w/w S	0.01	<0.01	0%	NA
Peroxide Oxidisable Sulphur (Spos)*	LB051217	%w/w	0.005		0%	
Peroxide Oxidisable Sulphur as moles H+/tonne*	LB051217	moles H+/T	5		0%	
Sulphur (Sp)	LB051217	%w/w	0.005	<0.005	0%	100%
Calcium (Cap)	LB051217	%w/w	0.005	<0.005	15%	108%
Magnesium (Mgp)	LB051217	%w/w	0.005	<0.005	15%	105%

Order 1096
 Project Moresby Height Subdivision

Sample Name
 Description
 Sample Date
 Matrix

Job Number	Method Name	Analyte Name	Units	Reporting Limit
PE071299	TAA (Titratable Actual Acidity)	pH KCl	pH Unit	0
PE071299	TAA (Titratable Actual Acidity)	Titratable Actual Acidity	kg H ₂ SO ₄ /ton	0.25
PE071299	TAA (Titratable Actual Acidity)	Titratable Actual Acidity	moles H ⁺ /ton	5
PE071299	TAA (Titratable Actual Acidity)	Titratable Actual Acidity	%w/w S	0.01
PE071299	TAA (Titratable Actual Acidity)	Sulphur (SKCl)	%w/w	0.005
PE071299	TAA (Titratable Actual Acidity)	Calcium (CaKCl)	%w/w	0.005
PE071299	TAA (Titratable Actual Acidity)	Magnesium (MgKCl)	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Peroxide pH (pH Ox)	pH Unit	0
PE071299	TPA (Titratable Peroxide Acidity)	TPA as kg H ₂ SO ₄ /ton	kg H ₂ SO ₄ /ton	0.25
PE071299	TPA (Titratable Peroxide Acidity)	TPA as moles H ⁺ /ton	moles H ⁺ /ton	5
PE071299	TPA (Titratable Peroxide Acidity)	TPA as S % W/W	%w/w S	0.01
PE071299	TPA (Titratable Peroxide Acidity)	Titratable Sulfidic Acidity	moles H ⁺ /ton	5
PE071299	TPA (Titratable Peroxide Acidity)	Titratable Sulfidic Acidity	kg H ₂ SO ₄ /ton	0.25
PE071299	TPA (Titratable Peroxide Acidity)	Titratable Sulfidic Acidity	%w/w S	0.01
PE071299	TPA (Titratable Peroxide Acidity)	ANCE as % CaCO ₃	% CaCO ₃	0.01
PE071299	TPA (Titratable Peroxide Acidity)	ANCE as moles H ⁺ /ton	moles H ⁺ /ton	5
PE071299	TPA (Titratable Peroxide Acidity)	ANCE as S % W/W	%w/w S	0.01
PE071299	TPA (Titratable Peroxide Acidity)	Peroxide Oxidisable	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Peroxide Oxidisable	moles H ⁺ /ton	5
PE071299	TPA (Titratable Peroxide Acidity)	Sulphur (Sp)	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Calcium (Cap)	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Reacted Calcium (C)	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Reacted Calcium (C)	moles H ⁺ /ton	5
PE071299	TPA (Titratable Peroxide Acidity)	Magnesium (Mgp)	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Reacted Magnesium	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Reacted Magnesium	moles H ⁺ /ton	5
PE071299	TPA (Titratable Peroxide Acidity)	Net Acid Soluble Sulphur	%w/w	0.005
PE071299	TPA (Titratable Peroxide Acidity)	Net Acid Soluble Sulphur	moles H ⁺ /ton	5
PE071299	SPOCAS Net Acidity Calculation	s-Net Acidity	%w/w S	0.01
PE071299	SPOCAS Net Acidity Calculation	a-Net Acidity	moles H ⁺ /ton	5
PE071299	SPOCAS Net Acidity Calculation	Liming Rate	kg CaCl ₂ /ton	0.1
PE071299	SPOCAS Net Acidity Calculation	Verification s-Net Acidity	%w/w S	0.01
PE071299	SPOCAS Net Acidity Calculation	a-Net Acidity without	moles H ⁺ /ton	5
PE071299	SPOCAS Net Acidity Calculation	Liming Rate without	kg CaCl ₂ /ton	0.1



PE071299.001	PE071299.002	PE071299.003	PE071299.004	PE071299.005
TP2 @ 0.25	TP2 @ 1.25	TP17 @ 0.25	TP17 @ 1.25	TP19 @ 0.25
24/9/2012	24/9/2012	24/9/2012	24/9/2012	24/9/2012
Soil	Soil	Soil	Soil	Soil
Result	Result	Result	Result	Result
6.1	5.5	6.0	5.9	5.5
<0.25	1.1	<0.25	<0.25	0.37
<5	23	<5	<5	8
<0.01	0.04	<0.01	<0.01	0.01
<0.005	<0.005	0.006	<0.005	<0.005
0.009	0.043	0.022	0.023	0.009
<0.005	0.021	<0.005	0.009	<0.005
5.9	5.9	5.7	5.9	5.7
<0.25	0.50	<0.25	<0.25	<0.25
<5	10	<5	<5	<5
<0.01	0.02	<0.01	<0.01	<0.01
<5	<5	<5	<5	<5
<0.25	<0.25	<0.25	<0.25	<0.25
<0.01	<0.01	<0.01	<0.01	<0.01
<0.01	<0.01	<0.01	<0.01	<0.01
<5	<5	<5	<5	<5
<0.01	<0.01	<0.01	<0.01	<0.01
<0.005	<0.005	<0.005	<0.005	<0.005
<5	<5	<5	<5	<5
<0.005	0.006	<0.005	<0.005	<0.005
0.009	0.044	0.021	0.025	0.010
<0.005	<0.005	<0.005	<0.005	<0.005
<5	<5	<5	<5	<5
<0.005	0.022	<0.005	0.010	<0.005
<0.005	<0.005	<0.005	<0.005	<0.005
<5	<5	<5	<5	<5
N.A.	N.A.	N.A.	N.A.	N.A.
N.A.	N.A.	N.A.	N.A.	N.A.
<0.01	0.05	<0.01	<0.01	0.01
<5	30	<5	6	9
<0.1	2.3	<0.1	NA	NA
N.A.	N.A.	N.A.	N.A.	N.A.
<5	23	<5	6	9
<0.1	1.8	<0.1	NA	NA

PE071299.006	PE071299.007	PE071299.008	
TP19 @ 1.25	TP22 @ 0.25	TP22 @ 1.25	
24/9/2012	24/9/2012	24/9/2012	
Soil	Soil	Soil	
	Result	Result	Result
	5.7	5.9	5.7
	0.74 <0.25		0.74
	15 <5		15
	0.02 <0.01		0.02
<0.005	<0.005	<0.005	
	0.033	0.014	0.024
	0.043 <0.005		0.037
	6.5	5.5	6.4
	0.62 <0.25		0.50
	13 <5		10
	0.02 <0.01		0.02
<5	<5	<5	
<0.25	<0.25	<0.25	
<0.01	<0.01	<0.01	
<0.01	<0.01	<0.01	
<5	<5	<5	
<0.01	<0.01	<0.01	
<0.005	<0.005	<0.005	
<5	<5	<5	
<0.005	<0.005	<0.005	
	0.032	0.017	0.031
<0.005	<0.005		0.008
<5	<5	<5	
	0.046 <0.005		0.051
<0.005	<0.005		0.014
<5	<5		12
N.A.	N.A.	N.A.	
N.A.	N.A.	N.A.	
	0.04 <0.01		0.04
	24 <5		23
	1.8 <0.1		1.7
N.A.	N.A.	N.A.	
	16 <5		16
NA	<0.1	NA	



Aurecon Australasia Pty Ltd

ABN 54 005 139 873

G1 219 Foreshore Drive

Geraldton WA 6530

Australia

T +61 8 6145 9991

F +61 8 9964 2053

E geraldton@arecongroup.com

W arecongroup.com

Aurecon offices are located in:

Angola, Australia, Botswana, Chile, China,
Ethiopia, Ghana, Hong Kong, Indonesia,
Lesotho, Libya, Malawi, Mozambique,
Namibia, New Zealand, Nigeria,
Philippines, Qatar, Singapore, South Africa,
Swaziland, Tanzania, Thailand, Uganda,
United Arab Emirates, Vietnam.

IN REPLY, PLEASE QUOTE
605-05-01

GHD
76 Forrest Street
GERALDTON WA 6530

FESA Unexploded Ordnance Services
Telephone: (08) 9331 7218
Facsimile: (08) 9331 5928
E-mail: aarnold@fesa.wa.gov.au
ABN: 39 563 851 304

Attention: Ms C Miller

Dear Cathee

UNEXPLODED ORDNANCE RECONNAISSANCE OF LOTS 80 & 81 HACKETTS ROAD, WAGGRAKINE - GERALDTON

Further to the Unexploded Ordnance field reconnaissance carried out by FESA UXO Services on the 14th September 2006, on Lots 80 & 81 Hackett's Road, Geraldton.

As witnessed, a limited field investigation with the support of an electro magnetic Metal detector was carried out by myself over several areas of interest within the area of Lots 80 & 81 Hackett's Road. Those sites that I chose for the limited investigations I considered to be the most likely affected areas if the Department of Defence had in fact, fired explosive munitions onto the property during training exercises in WW11. The sites consisted of elevated features that would have represented good targets for artillery or infantry training exercises, however, after conducting the limited investigative searching, no such evidence (fragmentation from exploded munitions, actual artillery projectiles, mortars or other produce) was located to support this theory. Whilst several items of small arms munitions (a spent 410 shot gun cartridge, .22 calibre cartridge case and a .303 calibre projectile) were found, these were not of military origins, but from normal farm culling/shooting activities. Whilst .303 calibre projectiles would normally be associated with infantry training from the WW11 period, many ex service Lee Enfield .303 Rifles and ammunition stocks were released by the Commonwealth and widely used by farmers and other individuals in the post WW11 period, prior to more stringent licensing and gun controls introduced in the 60s and 70s. Had a quantity of these projectiles been found during the limited search, it would be reasonable to assume that infantry units may have conducted small arms training in the area. This may still be the case however, but as this type of munition is not considered UXO (ball ammunition in small arms manufacture does not contain explosives) no further searching will be required.

After careful consideration, I have now come to the conclusion that this particular region of the Red Peak Artillery Range as identified in the WA UXO Register of former Department of Defence Training Areas – WW11 (Site C-303, N126) poses a minimal risk as far as UXO Contamination is concerned. In this regard, no further searching for UXO is recommended prior to the development of this site. It would appear that the training activities as mentioned in the war Diaries from which the details of the Red Peak area were first identified, are that the risk areas lie more to the east of Lots 80 & 81, in the area stretching between Mount Fairfax, Red Peak and Wokatherra/Yetna on the eastern side of the Moresby Flat Topped Range.

Please be advised that this Office will make recommendations to the Department of Planning and Infrastructure (Geraldton Office) to apply a "UXO Advice Note" only to any referral received for the proposed development of Lots 80 & 81 Hackett's Road, Waggrakine, advising that the risk of UXO contamination is considered to be absolute minimal and that no further searching for UXO is necessary, nor required prior to the proposed development of the site. This "Advice note" will then be reflected in the WAPC Reference: Approval Subject to Conditions, and will be worded similar to the following:

The Fire and Emergency Services Authority of Western Australia (FESA) advises that historical research has revealed that during the past 100 years, former elements of the Australian Defence Forces may have conducted training and/or operational activities within or close to the area of the proposed subdivision. It is possible that as a result of these activities, the subject area may contain unexploded ordnance (UXO). Whilst it is considered that the possible risk from UXO on the land subject to this approval is minimal, an absolute guarantee that the area is free from UXO cannot be given. Should, during subdivisional works, or at any other time, a form or suspected form of UXO be located, FESA has advised that the following process should be initiated:

- 1. Do not disturb the site of the known or suspected UXO;*
- 2. Without disturbing the immediate vicinity, clearly mark the site of the UXO;*
- 3. Notify FESA of the circumstances/situation as quickly as possible; and*
- 4. Maintain a presence near the site until advised to the contrary by a member of FESA, the Western Australian Police Service or Defence Forces.*

Further advice on this issue may be obtained by contacting the Unexploded Ordnance Unit, Fire and Emergency Services Authority of Western Australia

Having said that and despite the sample searching conducted, no absolute guarantee can be given by this Office that Lots 80 & 81 are in fact, completely free of UXO. In the unlikely event that you and your Company locate a UXO or suspect UXO during your research site investigations, please follow the above process and let me know ASAP.

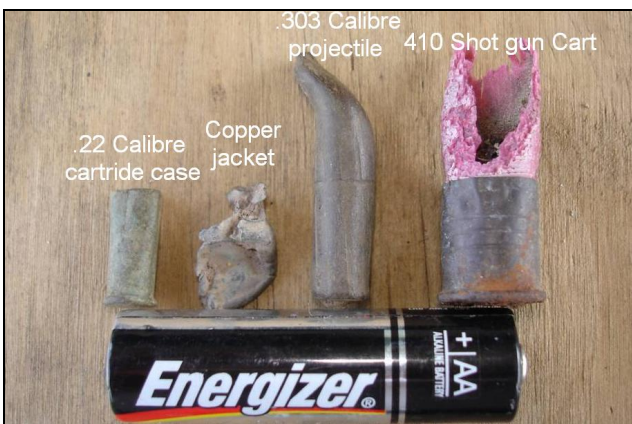
I have included a map on the following page showing the GPS track of most of the vehicle path, and the four search areas investigated for your records.

Again, I thank you for your company whilst on site and look forward to working with you again in the future as I am sure that the occasion will arise where GHD will be involved with other developments within potential UXO sites.

Yours sincerely

Andrew Arnold
FESA UXO LIAISON OFFICER
19 September 2006

**UXO Reconnaissance including limited detector search of several elevated areas
Lots 80 & 81 Hackett's Road, Waggrakine - Geraldton
Conducted by FESA UXO Services on the 14th September 2006**



Items of interest found



View looking south west over Lots 80-81 from top of ridge

Andrew Arnold
FESA UXO Liaison Officer

MORESBY HEIGHTS

LOCAL STRUCTURE PLAN



JANUARY 2014

EXECUTIVE SUMMARY

Location of the Structure Plan Area

The structure plan area is located approximately 10km north east of the Geraldton CBD, 4km from the coast, at the foot of the Moresby Range.

Land uses proposed by the Structure Plan

The structure plan proposes development of the site for predominantly residential purposes, supported by a neighbourhood centre, primary school and public open space. It also proposes areas of regional and district open space, in support of the City of Greater Geraldton's planning strategies and requirements, and a tourism node at the top of the Moresby Range scarp.

Relationship to the Local Planning Scheme

The structure plan has been prepared under Clause 5.17 of the City of Greater Geraldton's Local Planning Scheme No. 5.

Item	
Total area covered by the structure plan	395.1ha
Area of specific land uses	
Residential	187.7
Commercial (Local Centre)	3.5
Primary School	4.0
Rural Residential	68.5
Public Open Space	130.5
Estimated lot yield	1,500 – 2,000
Estimated number of dwellings	1,500 - 2,000
Estimated population (du x 2.6)	3,900 – 5,200
Number of high schools	-
Number of primary schools	1
Estimated retail floor space	4,500-6,500m ²
Estimated employment provided	150-200 ¹
Number and area of public open space	
'Regional' Open Space	79.0
District Open Space	33.7
Local Open Space	19.3

NOTES: 1 - Based on assumption of 3.3 employees per 100m² retail floorspace.

PART 1 – STATUTORY SECTION

TABLE OF CONTENTS

ENDORSEMENT PAGE

TABLE OF MODIFICATIONS

- 1.0 STRUCTURE PLAN AREA
- 2.0 STRUCTURE PLAN CONTENT
- 3.0 INTERPRETATION AND SCHEME RELATIONSHIP
- 4.0 OPERATION
- 5.0 LAND USE AND SUBDIVISION REQUIREMENTS
 - 5.1 Commercial Zone
 - 5.2 Tourist Zone
 - 5.3 Rural Residential Zone
 - 5.4 Residential Zone
 - 5.5 Public Open Space
 - 5.6 Reports/Strategies Required Prior to Subdivision
 - 5.7 Conditions of Subdivision Approval
- 6.0 DEVELOPMENT REQUIREMENTS
 - 6.1 Design Guidelines
 - 6.2 Detailed Area Plans (DAPs)
- 7.0 OTHER REQUIREMENTS

MAP 1 – Local Structure Plan



ENDORSEMENT PAGE

CERTIFIED THAT THE MORESBY HEIGHTS LOCAL STRUCTURE PLAN WAS ADOPTED BY RESOLUTION
OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON

.....

Signed for and on behalf of the Western Australian Planning Commission

.....

An officer of the Commission duly authorised by the Commission pursuant to section 16 of the
Planning and Development Act 2005 for that purpose, in the presence of:

..... Witness Date

AND BY RESOLUTION OF THE COUNCIL OF THE CITY OF GREATER GERALDTON ON

.....

AND THE SEAL OF THE MUNICIPALITY WAS PURSUANT TO THE COUNCIL'S RESOLUTION
HEREUNTO AFFIXED IN THE PRESENCE OF:

.....

Mayor, City of Greater Geraldton

.....

Chief Executive Officer, City of Greater Geraldton

.....

Date

This Structure Plan is prepared under the provisions of the City of Greater Geraldton Local
Planning Scheme No. 5

TABLE OF MODIFICATIONS

Modification No.	Description of Modification	Date Endorsed by Council	Date Endorsed by WAPC

PART 1 - STATUTORY SECTION

1.0 STRUCTURE PLAN AREA

This Structure Plan shall apply to lots 80 and 81 Hackett Road, and Lot 55 Cooper Street, Waggrakine being the land contained within the inner edge of the broken black line shown on the Structure Plan Map (Map 1).

2.0 STRUCTURE PLAN CONTENT

This Structure Plan comprises the:

- a) Statutory section (Part 1);
- b) Explanatory section (Part 2); and
- c) Appendices to Part 2 – Technical reports.

Part 1 includes the Structure Plan Map and provisions which require statutory effect.

Part 2 (and its appendices) justifies and explains the provisions contained in Part 1, and should be used as a reference guide to interpret and implement Part 1. It does not hold statutory effect.

3.0 INTERPRETATION AND SCHEME RELATIONSHIP

Unless otherwise specified in this part, the words and expressions used in this Structure Plan shall have the respective meanings given to them in the City of Greater Geraldton Local Planning Scheme No. 5 (Greenough) (the 'Scheme').

The Structure Plan Map outlines land uses, zones and reserves applicable within the Structure Plan area. The zones and reserves designated under this Structure Plan apply to land within it as if the zones and reserves were incorporated into the Scheme.

Pursuant to clause 5.17.12.2 of the Scheme, if a provision of this Structure Plan is inconsistent with a provision of the Scheme, then the provision of the Scheme prevails to the extent of the inconsistency.

Pursuant to clause 5.17.12.3 of the Scheme, the provisions this Structure Plan apply to the land as if its provisions were incorporated into the Scheme and it is binding and enforceable in the same way as corresponding provisions incorporated into the Scheme.

Part 2 of this Structure Plan and the Technical Appendices are to be used as a reference only to clarify and guide interpretation and implementation of Part 1.

4.0 OPERATION

In accordance with the sub-clause 5.17.12.1 of the Scheme, this Structure Plan shall come into operation when it is certified by the WAPC pursuant to clause 5.17.10.2 of the Scheme.

5.0 LAND USE AND SUBDIVISION REQUIREMENTS

The Structure Plan Map outlines land uses, zones and reserves applicable within the Structure Plan area. The zones and reserves designated under this Structure Plan apply to the land within it as if the zones and reserves were incorporated into the Scheme.

5.1 Commercial Zone

Land use permissibility shall be in accordance with the “Commercial” zone in the Scheme with the exception of the following variations:

<u>LAND USE</u>	<u>PERMISSIBILITY</u>
Aged and Dependent Persons Accommodation	D
Ancillary Accommodation	D
Bed and Breakfast	D
Home Business	D
Home Occupation	D
Home Office	P
Grouped Dwellings	D
Multiple Dwellings	D
Single House	D

‘P’ and ‘D’ shall have the same meaning as within the Scheme.

The ‘Commercial’ site may include retail floorspace up to 6,000m².

5.2 Tourist Zone

Land use permissibility shall be in accordance with the “Tourist” zone in the Scheme with the exception of the following restricted uses which are NOT PERMITTED:

- Aged and Dependant Persons Dwellings
- Fast Food Outlet
- Holiday Home
- Lunch Bar
- Residential Building
- Service Station.

A ‘Shop’ use may be permitted provided it is considered by the local government to be incidental to the predominant use.

Further subdivision of Tourist sites is not permitted except where:

- It has been fully developed, or an approved development plan has been prepared for the whole site, and provision has been made for the coordinated development of the site in accordance with the plan, to the satisfaction of Council; and
- An approved, enduring and enforceable management plan has been prepared to ensure the coordinated management, operation and maintenance of the site as a single tourism entity, to the satisfaction of Council.

5.3 Rural Residential Zone

Subdivision shall generally be in accordance with the Structure Plan Map with a minimum lot size of 1 hectare.

Stocking rates shall not exceed Agriculture Western Australia's standards and in any event no stock is permitted on 'Conservation Lots'.

At the time of subdivision a Detailed Area Plan shall be prepared for each lot and shall address the following:

- Identification of building envelopes and/or building exclusion areas;
- Sitting, materials and finishes for development; and
- Re-vegetation requirements.

For lots other than 'Conservation Lots' a minimum of 3% of the lot shall be re-vegetated, and thereafter maintained to the satisfaction of the local government, with a combination of trees, shrubs and ground covers consistent with the indigenous plant communities identified in the Geraldton Regional Flora and Vegetation Survey. The local government may accept a cash contribution in-lieu of revegetation.

No development or land use shall impede in any way the natural water flow along any creek line or water/drainage course.

'Conservation Lots' nominated on the Structure Plan Map shall be subject to a conservation covenant. The restrictive covenant will protect and preserve remnant or regenerated vegetation in perpetuity and should include among other things, provisions for:

- Prohibit further clearing;
- Clearly delineate a building envelope and/or building exclusion area;
- On-going weed management;
- Prohibit stocking; and
- Rehabilitate unstable/degraded areas with local provenance seedlings.

5.4 Residential Zone

Between 1000 and 2000 dwellings are anticipated within the Structure Plan area.

The Structure Plan Map defines the residential density ranges that apply to specific areas within the Structure Plan area.

5.5 Public Open Space

Public open space shall be provided generally in accordance with the Structure Plan Map and Table 1, with an updated public open space schedule to be provided at the time of subdivision for determination by the WAPC, upon the advice of the City of Greater Geraldton.

Table 1: Public Open Space Schedule

Regional Open Space	79.05 ha
District Open Space	21.16 ha
Neighbourhood Open Space	3.09 ha
Local Open Space	13.87 ha
Conservation	14.85 ha

Public open space management plans required as conditions of subdivision approval (refer 5.7 below) should address:

- Minimisation of clearing and vegetation disturbance during construction;
- Access control (during construction and post-construction);
- Revegetation species (incorporating native plant species with local provenance) and establishment;
- Invasive species control (weeds and pests);
- Stormwater management (including erosion control);
- Ongoing maintenance and management of the vegetated areas;
- Protection and improvement in the environmental condition of waterways and wetlands;
- Bushfire management;
- Interface management; and
- Public education.

5.6 Reports/Strategies Required Prior to Subdivision

Prior to lodgement of subdivision application to create the easternmost Tourist site, a Visual Landscape Assessment and Management Plan shall be prepared demonstrating to the satisfaction of the relevant authority how access to the site is to be provided in a manner which achieves visual integration and appropriate siting.

5.7 Conditions of Subdivision Approval

At the time of subdivision conditions may be recommended, as applicable, requiring the preparation and/or implementation of the following:

- a) Vegetation Management Plan identifying what areas of remnant vegetation are to be retained (the City of Greater Geraldton / Department of Parks and Wildlife);
- b) Bushfire Management Plan for land within 100m of significant areas of remnant vegetation proposed to be retained (City of Greater Geraldton / Department of Fire & Emergency Services);
- c) Public Open Space Landscape and Management Plan (City of Greater Geraldton);
- d) Urban Water Management Plan (including more detailed geotechnical assessment demonstrating soil permeability)(City of Greater Geraldton); and
- e) Waste Water Treatment Plan (in the event that on-site waste water treatment is approved) detailing the location of processing facilities either within or abutting POS (City of Greater Geraldton).

6.0 DEVELOPMENT REQUIREMENTS

6.1 Design Guidelines

Design Guidelines shall be recommended to be prepared as a condition of subdivision, to address the proposed Development Response detailed in section 7.2.1.2 of the Moresby Heights Visual and Landscape Assessment appended to Part 2 of the Structure Plan relating to building placement, design, materials and colours. These may be adopted and implemented as a Town Planning Scheme Policy under Clause 2.2 of the Scheme.

6.2 Detailed Area Plans (DAP's)

Detailed Area Plans shall be prepared and approved in accordance with Clause 5.17.15 of the Scheme for the following sites:

- Commercial site;
- Tourist sites;
- Rural Residential sites; and
- Lots with direct frontage to Public Open Space.

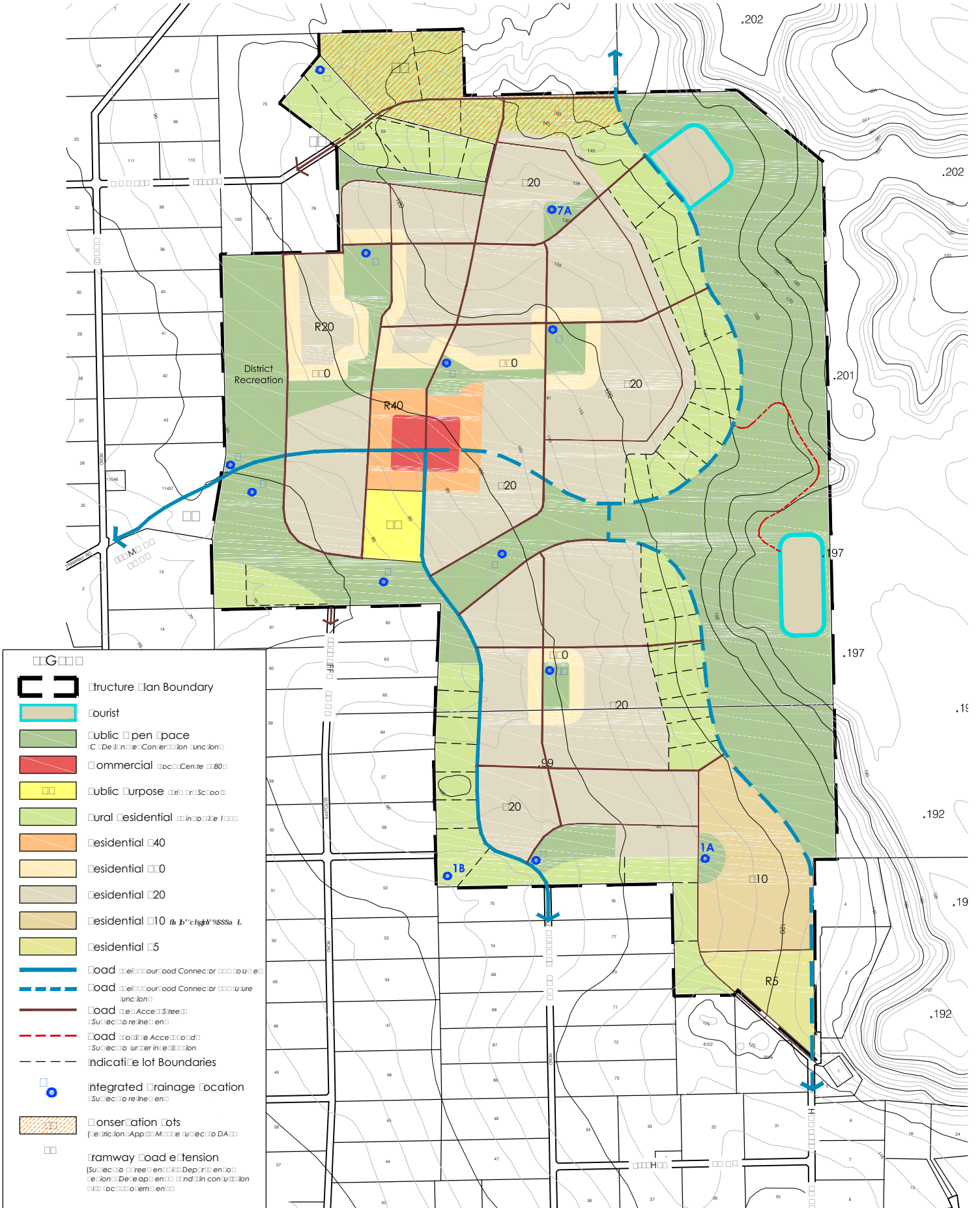
In addition, as a prerequisite to development, the 'Tourist' sites shall be required to prepare fire management plans which incorporate the aspects of bushfire protection, bushfire attack levels on buildings, access and egress to and from the sites in the event of bushfire, managing bushfire fuels adjacent to the sites and, for the site on the top of the Moresby Range, the potential for a shelter in place scenario.

7.0 OTHER REQUIREMENTS

Transfer of the District Open Space area to the City of Greater Geraldton shall occur at or before release of the 200th lot.

At least two permanent roads providing access to the southern portion of the development shall be provided at or before release of the 300th lot.

The construction of the Tramway Road extension to the development shall occur at or before release of the 300th lot. Deferral of the extension requirement up to a maximum of the 600th lot may occur with the approval of the City of Greater Geraldton, should the operation of Chapman Valley Road at the time be at a level acceptable to the City of Greater Geraldton.



PART 2 – EXPLANATORY REPORT

TABLE OF CONTENTS

- 1.0 INTRODUCTION AND PURPOSE**
- 2.0 LAND DESCRIPTION**
 - 2.1 Location**
 - 2.2 Area and Land Use**
 - 2.3 Legal Description and Ownership**
- 3.0 PLANNING FRAMEWORK**
 - 3.1 Zoning and Reservations**
 - 3.2 Regional and Sub-Regional Plans**
 - 3.2.1 Greater Geraldton Region Plan Update 2010 (WAPC)
 - 3.3 Policies**
 - 3.3.1 Moresby Range Management Strategy 2009 (WAPC)
 - 3.3.2 Moresby Range Management Plan 2010 (City of Geraldton Greenough & Shire of Chapman Valley)
 - 3.3.2.1 *Visual Impact Assessment*
 - 3.3.3 General WAPC Policies
 - 3.4 Other Approvals and Decisions**
- 4.0 SITE ANALYSIS**
 - 4.1 Landform, Topography and Soils**
 - 4.2 Conservation and Environmental Values**
 - 4.3 Bushfire Hazard**
 - 4.4 Heritage**
- 5.0 CONTEXT AND CONSTRAINTS ANALYSIS (REFER FIGURE 10)**
 - 5.1 Transport and access**
 - 5.2 Services and Infrastructure**
 - 5.3 Centres and Employment**
 - 5.4 Regional and District Open Space and Community Infrastructure**
 - 5.5 Land Use Context**
 - 5.6 Unexploded Ordinance**

6.0 STRUCTURE PLAN DESCRIPTION

6.1 Overview and Neighbourhood Structure

6.2 Commercial centres

6.3 Natural features

6.4 Street block layout

6.5 Movement network

6.6 Land use (including density and population estimates)

6.7 Schools and Community Facilities

6.8 Public Parklands (Refer Figure 16)

6.9 Urban Water Management

6.10 Infrastructure Coordination, Servicing and Staging

6.11 Visual Integration

7.0 BUSHFIRE MANAGEMENT

8.0 IMPLEMENTATION

FIGURES

Figure 1 - Structure Plan Area

Figure 2 - Location Plan

Figure 3 - Current Zoning (City of Greater Geraldton TPS 5)

Figure 4 - Greater Geraldton Region Plan Update 2010 (WAPC)

Figure 5 - Moresby Range Management Strategy 2010 – Map 8 (WAPC)

Figure 6 - Moresby Range Management Plan 2011 – Plan 3.1 (Shire of Chapman Valley – City of Greater Geraldton)

Figure 7 - Acid Sulphate Soil Overlay

Figure 8 - Vegetation Condition and Location of Priority Flora (Coterra)

Figure 9 - Wetland Locations (Coterra)

Figure 10 - Context and Constraints

Figure 11 - Development Concept

Figure 12 - Road Hierarchy (Jonathan Riley Traffic Consultant)

Figure 13 - Roads for Future Bus Service (Jonathan Riley Traffic Consultant)

Figure 14 - Footpaths and Cycle Paths (Jonathan Riley Traffic Consultant)

Figure 15 - Public Open Space Plan

Figure 16 - Landscape Hierarchy (EPCAD)

Figure 17 - Illustrative Landscape Plan (EPCAD)

Figure 18 - Landscape Concepts (EPCAD)

Figure 19 - Stormwater Catchment Plan (Aecom)

APPENDICES

Appendix 1 - Certificates of Title

Appendix 2 - Moresby Range Design Response (Ferart Design for Shire of Chapman Valley & City of Greater Geraldton, 2010)

Appendix 3 - Visual Impact Assessment Report (EPCAD, August 2013)

Appendix 4 - EPA Comments on Amendment 5 to Local Planning Scheme No. 5 (Oct 2011)

Appendix 5 - Environmental Assessment Report (Coterra, Jan 2013)

Appendix 6 - Traffic Report (Riley Consulting, Dec 2013)

Appendix 7 - Preliminary Engineering Servicing Report (including Local Water Management Strategy) (AECOM, Dec 2012)

Appendix 8 - UXO Clearance (Sept 2006)

1.0 INTRODUCTION AND PURPOSE

This structure plan seeks to provide a comprehensive planning framework to coordinate the subdivision and development of the Moresby Heights estate area (occasionally referred to as the Wavecrest Estate) as a new residential neighbourhood. It is prepared under section 5.17 of the City of Geraldton Greenough's Local Planning Scheme No. 5 and applies to 395ha north-east of Geraldton CBD (refer Figure 1 – Structure Plan Area).

2.0 LAND DESCRIPTION

2.1 Location

The structure plan area is located approximately 10km north-east of Geraldton CBD, on the foot and side slopes up to the Moresby Range, 4km from the coast (refer Figure 2 – Location Plan). It is located within the City of Geraldton Greenough and abuts the Shire of Chapman Valley boundary to the north and east.

2.2 Area and Land Use

The structure plan area totals 395.15ha. The majority is currently used for rural purposes, principally for pasture.

2.3 Legal Description and Ownership

The structure plan area comprises:

Lot No.	Certificate of Title (Appendix 1)	Area	Ownership
Lot 55	CT 136/190A	9.75ha	P J Dossetter & V L Neil
Lot 80	CT 2669/491 and 492	80.69ha	Caversham Property P/L Portstyle Nominees P/L
Lot 81	CT 2670/71, 72 and 73	304.67ha	VJ & JM Newman Seatone Nominees P/L Caversham Property P/L

3.0 PLANNING FRAMEWORK

Key planning instruments applicable to the site are summarised as follows:

3.1 Zoning and Reservations

The site is currently zoned 'Development' under the City of Geraldton-Greenough's Local Planning Scheme No. 5 (Greenough) (refer Figure 3 – Current Zoning). This zoning was put in place to facilitate its development by Amendment 6 to the Scheme, gazetted on 10 August 2012.

A portion of the site is subject to the Moresby Range Special Control Area provisions of Part 6 of the Scheme. This seeks to conserve the landscape values of the Range. Clause 6.3.4 (a) states that the Council may consider supporting development within the area which is responsive to the objective of the SCA, having regard to:

- The siting of the proposed development;
- The design and layout of the proposed development;
- The materials and finishes to be used in the proposed development;
- The protection of remnant native vegetation or revegetation located on the site; and
- The installation and maintenance of vegetation, retaining walls or other works to prevent erosion.

These issues are addressed by the Structure Plan, which is supported by a detailed Visual and Landscape Assessment, and are discussed further below.

3.2 Regional and Sub-Regional Plans

3.2.1 Greater Geraldton Region Plan Update 2010 (WAPC)

The Geraldton Region Plan (incorporating the Greater Geraldton Structure Plan) was adopted by the Western Australian Planning Commission in June 1999 to provide a regional framework to guide strategic planning and development decisions within the area. The Plan recognises that the greater Geraldton area is the focus of commercial and administrative activity for the Mid-West Region and, as such, aims to provide a framework for coordinating development and managing growth of the regional centre.

The Plan was subject to a review and update in 2010 which resulted in the subject site being identified as a Development Investigation Area (refer Figure 4). The text in relation to this Area states that:

- The site's location and proximity to Central Geraldton and the northern coastal corridor will be significant considerations in determining the most appropriate level of intensification;
- Whilst the site is largely cleared, some pockets of remnant vegetation remain;
- The surrounding area is of visual landscape value and any development will need to consider this context and its interface; and

- Any amendment will need to be supported by appropriate environmental studies and address the Geraldton Regional Flora and Vegetation Survey and the Moresby Range Management Strategy.

Development is therefore anticipated, subject to adequate response to key issues, most notably environmental and visual impact. These issues are addressed by the Structure Plan and are discussed further below. The proposal is consequently consistent with the Region Plan.

3.3 Policies

3.3.1 Moresby Range Management Strategy 2009 (WAPC)

The Moresby Range Management Strategy was prepared by the Western Australian Planning Commission and adopted in 2009. It recognises the high landscape significance of the Range, and seeks to:

- Protect, conserve and enhance its natural values;
- Protect the indigenous and non-indigenous cultural values;
- Improve public access and recreation opportunities;
- Manage the risk of erosion and bushfire; and
- Ensure a consistent and coordinated policy approach to the areas planning.

It makes a number of recommendations, some general and some specific in nature. Of particular relevance to this proposal are recommendations 11-17:

- *Ensure land use and development proposals maintain, and, where possible, enhance conservation values associated with the land... Consideration should be given to the potential to create conservation lots.* The recommendation has been complied with through the conservation of the Range face and tops within a reserve, the retention of vegetated areas and key linkages through the site in Public Open Space, and the application of graduating lot sizes and layout in a form responsive to the site's contours and attributes. Revegetation requirements on larger lots and remediation of local open spaces contributed to improved environmental outcomes. Creation of conservation lots is also proposed in the north of the site to allow retention of remnant vegetation on private land;
- Development management measures for land use or development proposals within or adjacent to nature reserves to protect and, where possible, enhance the conservation values of the nature reserve...: This recommendation has been complied with through the requirements for retention of vegetation on key sites, revegetation requirements for larger sites, retention of priority vegetation within local open space, and the requirement for all Public Open Space to be subject to an approved management strategy addressing a range of issues including conservation significance;
- *Promote revegetation of ... corridors identified in map 5...:* No vegetation corridors are identified on the site in map 5 of the Strategy, however an additional corridor or linkage is proposed through the site as part of the LSP to provide both a recreational and environmental link across the site to the Range tops;

- *Ensure that land use or development proposals over land containing or adjacent to an existing or potential vegetation corridor reasonably contribute to the provision and / or enhancement of the vegetation corridor:* as stated above, the site has not been identified as requiring a vegetation corridor however one has been provided as part of the overall open space strategy in part in response to the objectives of the Range Management Strategy. A road is proposed along this as stipulated as the preferred interface in most circumstances by WAPC policy, and revegetation and enhancement of the corridor will be achieved through the development and implementation of a POS management strategy required as a component of subdivision. This City's role in developing and approving all POS management strategies should ensure that its objectives, including those of the Range Management Strategy, are met;
- *Working with land owners, target and prioritise areas for revegetation...:* The landowner has, in this instance, approached and worked with the City to identify and prioritise areas for revegetation, consistent with the intent of this recommendation;
- *Seek expert advice from the DEC, DAFWA and NACC regarding revegetation.....:* Expert environmental scientists Coterra Environments undertook analysis of the site, and sought the input of both the (then) DEC and City in their investigations, the recommendations of which have been incorporated into this proposal. Development of detailed plans for local open space will be undertaken at subdivision in accordance with WAPC processes and the requirements of the Structure Plan. At that time, further input from expert groups as to the detail of works required and species to be used can be undertaken;
- *Implement the recommendation of the Chapman River Foreshore Assessment Report...:* Application of integrated local water management principles should ensure that the development does not adversely affect, and indeed can improve the quality and maintain the quantity of its input into the catchment within which it is situated.

The Strategy Plan for Detailed Investigation (Map 8 reproduced in Figure 5) also indicates that the sideslopes on the subject site should be revegetated, with which recommendation the proposal accommodates. The Plan also indicates an area of 'Priority for Public Recreation' immediately south-east of the site, which outcome the proposal can also contribute to by providing complementary spaces and activities.

3.3.2 Moresby Range Management Plan 2010 (City of Geraldton Greenough & Shire of Chapman Valley)

The Moresby Range Management Plan was prepared for the Shire of Chapman Valley, City of Geraldton-Greenough and the Department of Planning to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range (closest to Geraldton). It has been endorsed by both local governments, but not by the WAPC. Of particular relevance to the site, it defines the boundary of a proposed Regional Reserve incorporating the eastern portion of the site, within and to which rehabilitation and public access are promoted. The document states that current land owners are to receive a fair and reasonable exchange for their land through purchase, land swaps, and development opportunities.

The document also makes recommendations regarding appropriate forms of development to limit visual impact and promote an appropriate interface within the study area, suggesting that:

- the eastern portion of the site forms part of the '*broad landscape features that should be preserved and enhanced*';
- The northern portion of the lot is defined as a '*high visibility area, larger lots typically 2-4ha*';
- The south-western pocket forms a '*lower visibility area, lots typically larger than 1ha*'.

The Plan anticipated development in the area and, as such, this proposal is not at odds with it, albeit contemplating development at a higher density than is notionally indicated in the Plan. This should, however, be acceptable, subject to satisfactory demonstration that this will not undermine the associated objectives of managing the visual impact of new development.

The development proposal assists in achieving a number of other Management Plan objectives including:

- establishment of the Range Reserve, through provision of around 80ha of regional open space in the Range, in addition to local open space within the development;
- provision of public access to the scarp, with establishment of a strong green spine or link through the subdivision to the 'top', providing for integrated pedestrian and cycle access through a landscaped setting. Vehicular access would also be required to provide access to the tourism site, and would be subject to detailed location and site planning;
- creation of recreational opportunities associated with the Range, including walk and cycle trails and potentially other activities associated with the tourism site;
- preservation and enhancement of remnant vegetation within local open space and within the range parkland;
- retention and remediation of drainage lines within green open space links;
- revegetation of open space areas and through provision of landscaping along road reserves and within private land; and
- limitation of visual impact through careful development siting and design, and application of design controls on colours, materials and building location.

3.3.2.1 Visual Impact Assessment

Due to the sensitivity of the site and its relationship to the Range highlighted in the Management Plan, a detailed assessment was undertaken to more comprehensively assess its role in the landscape and the potential visual impact of development (Appendix 3). This was undertaken by EPCAD Landscape Architects and Environmental Planners and concludes that development can occur without detriment to the broader and contextual landscape, subject to application of a number of visual management measures detailed in section 7.2.1 of the report. These have been incorporated in the statutory component of the structure plan and include:

- Siting of higher density areas in areas of least visual exposure, and areas lower density in higher parts of the site;
- Preservation of the Range face;
- Retention of remnant vegetation where possible;
- Revegetation of public open space areas and the planting of street trees;
- Promotion of native plant species in both public and private areas of the site;
- Application of design guidelines to control the use of materials and colours in new buildings to ensure these complement the landscape and are non-intrusive; and
- Separate, detailed assessment of any development proposed on top of the escarpment, and the construction of a road up to it.

3.3.3 General WAPC Policies

A number of more general planning policies and guidelines apply to the zoning, development and subdivision of the land including:

- State Planning Policy 3 – Urban Growth & Settlement (WAPC);
- State Planning Policy No. 3.4 Natural Hazards and Disasters (WAPC);
- Liveable Neighbourhoods (WAPC);
- Planning for Bush Fire Protection Guidelines (Edition 2); and
- Better Urban Water Management Guidelines.

The Geraldton Regional Flora Survey 2010 and draft Biodiversity Strategy also provides useful background information and guidance.

The structure plan and its supporting documents respond to and generally accords with these.

3.4 Other Approvals and Decisions

The rezoning proposal for the site discussed above represents the only relevant and outstanding planning proposal affecting the site. Advice provided by the EPA in relation to the rezoning (provided in Appendix 4) indicated that:

- The environmental report submitted with the scheme amendment adequately documents environmental factors;
- The amendment report and supporting documentation demonstrate consideration of significant values in the area, and advance adequate management to preserve the majority of these values;
- The delineation of Public Open Space should occur, and provision for preparation of a Public Open Space Management Plan/s should be made as part of the site Structure Plan to formalise public open space provision and management measures.

This advice has been addressed in the Structure Plan through the formalisation of open space locations to coincide with areas of environmental value, and through inclusion of a requirement for preparation of management plans for all public open space, with consultation with the Department of Environment and Conservation to occur for those incorporating an environmental function (refer Clauses 6 and 8 of Part 1).

4.0 SITE ANALYSIS

4.1 Landform, Topography and Soils

The site's topography transitions from the flat coastal plain west of the site, through the foot and side slopes to the Moresby Range 'tops' on the very east of the site. Its elevation consequently rises from approximately 75m AHD up to 210m AHD at the highest point of the ranges on the eastern boundary (refer Figure 1). The contours show quite a steep rise in elevation however when viewed from the ground, the slope appears quite gradual, with the exception of the dramatic rise along the eastern edge of the site to the range 'tops' which appear almost cliff-like. The steepest portion of the site is generally not proposed to be developed, with the slope in the development area not posing any significant challenge to development. Access to the tops will, however, require careful analysis to achieve in a form acceptable from both an engineering and visual impact perspective.

Details of soil types are documented in the appended Environmental Assessment report (Appendix 5). It notes that the majority of the site contains primarily colluvial foot slopes, with silty sand over mottled sandy clay soils (WA Geological Survey, 2001, quoted in Coterra, 2010). The escarpment is composed of colluvial formed tallus slope consisting of weathered rock, debris and gravel, shale, siltstone and sandstone with shelly sandy limestone (Coterra, 2010). These soil types are generally suitable for development and on-site effluent disposal, though with some management potentially required for erosion, particularly for the steeper sloped eastern area.

Geotechnical investigations will provide further detail and will inform the development of specific treatments and management strategies to support subdivision.

The site is generally identified as being at low risk of acid sulphate soils, though a small area around the dampland in the south and abutting the wetland in the west of the site poses some risk (refer Figure 7). For the most part, these areas are not proposed to be disturbed, however an Acid Sulphate Soils Investigation is being undertaken to further ascertain the risk, and to determine whether a Management Plan will be required in accordance with the requirements of the Department of Environment and Conservation (DEC) at subdivision stage.

4.2 Conservation and Environmental Values

The Environmental Assessment Report prepared for the site (Appendix 5) found that:

- The site consists of largely degraded agricultural grazing land;
- There is some remnant native vegetation of mixed Thicket of Acacia and Banksia shrub. Much of this has been impacted by historic grazing practices and for the most part, the vegetation exists as overstorey;
- One Priority 1 Flora species (*Melaleuca huttensis*) and one Priority 3 Flora species (*Grevillea triloba*) were located on the site (refer Figure 8);
- One individual *M. huttensis* was recorded within the northwest corner of the site;
- *G triloba* was recorded in three areas in the northern and northwest corners, in the areas classified as being in 'Good' to 'Excellent' condition, at densities of 20%, 5% and patches of 20% respectively;

- There are no recorded Environmentally Sensitive Areas (ESA's) within or near to the site. In addition, no known occurrences of Threatened Ecological Communities are known to exist within the site based on the surveyed vegetation associations;
- The proposed development is expected to have a limited impact on remnant vegetation. Over-storey vegetation will be mostly located within Public Open Space or retained in large covenanted lots, and individual and small clusters of trees will be retained where feasible. All areas with Priority Flora located in them will be retained in Open Space or within the large lots on the north in which vegetation located outside specified building envelopes will be required to be retained (subject to bushfire management requirements);
- Development of the site presents an opportunity to facilitate revegetation through site, open space and streetscape landscaping, with the use of native species promoted. Approximately 30% of the site is proposed for open space under the current Development Concept (discussed below), well above the 10% normally required of residential development, and far in excess of the 0% which could be achieved through maintenance of existing rural use, or even Rural Residential redevelopment. Further detail on precise areas, design, species to be used and management of open space proposed will be developed and submitted to approval agencies as part of the subdivision process;
- There are two seasonal wetlands on the site, located in the south-west and near the western edge of the site (refer Figure 9). The vegetation condition of both was assessed to be between 'Good to Degraded' to 'Degraded' (refer Figure 8). Neither are mapped as wetland areas by the DEC or EPA, and are not identified as having any conservation significance. Nevertheless they are proposed to be retained within open space given they represent natural drainage features and retain some vegetation, albeit degraded, thus retaining some environmental value;
- Three natural drainage lines are present through the site, which have been highly modified due to clearing. The Local Water Management Strategy prepared for the site incorporates these within multiple use open space corridors;
- Fauna habitat is limited across the bulk of the site due to the cleared nature of the site. Habitat for some species would be available in remnant vegetation, particularly in north west corner, however as these are generally degraded with limited understorey, they are of limited value. The vegetation within the very north west corner of the site will be retained outside of designated building envelopes and will not compromise habitat viability;
- Potential foraging habitat for Carnaby's and Baudin Cockatoo is present in some areas of existing vegetation (Coterra, 2011). Retention of these areas is proposed in the Development Concept prepared for the site, limiting potential impact on these species. Regeneration of existing vegetated areas and the provision of additional areas of open space, as well as plantings in road reserves and on private properties present opportunities to improve the environment for these and other native species.

4.3 Bushfire Hazard

A strategic analysis of the site and development proposal has been undertaken by ICS Group, the key findings and recommendations of which are summarised as follows:

- The site is largely cleared but some pockets of remnant vegetation remain;
- Adjoining properties have a mix of native vegetation and cleared land;
- The site has not been declared a Bushfire prone area. Nevertheless, fire does present a risk requiring consideration and response in the detailed planning of the site. Measures might include:
 - Maintenance of a minimum of two access points to development areas;
 - Provision of fire hydrants at appropriate intervals along roads adjacent to development areas;
 - Provision of roads or strategic firebreaks in appropriate locations;
 - Provision of appropriate hazard separation (setbacks) to reduce Bushfire Attack Levels on houses to BAL-29 or less;
 - If required, specific assessment of bushfire protection for on-site waste water treatment infrastructure;
 - Specific assessment of and planning for the proposed tourism facilities;
 - Where appropriate, provision of fire services access to and through open space areas in landscape planning;
 - Development of a bushfire protection plan for the Moresby Range reserve;
 - Consultation with the local government and / or DFES (as the case may be) with regards to the possibility of their wanting to locate a fire station within the development.

These recommendations have been incorporated into the Local Structure Plan where applicable. Further implementation will occur through the subdivision process (at which time more detailed site planning, hydrant placement planning etc will occur).

4.4 Heritage

A search conducted through the Department of Indigenous Affairs Register of Aboriginal Heritage Sites found that there are no sites of Aboriginal significance which have been recorded on the site (Coterra, 2011). The closest registered site is located approximately 3km north-west of the northern edge of the site. It is recognised that the Moresby Range is likely to have significance to the indigenous as well as the non-indigenous community, as is noted in the Moresby Range Management Plan: There is potential for development of the site to incorporate recognition of its cultural significance. This issue can be further considered and addressed in detailed site planning of the proposed tourism site on top of the Range.

There are no other places or features of known significance on the site.

5.0 CONTEXT AND CONSTRAINTS ANALYSIS (REFER FIGURE 10)

5.1 Transport and Access

Private vehicular access represents the most prevalent form of transport within Geraldton and will likely serve as the primary travel mode to and from the site. The landholding has very good access to the existing road network, being just north of Chapman Valley Road with existing access connections to Sutcliffe Road, Arnold Road, Hackett Road and Cooper Street. A further link is proposed through extension of Tramway Road, subject to the agreement of Council. Some upgrading of local roads and intersections is likely to be required to support the development, as detailed in the Traffic Report prepared by Riley Consulting (Appendix 6), and contributions towards regional upgrades of Chapman Valley Road and the North West Coastal Highway may also be required.

Only limited public transport is currently available within Geraldton, and none to the subject site however this development will provide a strong catchment for the extension of services if and when the network is reviewed.

The new Oakajee infrastructure corridor is proposed to run around the back of the Moresby Range, with this site having good access to the port from both it and the Highway.

5.2 Services and Infrastructure

Preliminary investigation of service availability has indicated that all basic utilities should be available to service the site, subject to the usual upgrade requirements (refer Appendix 7). Extension of power, water and telecommunications will be required as conditions of subdivision and will occur as a matter of course. Sufficient water pressure may necessitate the provision of some pressure boosting: this will be confirmed following detailed design, in consultation with Council and Water Corp.

As an alternative to extension of sewer to the site, new sustainable water treatment technology is proposed to deal with waste water. This will see it pumped to one or two local treatment facilities (housed in buildings the size of a residential house – refer below examples) where it will be processed and grey water produced to provide reticulation to public open space. The establishment of this process and licensing of the facilities is subject to strict requirements and guidelines to ensure no risk to public health or amenity, and on-going responsible management of the system. This technology is currently being applied throughout the United States of America with a similar local example approved at Point Grey in Mandurah and at Lancelin. In the current context of water shortages and stretched services, this technology appears likely to become increasingly common, and represents an example of sustainable innovation.



Plates 1 & 2: Example Aqueonics WWT facilities, West Chester PA, & Truckee, CA

Extension of conventional deep sewerage to the site represents an alternative waste water treatment option, though would be likely to come at a high capital cost.

Preliminary geotechnical information suggests that Rural Residential lots will be capable of accommodating septic systems, with detailed investigations currently being undertaken to confirm this.

5.3 Centres and Employment

Geraldton is well provided for regional shopping, services and employments, with residents of the proposed development able to access these. In addition to the Geraldton CBD centre, a district activity centre is proposed at Glenfield Beach, with local facilities at Drummond Cove, Waggrakine, Glenfield and Strathbalyn. A neighbourhood centre is also proposed as part of the structure plan to provide local goods and services on-site. This can provide for a range of local services, such as a small supermarket or local store, GP, hairdressing etc. This will provide for excellent accessibility to convenience goods, reduce travel distances required, and will provide a focal point for the development and locally based social engagement.

The site's proximity to Oakajee is likely to make it attractive to employees at the port, and to mining and other enterprises north and east of Geraldton.

5.4 Regional and District Open Space and Community Infrastructure

Liveable Neighbourhoods states that an average of one primary school is required for 1500 residential lots, and one secondary school per 6500-7000 lots. A primary school is proposed to be provided in a central and accessible location abutting the neighbourhood centre. Consultation with the Department of Education has indicated the proposed plan is acceptable to them.

The City of Geraldton Greenough staff have identified a need for additional district recreation facilities to serve this area. 14ha of open space is consequently proposed along the southern boundary of the site, in close proximity to the proposed primary school and local centre.

No other community facilities have been identified as necessary to support the proposal, though there is potential for a community building to be located within the local centre, if necessary. Less formal but equally important community meeting spaces will be available within open spaces, a possible town square and within quality streetscapes.

5.5 Land Use Context

The site is surrounded by Rural Residential developments to the south and west, which are subject to the Waggrakine Rural Residential Structure Plan. Land to the north and east is zoned Rural and is subject to low intensity agricultural use.

The development of the site for urban purposes will require treatment of these areas to provide a transition in intensity of development. This has been addressed through the provision of rural residential and 'special residential' lots and / or open space around the periphery of the development. Increased traffic on local roads providing access to the site is likely to be of concern to some abutting residents however it will remain within the limits of their current designated function.

The development will essentially represent an expansion of Geraldton city. Its separation from existing urban areas by the Waggrakine Rural Residential area will give it something of a 'village' character, however its proximity to Geraldton means that it will effectively form a suburb of the city.

5.6 Unexploded Ordinance

The site has been identified as having potential unexploded ordinance, because the face of the Moresby Range could possibly have been used for target practice during training in the past. UXO investigations conducted in 2006 by FESA concluded that the site poses minimal risk, and consequently application of a standard advice note on subdivided titles is the only recommendation made (refer Appendix 8).

6.0 STRUCTURE PLAN DESCRIPTION

6.1 Overview and Neighbourhood Structure

The proposed Structure Plan and the Development Concept from which it has evolved (refer Figure 11) provide for development of the site to accommodate:

- 79 ha of 'regional' open space, protecting the Moresby Range tops;
- A neighbourhood commercial centre and abutting Primary School, roughly in the centre of the site;
- Urban residential neighbourhoods both north and south of the neighbourhood centre, with potential for higher density in close proximity to the centre;
- Low density and Rural Residential around the periphery of the residential neighbourhoods, providing for a diversity of lot types and a graduation in density from adjoining rural residential and rural areas;
- An integrated network of parkland throughout the development, protecting areas of environmental significance, providing for integrated urban water management, and providing for local recreation and amenity to service the subdivision;
- 33ha of District Open Space, provided in a linear spine through the development to link to the Moresby Range, and in a consolidated 14ha block in the south of the site, to provide for District Recreation (as requested by the City);
- Two potential tourism facilities, including one on the Range Tops, where a low profile development could be designed to nestle in behind the Range 'edge' where it would be visually unobtrusive, but could benefit from the magnificent ocean views this location affords. In addition to accommodation, the site might also accommodate a cafe or restaurant, or possibly even a small tavern similar to the Mundaring Hotel, which would provide an attraction to the local Geraldton community as well as more distant visitors. The second, lower site appears more suited to eco-chalets or similar self-contained, low intensity accommodation.

The design is based on a 'modified grid' layout, providing an interconnected, legible and walkable area. The centre and school are provided at a key intersection within the subdivision, maximising accessibility and reinforcing their role as a physical as well as psychological centrepiece. Linear open space abutting the centre has been incorporated to protect areas of environmental significance, provide for integration of natural drainage function, create a local community parkland, and to provide a strong open space link or spine running through the site and connecting up with the Moresby Range open space in the east. It will accommodate areas for both passive and active recreation, cycle and walk paths and provide a strong link to through the estate to the Range.

6.2 Commercial Centres

The commercial centre proposed is expected to be of a neighbourhood centre scale (up to 6,500m² of retail, subject to economic viability). It is intended to provide for convenience goods and services such as a small supermarket, hairdresser and the like, as well as providing a community focal point for the estate. It will not compete with the commercial primacy of Geraldton CBD which, 10km from the site, will continue to provide the primary destination for many commercial activities, but it can supplement it, providing local access to daily needs and increasing the self-sufficiency of the estate. It accords with the direction of SPP 4.2

which stipulates that Neighbourhood Centres can service catchments of between 2,000 and 15,000 people, within a radius of approximately 1km.

The centre has been co-located with the estate primary school, district open space and linear park to reinforce its role as an activity centre, in accordance with Liveable Neighbourhoods design requirements. It has also been located at a central cross roads to maximise its accessibility to the neighbourhoods it services.

Its design will be subject to a specific Detailed Area Plan as a condition of subdivision approval.

6.3 Natural Features

The design is highly responsive to natural features, facilitating the creation of a 'sense of place' within the community. The Plan:

- Provides for the protection of the Moresby Range face and tops, and provides for public access to these;
- Integrates natural drainage lines into an open space network, allowing for best practice stormwater management;
- Retains and enhances the local damp lands / wetlands in the southern portion of the site;
- Locates the majority of remnant vegetation within open space or, in the case of vegetation in the very north of the site, on large lots with restricting clearing; and
- Responds to the contours of the land, both with regards to road layout and in the concentration of residential densities in low lying areas and, placement of larger lots in higher areas where they may be more visible.

Earthworks required to implement the plan will be limited, ensuring that the natural topography is respected.

6.4 Street Block Layout

The street network is highly interconnected, building off the existing local network and extending routes in a modified grid through the subdivision. It provides a legible layout with good connectivity for local vehicles, pedestrians and cyclists, whilst avoiding long straight, unbroken routes which encourage high speeds.

The network promotes perimeter block development, creating conventional, safe and attractive streetscapes with good passive surveillance. Cul de sac have been minimised.

6.5 Movement Network

A traffic analysis of the proposal has been undertaken by Riley Consulting (refer Appendix 6).

This has found that:

- The site when fully developed can be expended to generate 16,200 vehicle movements per day, of which about 11,300 can be expected to access the external network;
- Projected traffic increases to the external network indicate that the North West Coastal Highway south of Chapman Valley road will require duplication;
- The intersection of North West Coastal Highway / Cooper Street is probably sufficient in its current layout but is recommended to be modified to include full standard left and right turn lanes;
- The intersection of North West Coastal Highway / Tramway Road will require a full standard right turn lane;
- The creation of four-way intersections on Tramway Road may require provision of small roundabouts or other forms of traffic management;
- Local roads providing access through to Chapman Valley Road can accommodate forecast volumes but may require some upgrading such as provision of kerbs and wider carriageways.

The details and timing of improvements is proposed to be further assessed and determined at subdivision.

The internal road network incorporates two Neighbourhood Connector roads extending from Tramway Road and Arnold Road, through to the town centre. The remainder of the network comprises Access and Higher Order Access Streets (refer Figure 12), though the Hackett Road connection may ultimately develop into a Neighbourhood Connector, should further links providing a continuous route along the foothills of the Moresby Range be developed as is recommended by the Moresby Range Management Plan. The majority of roads are expected to carry less than 1000 vehicles per day, with all but one (the Tramway Road extension) expected to carry less than 3000vpd. Indicative minimum cross sections for predominant street types are provided in Figure 12 – 17 of the traffic report, though will be subject to further development at subdivision.

The road network is in the form of a modified grid which provides for excellent levels of accessibility and permeability.

Traffic signals are not anticipated as necessary within the development however priority controls will be necessary in some locations. The details of treatment will be determined in consultation with the City as part of the subdivision planning process.

Provision for possible future bus services to the site is proposed through the provision of a wider (7.2m carriageway) route through the subdivision (refer Figure 13) however there is currently no timeframe for or commitment to the provision of such a service by PTA.

Provision for pedestrians and cyclists is proposed through:

- Recommended placement of footpaths on both sides of the road where traffic volumes are anticipated to exceed 1000 vehicles per day (refer Figure 14);
- Provision of shared paths as an alternative to on-street cycling on Neighbourhood Connectors.

Additional recreational walking and cycling routes are proposed through open space as part of the landscape planning process. Provision of some public parking to service the key terminus to this network (most likely abutting the village centre) may be appropriate.

6.6 Land Use (including density and population estimates)

The land use breakdown provided for by the structure plan is as follows:

TABLE 1: Land Use Schedule – Moresby Heights Local Structure Plan, January 2013 (2118-100E-01)

	Lot 55 (ha)	%	Lots 80 & 81 (ha)	%	Sub-Total (ha)	%	Total (ha)
GROSS AREA (GA)	9.75		385.40		395.15		395.15
Non Residential Land Uses (NRLU)							
Wetlands	0.00		1.51		1.51		
High School	0.00		0.00		0.00		
Primary School	0.00		4.00		4.00		
Village Centre	0.00		3.50		3.50		
Tourist	0.00		8.30		8.30		
Rural Residential	2.86		65.64		68.50		
Total NRLU	2.86		82.95		85.81		85.81
GROSS RESIDENTIAL AREA (GRA) [GA less NRLU]	6.89		302.45		309.34		309.34
Public Open Space							
Required @ 10%	0.69		30.25		30.93		30.93
Gross Open Space Proposed	0.00	0.00	130.52	43.16	130.52	42.19	130.52
Credit Open Space Proposed (refer POS Schedule)	0.00	0.00	124.40	41.13	124.40	40.22	
POS Surplus to 10%	-0.69		94.16		93.47		94.16
NET RESIDENTIAL AREA (NRA) [GRA less POS]	6.89		171.93		178.81		178.81

The Plan provides for approximately 2000 dwellings, at the following densities:

	Lot 55 (ha)	Lots 80 & 81 (ha)	Total Zoned Area (ha)	Assumed Yield / Ha¹	Estimated Yield
Rural Residential	8.77	65.64	68.50	As per LSP	45.00
Residential R5	0.00	5.99	11.90	3.00	35.71
Residential R10	0.00	15.40	15.40	5.00	77.00
Residential R20	0.00	129.60	129.60	10.38	1345.25
Residential R30	0.00	14.70	14.70	17.33	254.75
Residential R40	0.00	7.00	7.00	21.67	151.69
Total	8.77	238.33	247.10		1909.40
Notes:					
1. Assumes 20%, 25%, 25%, 32.5%, 35% & 35% respectively for roads etc, and av lot areas of 1ha, 2500m ² , 1,500m ² , 650m ² , 375m ² and 300m ² respectively.					

This yield estimate equates to a density yield of around 5 dwellings per gross hectare or 11 per net residential hectare. The yield per gross hectare is relatively low because of the high proportion of open space incorporated.

Actual yields are likely to vary this estimate, particularly if the market dictates larger lot sizes (as current indications suggest is probable), however it provides a reasonable indication of what could occur.

This could cater for up to 54,963 people assuming an average of 2.6 persons per household (as per 2011 national average).

Areas of higher residential density have been concentrated around the Neighbourhood Centre, maximising accessibility to local amenities as well as limiting visual impact (this area being identified as least visually intrusive). The lowest density areas have been located around the periphery of each neighbourhood, where they:

- Contribute to lot and lifestyle diversity;
- Provide for reduced visual impact;
- Allow for increased tree cover;
- Provide a transition to abutting rural and rural residential sites, reducing land use impact; and
- Allow for retention of vegetation, particularly on the lots in the very north of the site, where vegetation is to be retained through covenant.

6.7 Schools and Community Facilities

Based on the estimated lot yield, one primary school has been provided abutting the centre, in the middle of the development. This should service the entire subdivision.

Geraldton Senior College and John Willcock College will service secondary education demand, supplemented by private facilities.

The Department of Education and Training has indicated support for this proposal.

The nominated school site is 4ha in area, is surrounded by streets on three sides and abuts the linear open space spine on the fourth (east) side. The site is flat, highly accessible and meets the requirements of Liveable Neighbourhoods.

6.8 Public Parklands (Refer Figure 15)

A total of 130ha of public open space (POS) is shown in the Structure Plan. This substantially exceeds the 31ha required under WAPC Policy, but allows for:

- Retention of the Moresby Range side slopes and tops within a 'regional' park (approx. 79ha);
- Incorporation of a linear POS spine running through the estate from Tramway Road to the Range (approx. 15.5ha);
- Provision of 14ha of District Recreation, as requested by the City; and
- A network of local open space, providing for good access to parkland for all residents, and retention of remnant vegetation and environmental features in several locations (approx. 22ha).

Open space provision is illustrated in Figure 15 and is calculated against Liveable Neighbourhoods requirements in the Table 3, overleaf, which demonstrates provision well in excess of the minimum requirement, even if full credit is not extended to drainage areas outside the 1:1 year event swale area.

Precise areas and locations of POS may be refined at subdivision.

Sites with a 'conservation' function nominated provide for retention of some remnant vegetation and, within POS P3 and P11, the retention and enhancement of wetlands as part of integrated drainage areas. Those where the conservation function is more significant are designated as 'Conservation' in the LSP.

Development of the linear parkland and local open spaces (totalling around 37ha) would be required as a condition of subdivision under WAPC Policy, with the details of landscape treatment to be determined as part of POS Management Strategies required prior to development. It is, however, intended that open space:

- Retain remnant vegetation where feasible;
- Incorporate integrated drainage lines and swales;
- Provide for grassed areas, natural areas, recreational use and play equipment;
- Address state and local government requirements in regards to maintenance, and local government and / or DFES (as the case may be) requirements in relation to bushfire management.

TABLE 3: Public Open Space Schedule – Moresby Heights Local Structure Plan, January 2013
 2118-105-01 (based on Plan 2118-121-01 & Aecom LWMS Rev.C)

	Lot 55	Lots 80 & 81	Total LSP Area (lots 55, 80 & 81)	TOTALS
	(ha)	(ha)	(ha)	(ha)
Site Area (SA)	9.75	385.40	395.15	395.15
Less:				
Environmental Exclusions (EE)				
Wetlands ¹	0.00	1.51	1.51	
Total Environmental Exclusions	0.00	1.51	1.51	
Net Site Area (NSA = SA - EE)	9.75	383.89	393.64	
Less:				
Deductions (ha)				
High School	0.00	0.00		
Primary School	0.00	4.00	4.00	
Village Centre	0.00	3.50	3.50	
Tourist	0.00	8.30	8.30	
Rural Residential	2.86	65.64	68.50	
Deductions Subtotal	2.86	81.44	84.30	
Gross Subdivisible Area (GSA = NSA - Deductions)	6.89	302.45	309.34	309.34
Public Open Space Required @ 10% GSA	0.69	30.25	30.93	30.93
Public Open Space contribution (ha)				
May comprise:				
Minimum 80% unrestricted Public Open Space	0.55	24.20	24.75	
Maximum 20% restricted use Public Open Space	0.14	6.05	6.19	
Unrestricted Public Open Space sites (ha)				
P1 - Moresby Regional Parkland	0.00	79.05		
P2 - Linear Open Space (incorporating conservation function, excluding drainage area) ³	0.00	5.05		
P3 - Linear Open Space 2 (incorporating conservation function, excluding drainage area & wetland)	0.00	8.16		
P4 - District Recreation (excluding drainage area)	0.00	13.66		
P5 - Local Park (excluding drainage area)	0.00	4.63		
P6 - Local Park (excluding drainage area)	0.00	2.36		
P7 - Neighbourhood Park (excluding drainage area)	0.00	0.38		
P8 - Neighbourhood Park (excluding drainage area)	0.00	0.81		
P9 - Local Open Space (incorporating conservation function) ³	0.00	2.50		
P10 - Neighbourhood Park	0.00	0.38		
P11 - Local Park (incorporating conservation function, excluding drainage area & wetland)	0.00	1.23		
P12 - Neighbourhood Park	0.00	0.15		
Total Unrestricted Public Open Space sites	0.00	118.36	118.36	

Restricted Public Open Space sites ²				
P2 drainage area (catchment 3)	0.00	2.19		
P3 drainage area (catchment 2 & 4)	0.00	3.39		
P4 drainage area (catchment 5)	0.00	0.50		
P5 drainage area (catchment 6)	0.00	1.05		
P6 drainage area (catchment 7)	0.00	0.67		
P7 drainage area (catchment 9)	0.00	1.54		
P8 drainage area (catchment 7A)	0.00	0.38		
P10 -drainage area (catchment 2A)	0.00	0.80		
P11 drainage area (catchment 1)	0.00	0.75		
P12 drainage area (catchment 1A)	0.00	0.90		
Total Restricted Public Open Space sites	0.00	12.17	12.17	
Gross Public Open Space Provision	0.00	130.52	130.52	
Credited Public Open Space Provision (= Restricted Open Space plus up to 20% Unrestricted Open Space)	0.00	124.40	124.54	124.54
Surplus Open Space Provision	-0.69	94.16	93.61	

Notes:

- 1: Wetland areas as mapped in Landgate
- 2: Areas subject to inundation in 20% AEP Storm Events (1:5year events). Credit actually available to 1:1 year event, but calculation not yet available. To be detailed at subdivision.
- 3: Conservation Open Space: credit given to be determined at subdivision in consultation with Local Authority.

A landscape hierarchy and some indicative illustrations are provided in Figures 16-18.

The central linear open space is particularly significant for the development, providing for both a physical and psychological link to the Range, and encouraging better access to it, as so strongly promoted in the Moresby Range Management Strategy.

The City will be responsible for the development of the playing fields and any associated infrastructure, given that this facility services a much wider area than the development alone, and that the 14ha area is being given up above and beyond the requirements of WAPC POS requirements. Similarly, revegetation of the Range Reserve is proposed to be allocated to the Council and DEC, or the Range Management Authority proposed under the Moresby Range Management Plan. Again, this is because this regional open space provides a regional rather than local amenity, with its provision free of cost more than meeting the proponents' responsibilities. All other POS areas are expected to attract the standard requirement for development in accordance with an approved management strategy, as per WAPC policy.

6.9 Urban Water Management

A Local Water Management Strategy (LWMS) has been prepared by AECOM to support the Structure Plan (Appendix D to the Preliminary Engineering Services Report – Appendix 7). The LWMS:

- Responds to the Better Urban Water Management Guidelines (DoW 2008b) as well as Council requirements and WAPC policies;

- Applies Integrated Water Cycle Management principles, including holistic consideration of all water resources in planning, sustainable and equitable use of water sources and whole of catchment integration of natural resource use and management;
- Proposes nine catchments (and 4 additional sub-catchments) and provides preliminary calculations for the storage requirements of each (to be incorporated into public open space) – refer Figure 19; and
- Confirms that development and implementation of the Strategy recommendations will occur through more detailed Urban Water Management Plans which will be prepared to support subdivision.

The Strategy generally reflects City of Greater Geraldton guidelines in relation to basin sizing however it should be noted that these conservatively assume that the ability of lots to dispose of stormwater on-site will be limited. As such, they incorporate a high assumption for lot and POS drainage, in addition to the usual road drainage. Preliminary information suggests that on-site permeability and water table levels will not inhibit the ability of lots to dispose of stormwater on site, and lot sizes are not so small as to restrict this either. It is therefore likely that basin sizes and infrastructure will be reduced to substantially reduce the private lot and POS component in the development of Urban Water Management Plans at subdivision, when detailed geotechnical (including deeper test pits) and lot size information will be available to confirm the appropriateness of this.

6.10 Infrastructure Coordination, Servicing and Staging

Preliminary investigation of servicing opportunities and constraints has been undertaken, as documented in Appendix 7. This confirms that upgrades to existing infrastructure will be necessary to service the development. Service agencies have indicated that upon approval of the site's rezoning or, in some cases, the structure plan, they will undertake the necessary planning to determine the details of service provision, and upgrades required. These may include a requirement to boost water pressure through installation of new or upgrade of the existing water tank on Hackett Road, to be determined in consultation with Council and Water Corp. The responsibilities and procedures for service provision are well established through the respective agencies.

Application of new waste water treatment technology, if this is pursued in lieu of conventional deep sewer, will require that all necessary approvals are in place (namely approval from the Economic Regulation Authority and Council approval for the development) prior to development. Additionally establishment of a binding and on-going operating agreement will be necessary. In principle agreement on this has already been reached with the City. Finalisation of the agreement should be a condition of subdivision. Location of the water treatment plant/s is proposed to be within open space, most probably in the west, at the bottom of the catchment, and will be subject to development approval. Because of the small size and self contained nature of these facilities, and the absence of odour issues generated by them, their location and development should not have any impact on surrounding areas.

The landscaping of local open space areas will be the responsibility of the developer as per Liveable Neighbourhoods requirements. The landscaping of POS areas will be undertaken in accordance with plans approved by the City, following consultation with the DEC, as documented in Part 1.

A preliminary indication of anticipated staging for early releases is detailed in Appendix C to Appendix 7, which will see development of Low Density / Special Residential areas in the south of the estate occur first, supplemented by a proposed Stage 2 just west of the Neighbourhood Centre. Further stages are planned to the north of this, abutting the District Recreation, providing for a range of residential lots types. Development of the Centre is planned as early as commercially feasible.

Provision of district recreation areas and Moresby Range Reserve are planned to occur prior to or upon completion of Stage 1, with Part 1 specifying that it is to occur prior to or upon creation of the first 200th lot, or as otherwise agreed between the City and the landowner.

To ensure adequate access and appropriate traffic management:

- Secondary access (additional to Hackett Road) is required at or before release of 300 lots;
- Extension of Tramway Road will be required at or before release of 600 lots.

6.11 Visual Integration

Visual impact measures have been incorporated into the structure plan in two ways:

- Firstly the design and layout limits impact by:
 - Retaining most of the Range side slopes and the tops in their natural form;
 - Locating more dense development within the lower, least visible portion of the site;
 - Locating larger lots are on the higher, more visible portions of the site; and
 - Making provision to retain much of the remnant vegetation.
- Secondly, statutory provision has been made in the LSP text to require:
 - Development and application of guidelines governing colours and finishes;
 - Landscaping and streetscaping with appropriate plant species to soften the impact of development; and
 - Detailed design assessment of those elements with greatest potential for visual intrusion, namely the tourism sites, and the access road to the eastern of these.

The plan was prepared with reference to the detailed Visual Impact Assessment conducted of it as part of the early planning process for the site, and has been subsequently reviewed by Epcad to ensure compliance.

7.0 BUSHFIRE MANAGEMENT

Fire management measures have been incorporated in the Structure Plan through:

- Provision of multiple access points to and through the development;
- Location of road interface abutting open space; and
- Incorporation of requirements in the Part 1 statutory provisions or as part of routine conditions of subdivision approval requiring:
 - Provision of detailed Fire Management Plans at subdivision;
 - Provision of fire hydrants at appropriate intervals along road;
 - Incorporation of fire access and planning within open space design and management; and
 - Application of AS3959 design requirements on buildings within bushfire prone areas.

8.0 IMPLEMENTATION

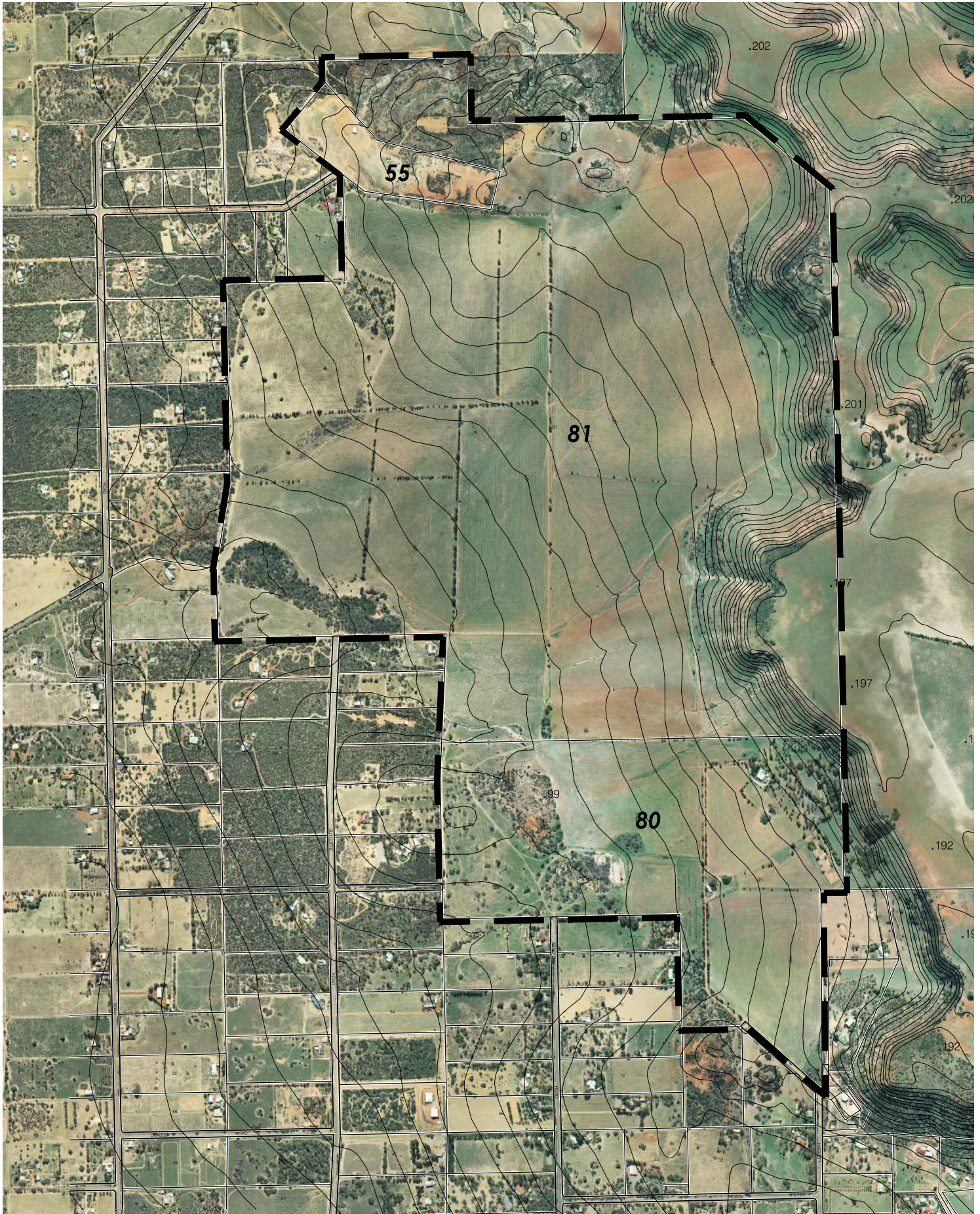
Implementation will be staged over a number of years (estimate 10-20). Construction is proposed to commence in the south of the site, taking access from Hackett Road. Provision has been made in the structure plan to ensure adequate provision of access to the development as it expands, as per the Traffic Report.

Provision of more detailed information in relation to service provision and design, and open space will occur as a matter of course, as part of the subdivision process, and will be enforced through standard subdivision conditions.

Schedule 1: Summary of Consultation

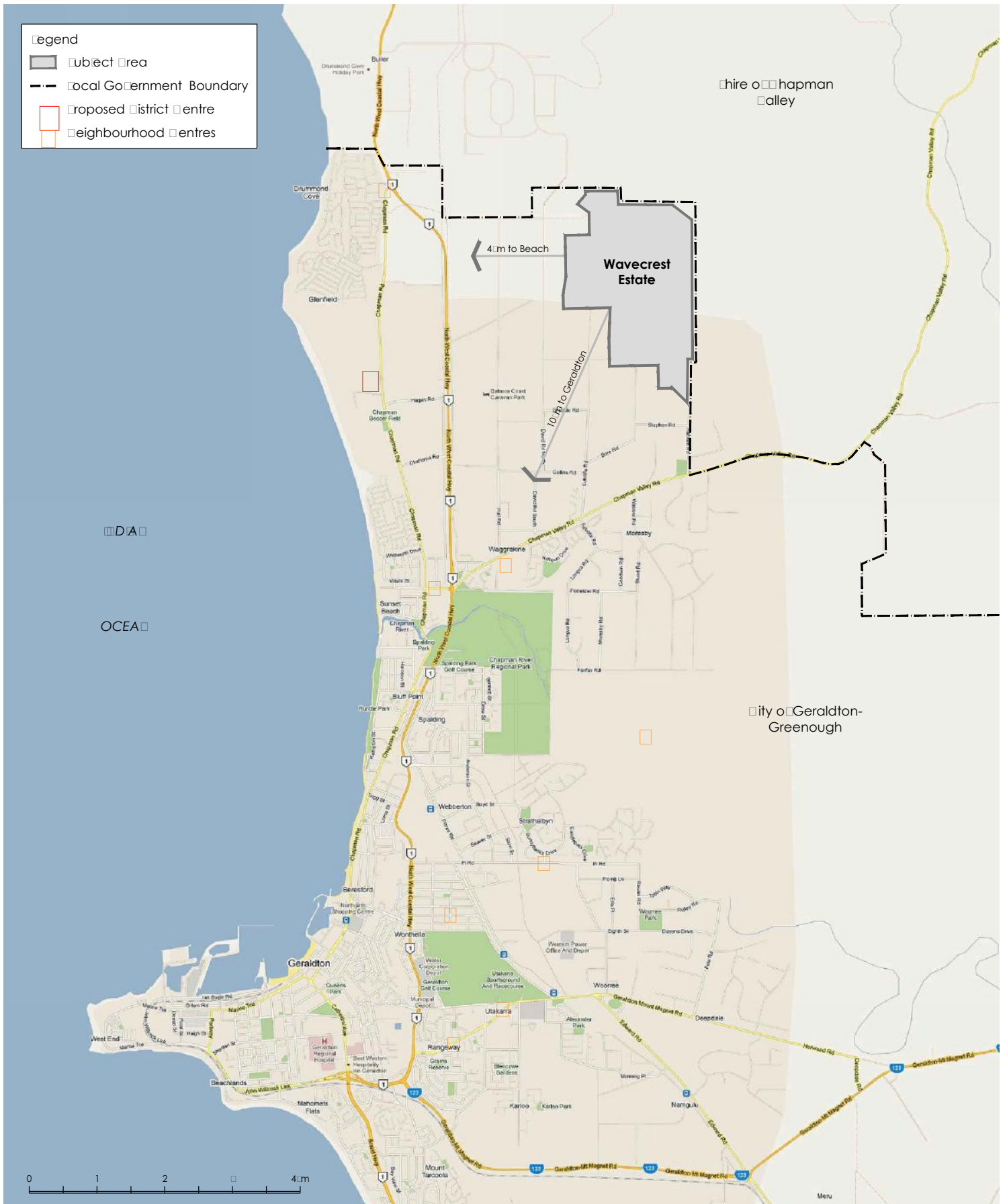
Agency	Date/s	Summary of Outcomes
Local Government	Various inc 22 Nov 2011, 10 May 2012, LSP consultation meeting 10 th May 2012, LSP update meeting 14 August 2012, March-Dec 2013	Incorporation of Lot 55 into plan, modification to residential densities, reconfiguration access to Rural Residential lots south of POS 3, conduct of preliminary geotech to confirm soil permeability. Earlier input into Development Concept, prior to rezoning. Input into draft LSP including requirement for additional assessment of visual impact, modifications to text, designation of Conservation areas and review of traffic estimates.
Dept of Planning	Various inc. 1 May 2012	Provision for the requirement of detailed POS Schedules as a component of subdivision to be included in LSP.
Dept of Water	January & February 2012	Kerry Wray, Simon Rodgers: LWMS to be submitted
Dept of Environment & Conservation	May 2011 - Amdt	Desire to retain majority remnant vegetation, particularly priority species, possible Carnaby habitat, retention & rehabilitation of Range desirable, POS management important.
Dept of Education	17 Nov 2011	1 Primary School on site acceptable. Size appears acceptable, though subject to confirmation of lot yield. Location & layout appear acceptable, subject to confirmation of grades (flat site required) and ability to extend roads around all four sides if required. Further comment to be provided following more detailed review of plan.
Western Power	Nov - Dec 2011	Feasibility Study supplied as documented in Engineering Services Rpt
Alinta Gas		Atco gas consulted August 2011 (response February 2012). WA Gas Network & Origin Energy consulted late 2011 as potential alternative suppliers.
Water Corporation	Nov 2011	As documented in Preliminary Engineering Services Rpt – Waste Water Planning yet to be undertaken for the precinct. Process for alternative service provider documented.
Telstra	Early 2012	N/A – Subject to NBN Co. – consulted early 2012
FESA (now DFES)	19 & 20 Oct 2011	Identification of key risks and strategies inc minimum setback distances for houses, density & building control, access & vegetation management
Adjoining landowners	Nov / Dec 2011 June 2012	Consultation as part of rezoning process. Provision of alternative development options and discussion with HLD occurred June 2012. Owners provided preferred concept through the City (March 13) which has been incorporated in LSP.

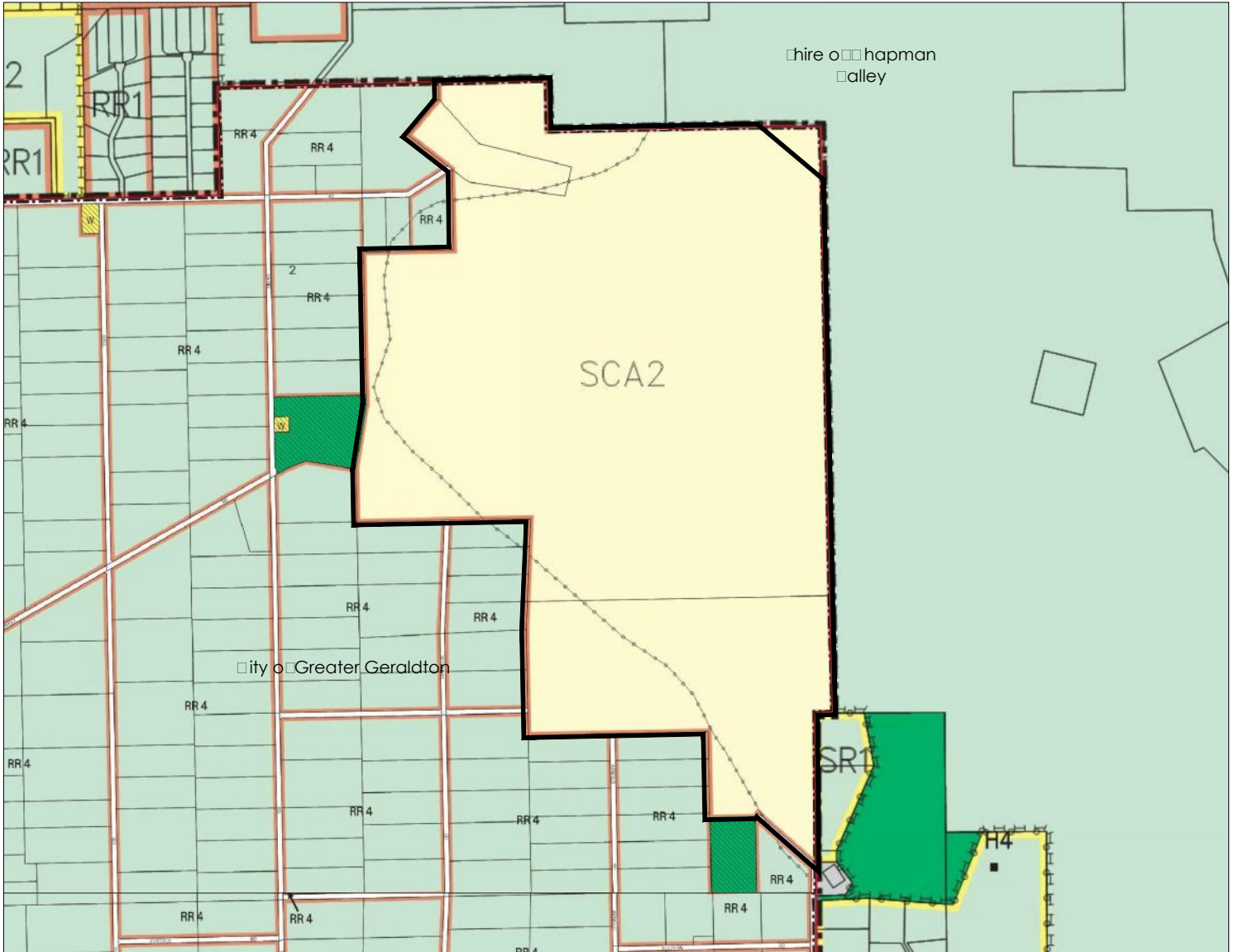
FIGURES



STRUCTURE PLAN AREA (AERIAL IMAGERY)







LEGEND

LOCAL SCHEME RESERVES

MAJOR ROAD	ROAD
NATURE RESERVES	WATERWAY
PARKS AND RECREATION	<input type="checkbox"/> B <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
PUBLIC PURPOSES	
PUBLIC PURPOSES DENOTED AS FOLLOWS:	
A AIRPORT	
C CIVIC	
CE CEMETERY	
CF&F CONSERVATION OF FLORA & FAUNA	
CP CAR PARK	
D DRAINAGE	
FF FIRE FIGHTING	
G GRAVEL	
H HALL	
HS HIGH SCHOOL	
M MUSEUM	
P PRISON	
PS PRIMARY SCHOOL	
PS/HS PRIMARY & HIGH SCHOOL	
RD RUBBISH DISPOSAL	
TS TRIG STATION	
W WATER	
WP WESTERN POWER	
RAILWAY	

ZONES

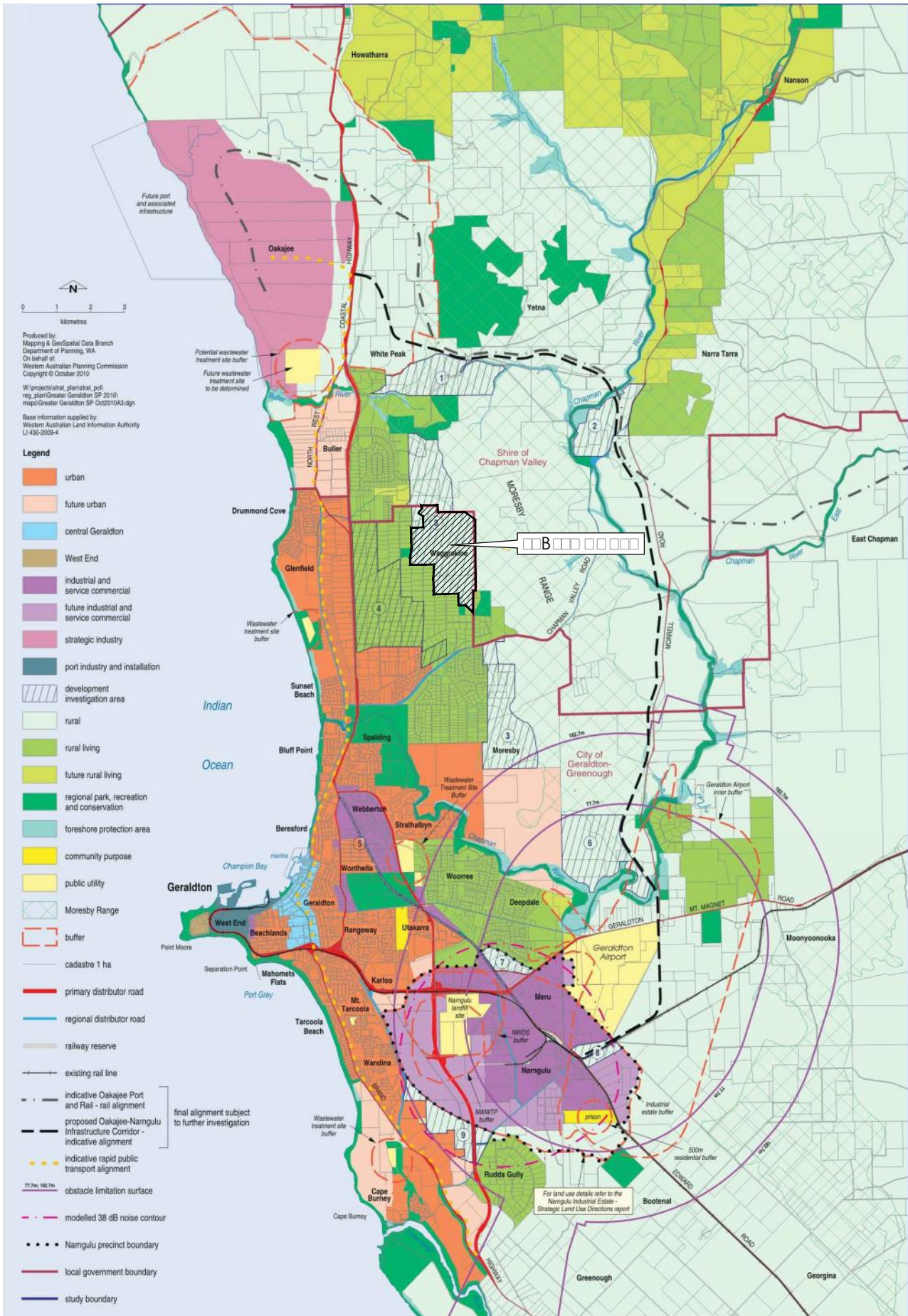
DEVELOPMENT	LIGHT INDUSTRY
RESIDENTIAL	DUNE PRESERVATION
TOURIST	RURAL
COMMERCIAL	RURAL RESIDENTIAL
HIGHWAY COMMERCIAL	RURAL SMALLHOLDING
SPECIAL USE	
CIVIC AND CULTURAL	
GENERAL INDUSTRY	

OTHER

R CODES	SCA-NARNGULU WASTEWATER TREATMENT PLANT
RESTRICTED USES	SCA-NARNGULU WASTE DISPOSAL FACILITY
SCHEME BOUNDARY	SPECIAL USE AREA (SEE SCHEME TEXT)
LOCAL GOVERNMENT BOUNDARY	RURAL RESIDENTIAL AREA (SEE SCHEME TEXT)
TOWNSITE -- LAND ACT	RURAL SMALLHOLDING AREA (SEE SCHEME TEXT)
SPECIAL CONTROL AREA - MORESBY RANGE LANDSCAPE	
SPECIAL CONTROL AREA - GREENOUGH HERITAGE	

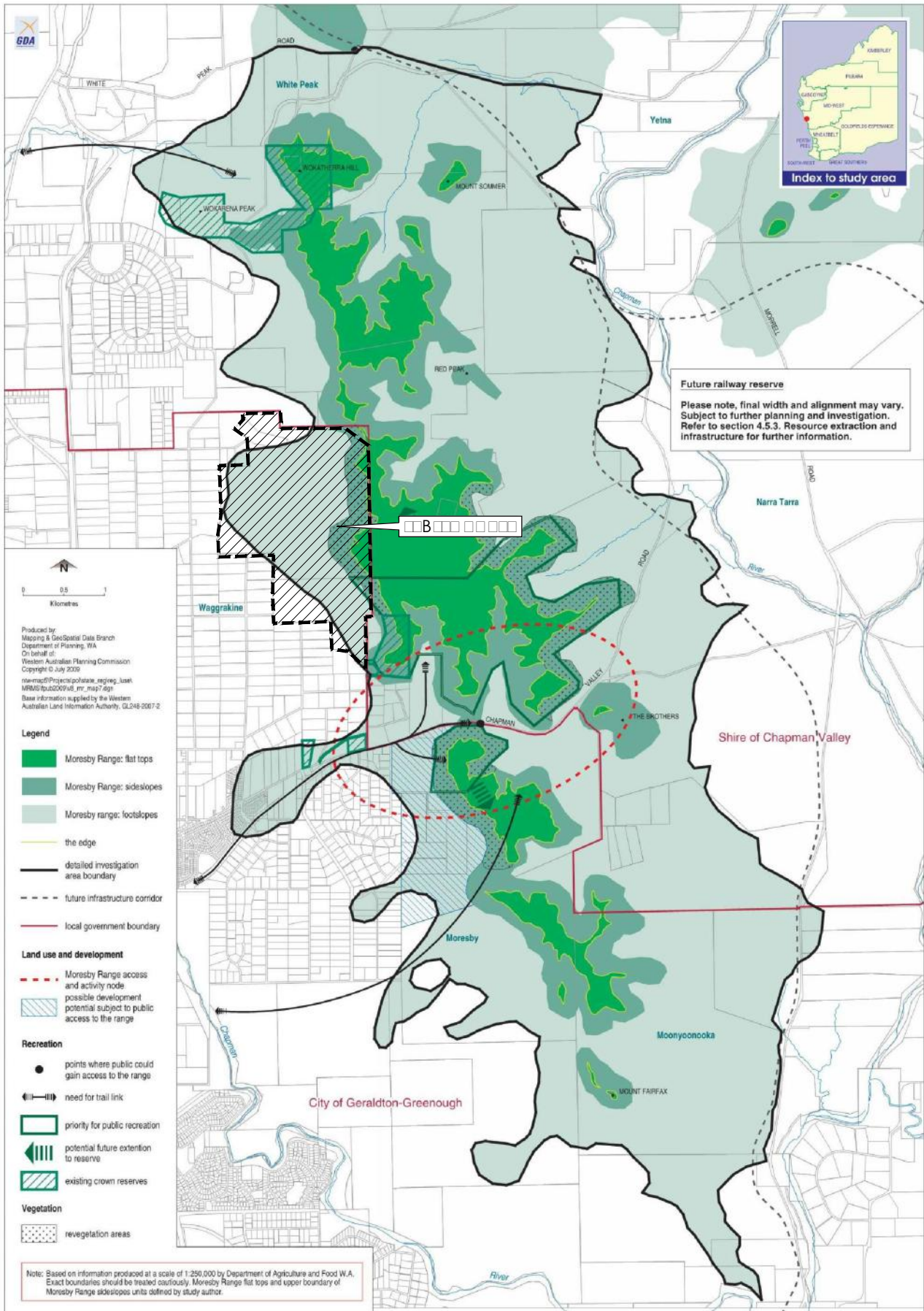
CURRENT ZONING - CITY OF GREATER GERALDTON TPS No.5





GREATER GERALDTON STRUCTURE PLAN UPDATE 2010





MORESBY RANGE MANAGEMENT STRATEGY 2010
-STRATEGY PLAN FOR DETAILED INVESTIGATION AREA



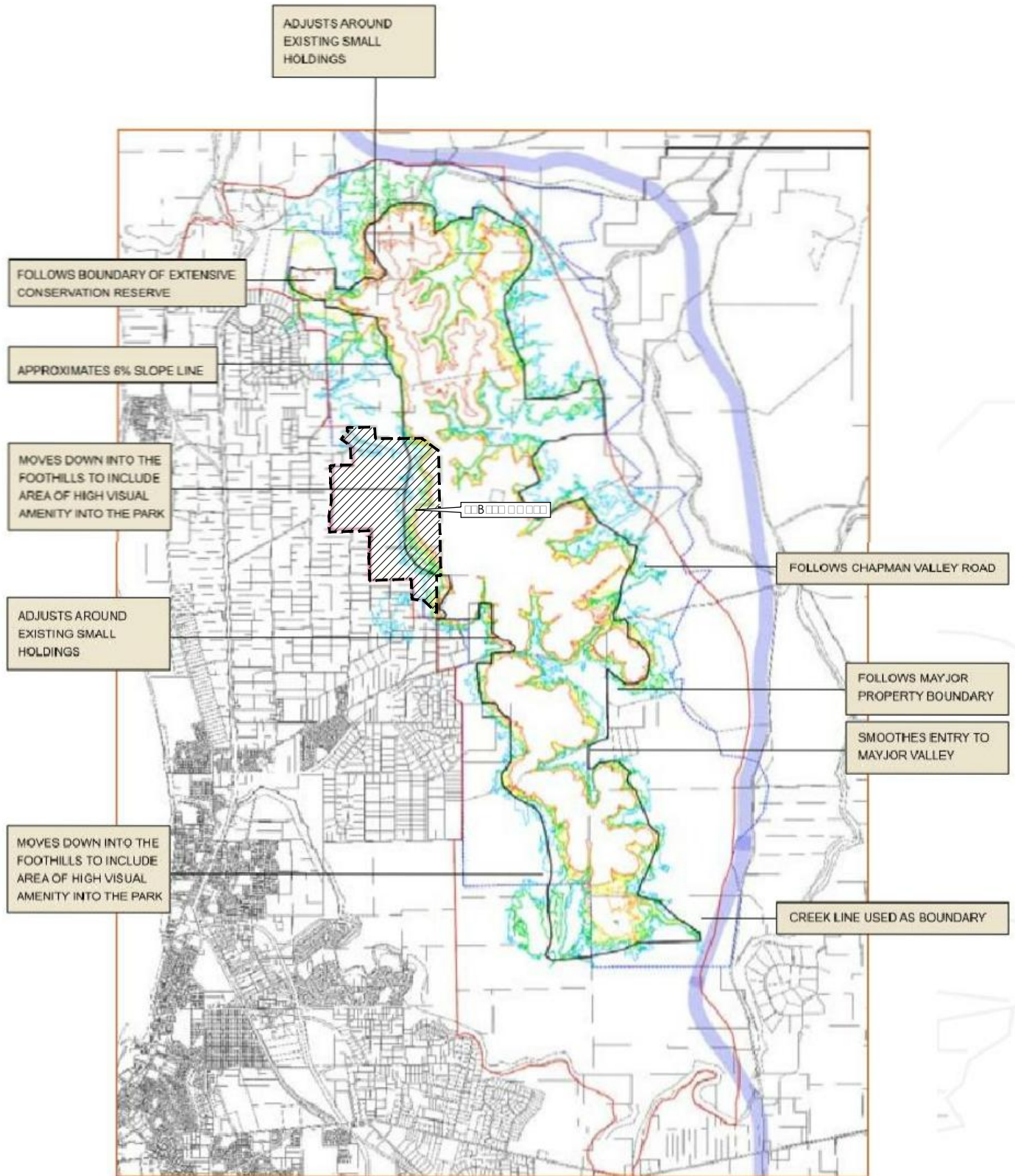
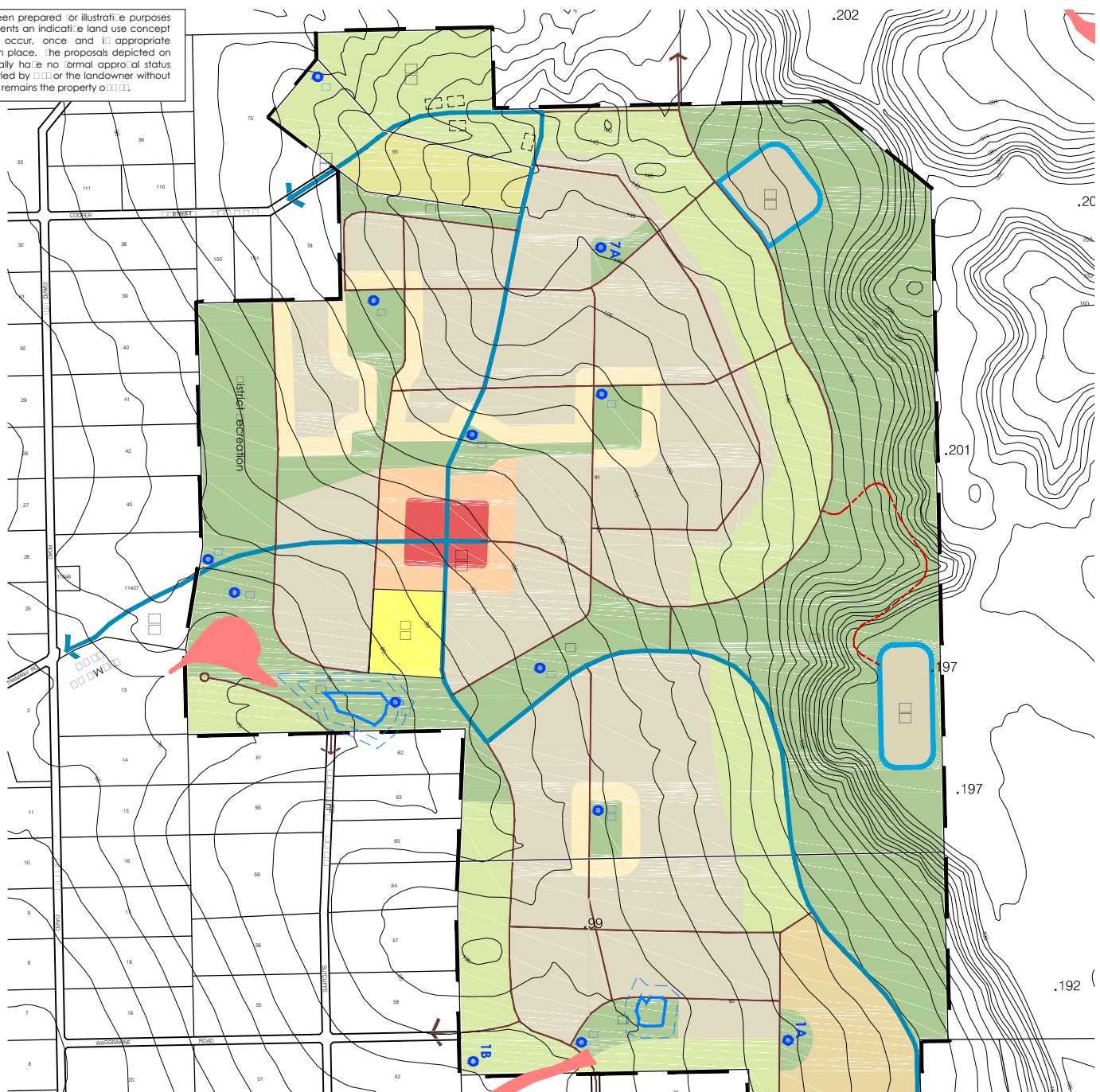


Figure 03.1 The Range Precinct boundary with examples of how the criteria in Section 3.2 were applied to identify the boundary.

- Cadastre — Study boundary ····· Original study boundary — Range Precinct boundary
- Oakajee Narngulu Infrastructure Corridor at June 2010
- Slope classes — 5% — 6% — 7% — 8% — 10%

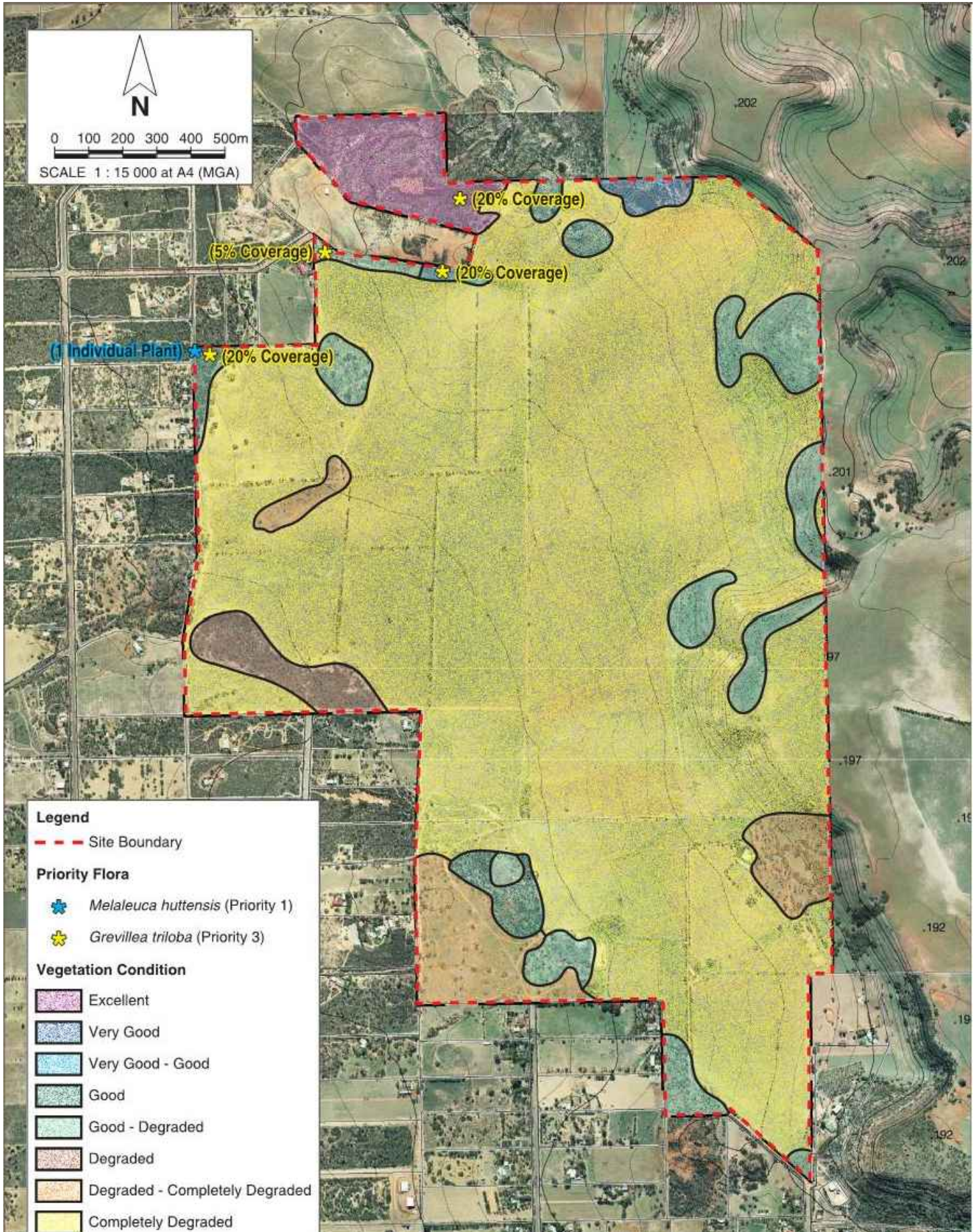


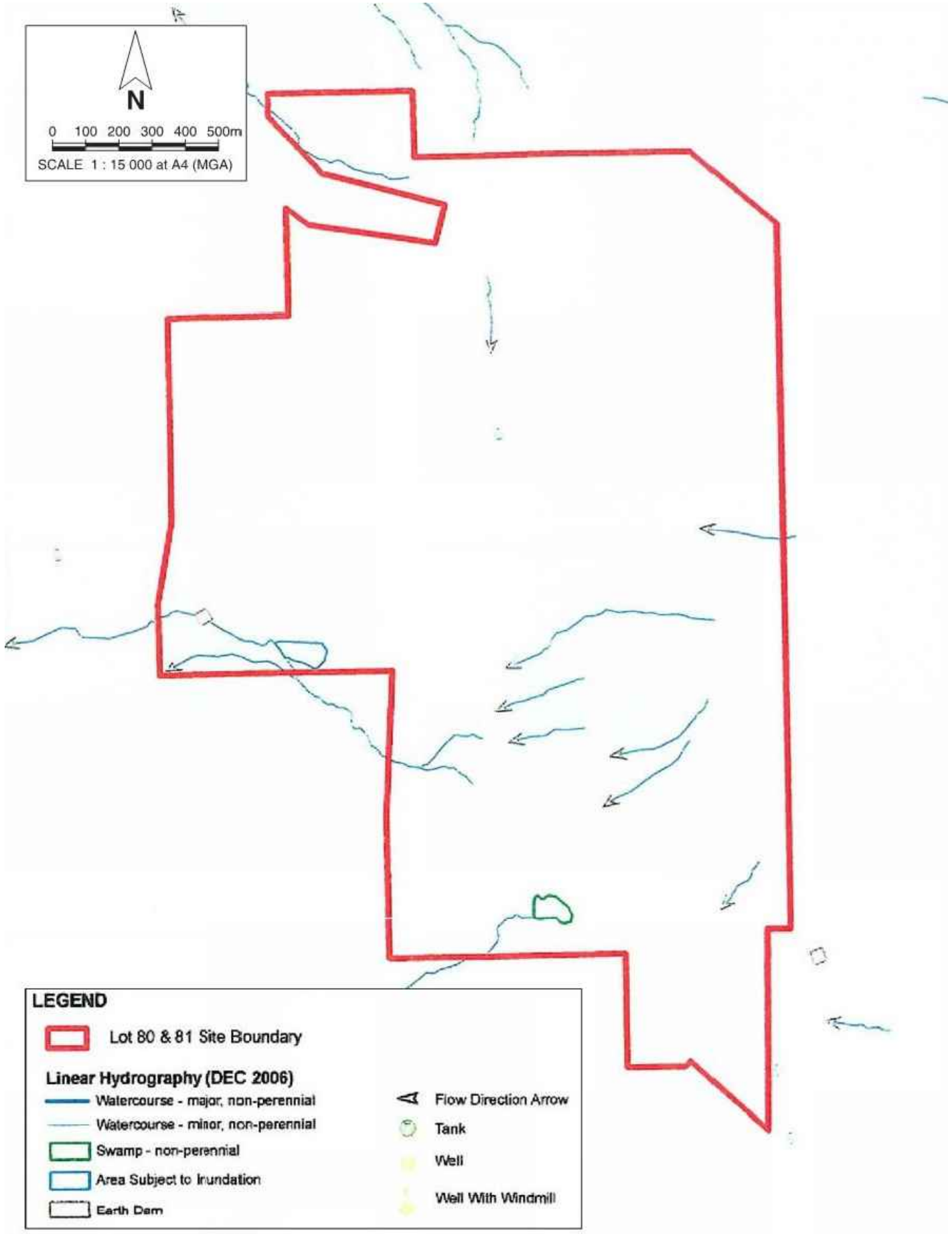
This plan has been prepared for illustrative purposes only and represents an indicative land use concept of what may occur, once and if appropriate approvals are in place. The proposals depicted on this plan generally have no formal approval status and can be varied by the landowner without notice. This plan remains the property of CLE.

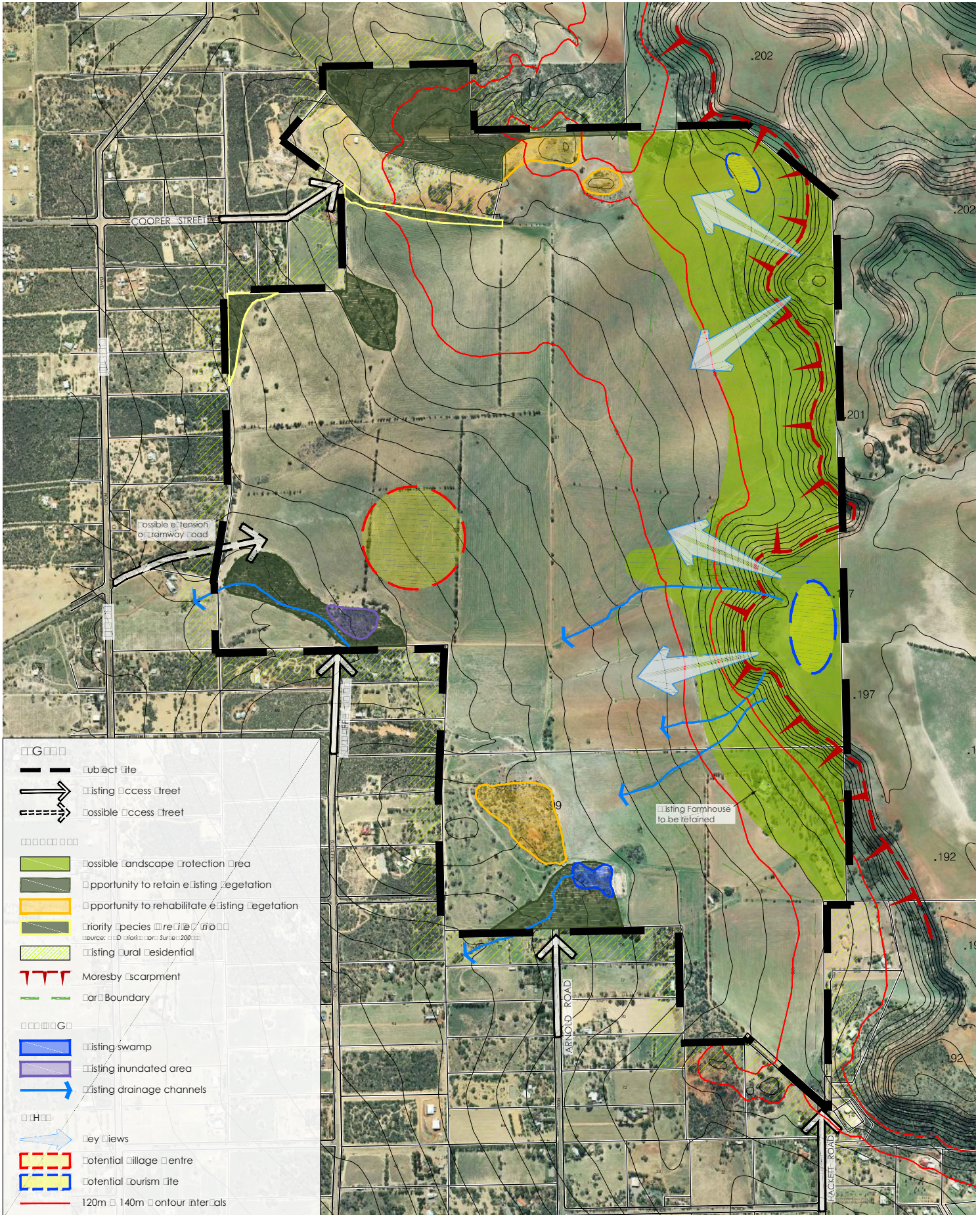


	Public Open Space		Structure Plan Boundary
	Tourist		Road (Local Road Connector)
	Public Open Space		Road (Access Street)
	Commercial (Centre Zone)		Road (Access Street)
	Public Purpose (Primary School)		Road (Access Street)
	Rural Residential (Medium Density)		61 (X) 9b Yc d Y f # S S a L
	Residential R40		Integrated Drainage Location
	Residential R10		Conservation Lot
	Residential R20		Detailed Area Plan required
	Residential R10		Cooper Street Extension
	Residential R5		Tramway Road Extension
	Acid Sulphate Soils		





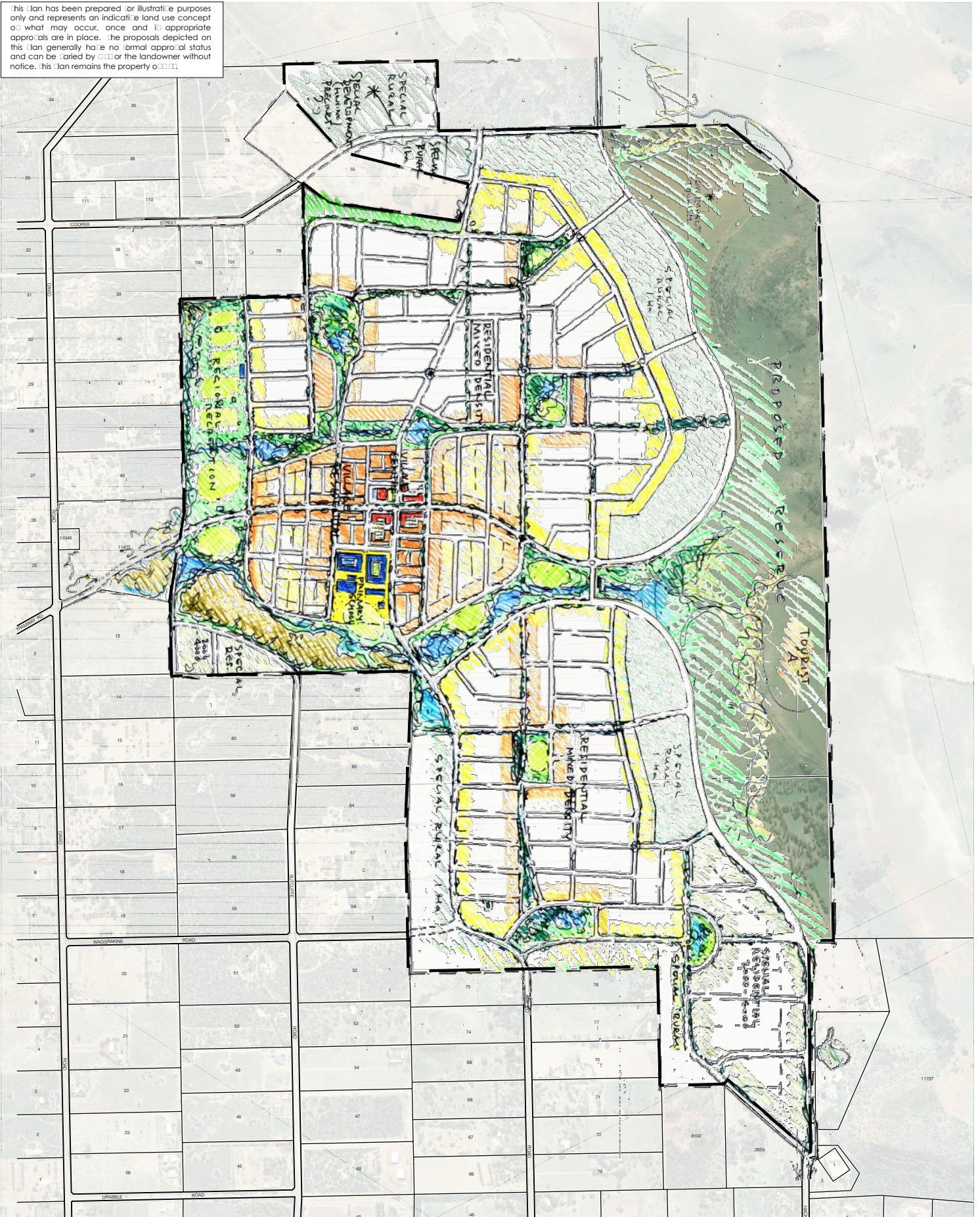


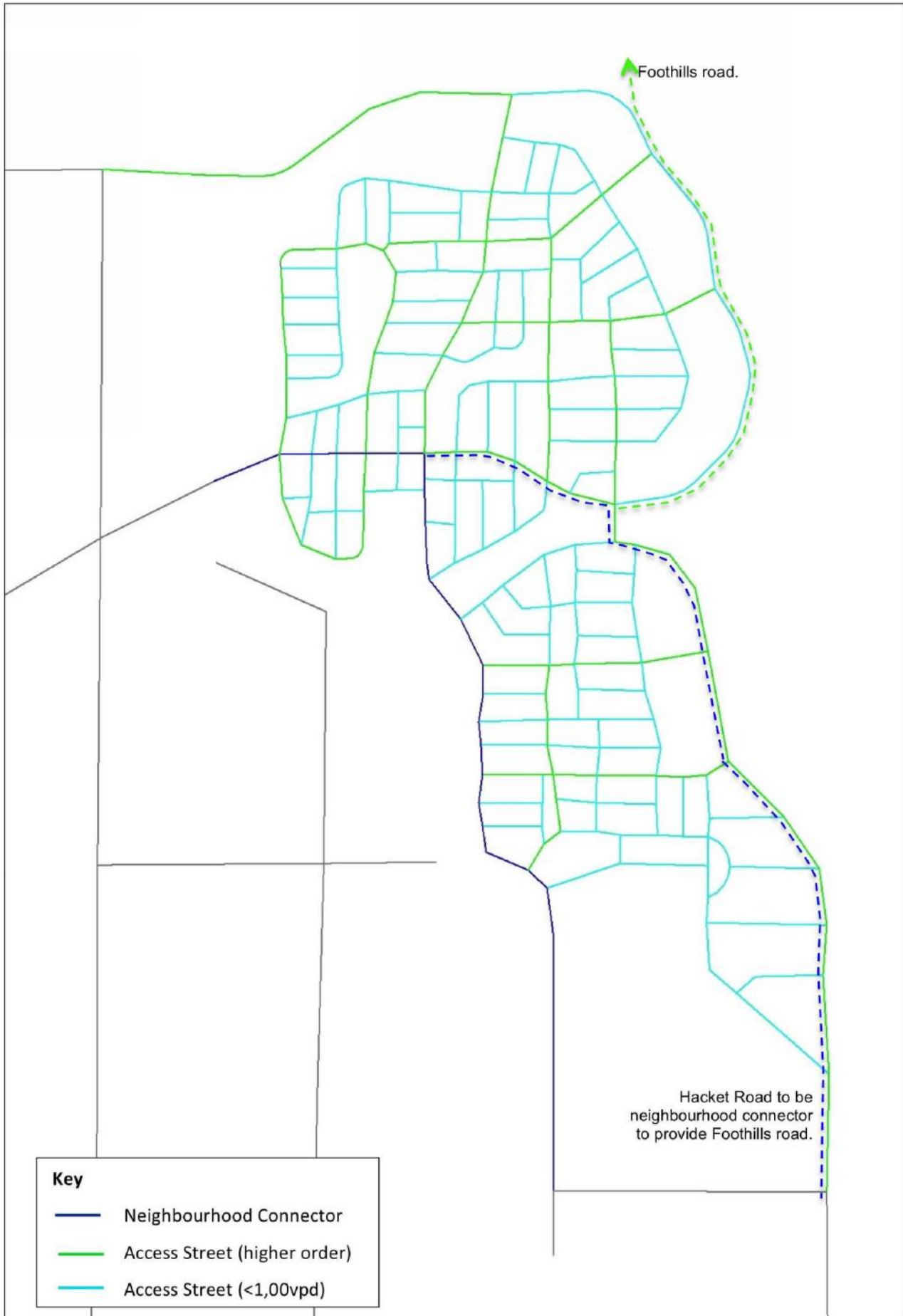


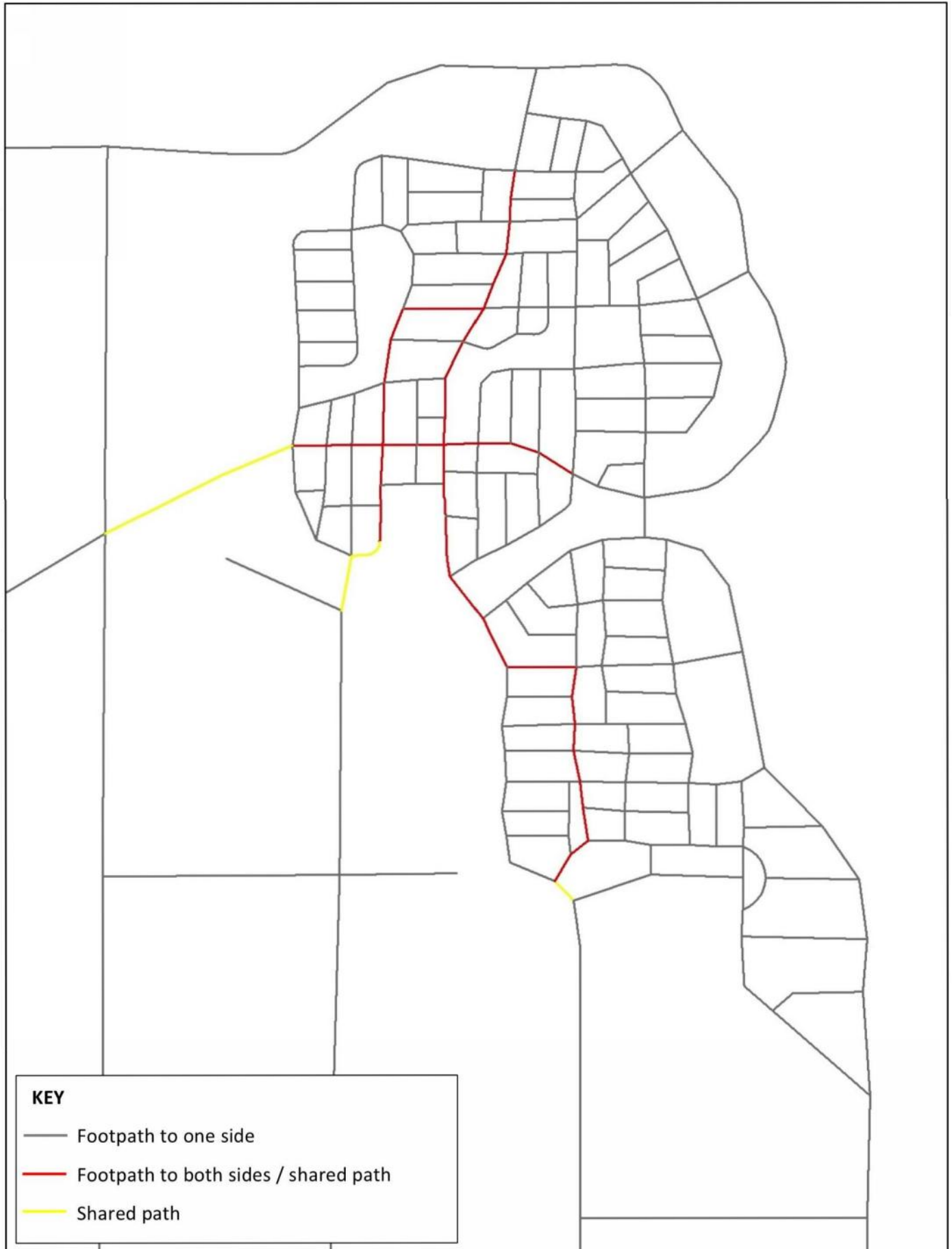
CONTEXT AND CONSTRAINTS



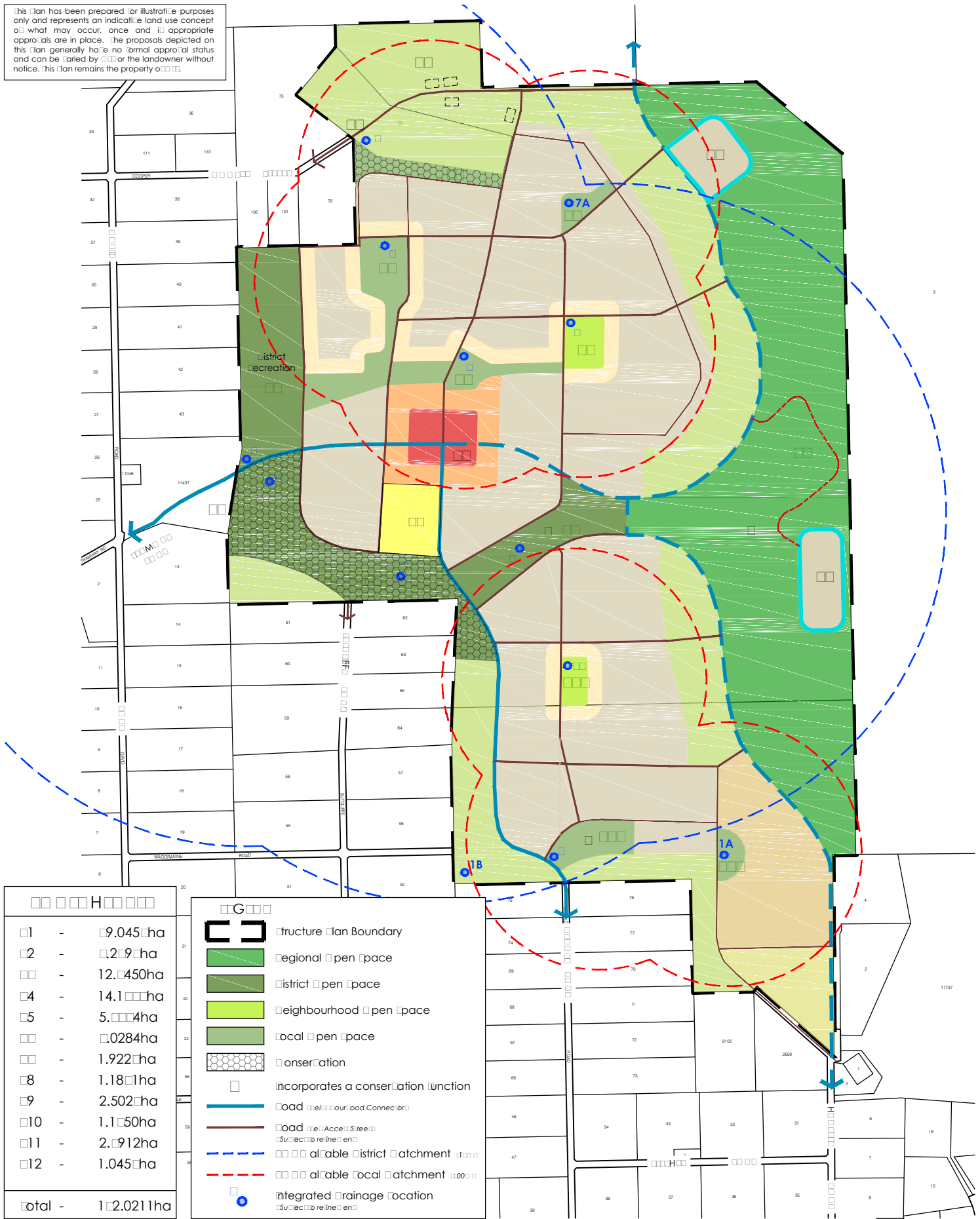
This plan has been prepared for illustrative purposes only and represents an indicative land use concept only. What may occur, once and where appropriate approvals are in place. The proposals depicted on this plan generally have no formal approval status and can be varied by the Council or the landowner without notice. This plan remains the property of CLE.







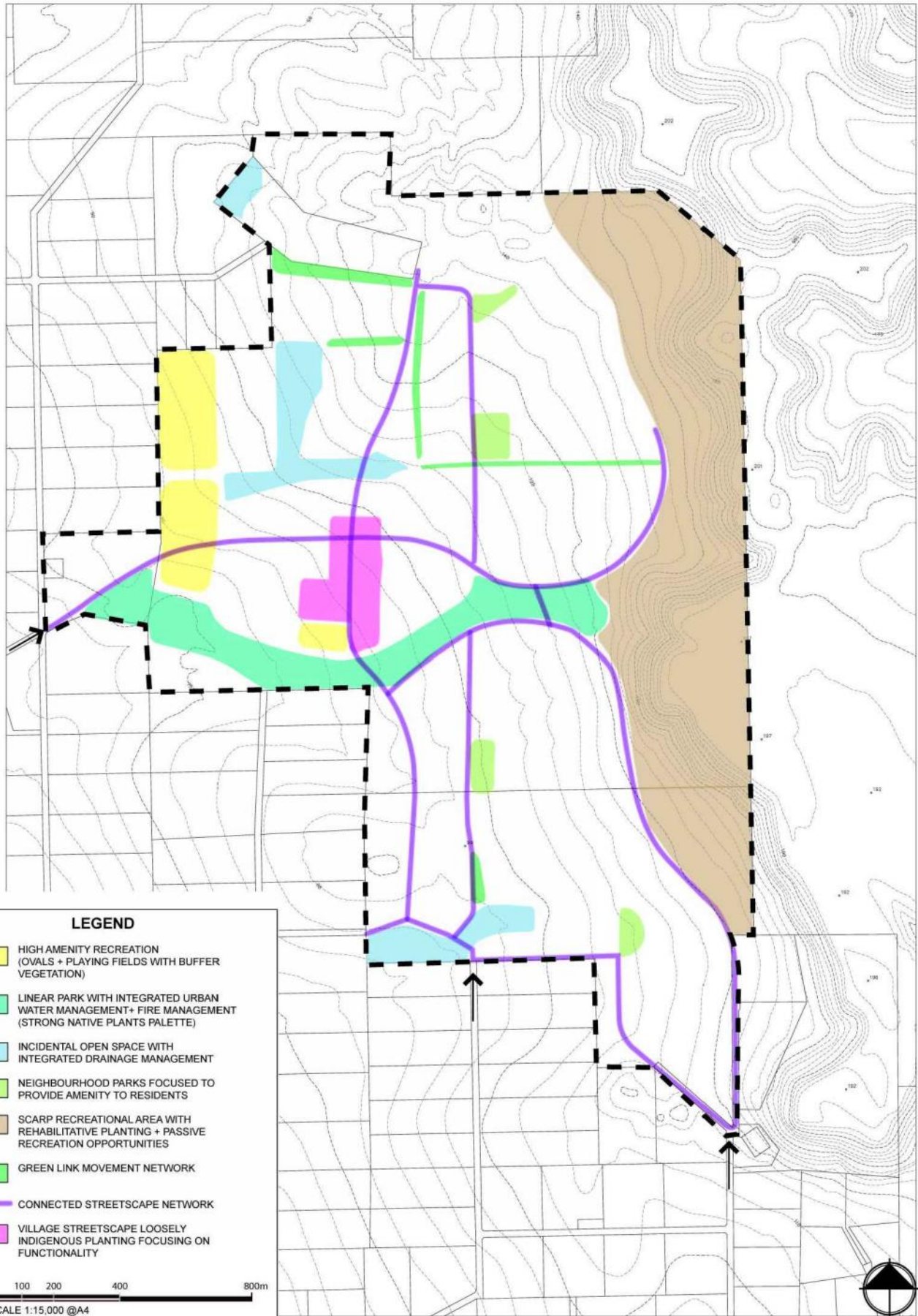
This plan has been prepared for illustrative purposes only and represents an indicative land use concept of what may occur, once and if appropriate approvals are in place. The proposals depicted on this plan generally have no formal approval status and can be varied by the council or the landowner without notice. This plan remains the property of CLE.



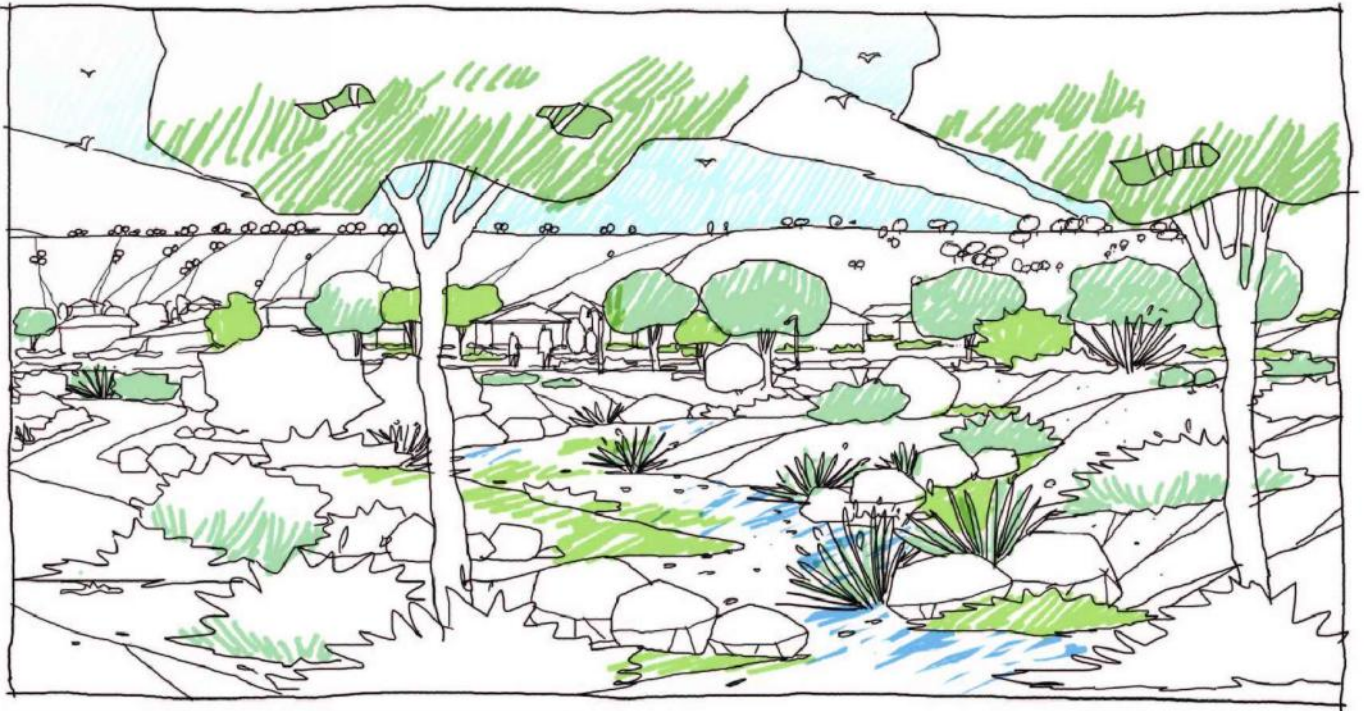
PUBLIC OPEN SPACE (POS) PLAN

Moresby Heights, Geraldton - Figure 15







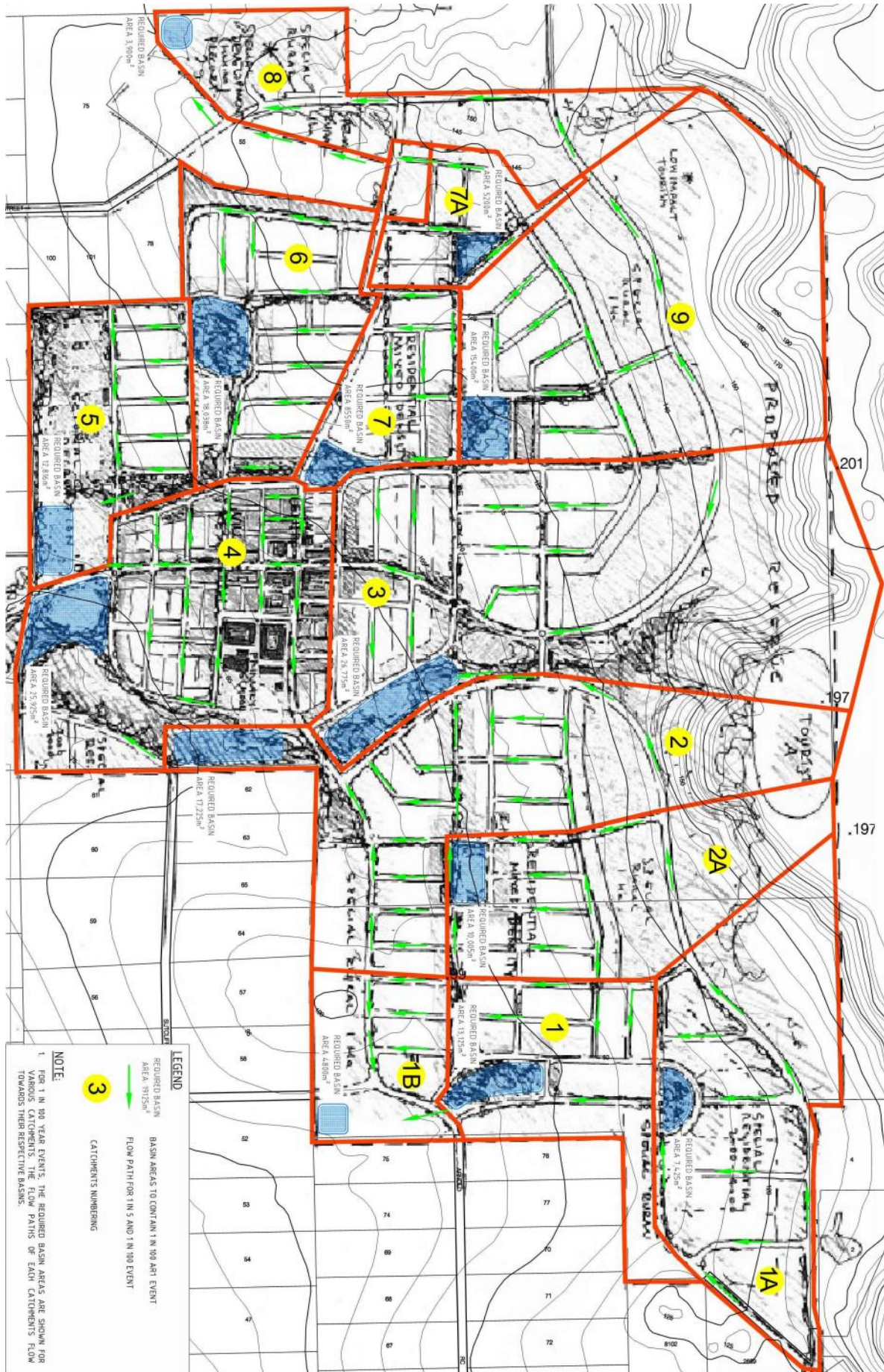


SKETCH IMPRESSION OF LINEAR PARK (LOCATION A)



SKETCH IMPRESSION OF WHERE VEHICLE CORRIDOR INTERSECTS LINEAR PARK (LOCATION B)





AECOM



MORESBY HEIGHTS

LOCAL STRUCTURE PLAN

APPENDICES



JANUARY 2014

APPENDICES

APPENDIX 1

Certificates of Title

WESTERN




AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 19/11/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2669** FOLIO **491**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

R. Roberts
REGISTRAR OF TITLES 

THIS IS A SHARE TITLE

LAND DESCRIPTION:

2/3 UNDIVIDED SHARES OF
LOT 80 ON PLAN 15415

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

CAVERSHAM PROPERTY PTY LTD OF 272 FORESHORE DRIVE, GERALDTON
AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
(XA K37791) REGISTERED 15 OCTOBER 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

- E113642 EASEMENT TO WATER AUTHORITY OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1800 FOL 659. REGISTERED 29.5.1989.
- *K821219 CAVEAT BY ROBYN JUDITH HUNT LODGED 9.1.2009.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-659 (80/P15415).
PREVIOUS TITLE: 1800-659.
PROPERTY STREET ADDRESS: 131 HACKETT RD, WAGGRAKINE.
LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.

WESTERN



AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 19/11/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2669** FOLIO **492**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

B. Roberts

REGISTRAR OF TITLES



THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
LOT 80 ON PLAN 15415

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

PORTSTYLE NOMINEES PTY LTD OF 272 FORESHORE DRIVE, GERALDTON
AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
(XA K377791) REGISTERED 15 OCTOBER 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

- E113642 EASEMENT TO WATER AUTHORITY OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1800 FOL 659. REGISTERED 29.5.1989.
- *K821219 CAVEAT BY ROBYN JUDITH HUNT LODGED 9.1.2009.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-659 (80/P15415).
PREVIOUS TITLE: 1800-659.
PROPERTY STREET ADDRESS: 131 HACKETT RD, WAGGRAKINE.
LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.



Application D779604
Volume 1533 Folio 683

WESTERN



AUSTRALIA

VOL. 1800
FOL. 659

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.



REGISTRAR OF TITLES

Dated 10th June, 1988

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of Victoria Location 2659 and being Lot 80 on Plan 15415, delineated on the map in the Third Schedule hereto, limited however to the natural surface and therefrom to a depth of 609.6 metres.

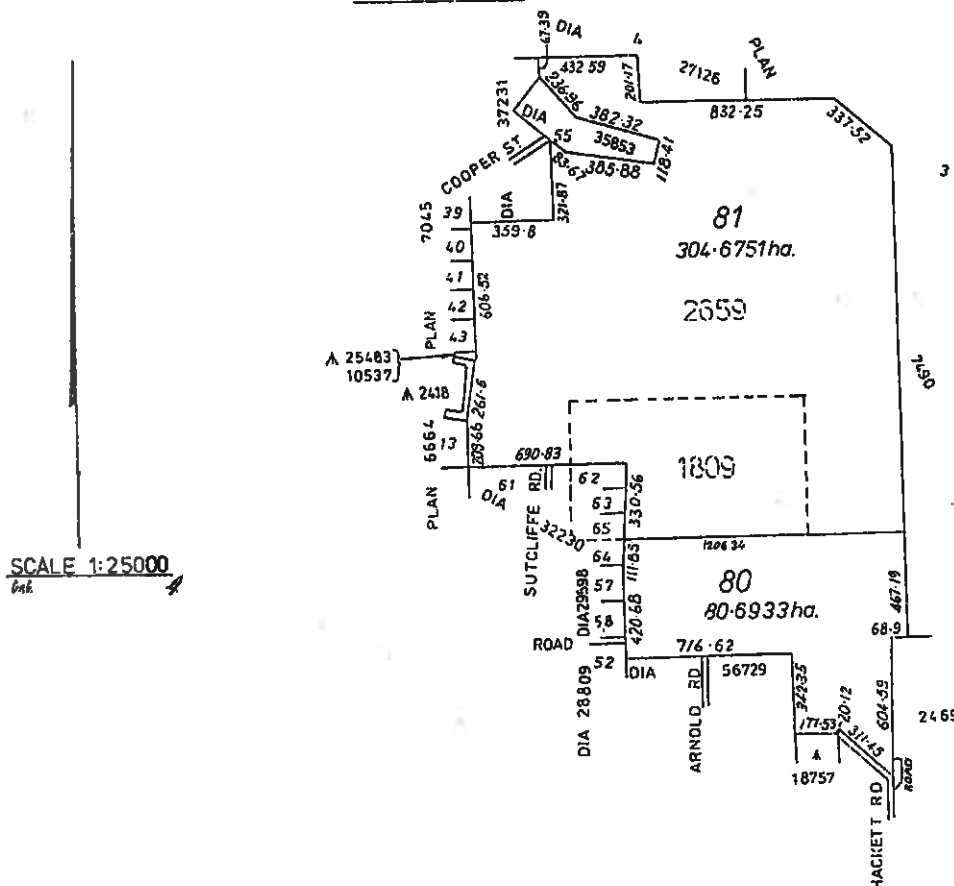
FIRST SCHEDULE (continued overleaf)

~~Joscelyn Beverley Percy of Willambury Station, Carnarvon, Station Manager and Gretche Pty. Ltd. of 3rd Floor, 524 Hay Street, Perth, as tenants in common in equal shares.~~

SECOND SCHEDULE (continued overleaf)

1. ~~MORTGAGE D501770 to Westpac Banking Corporation. Registered 23.2.83 at 0.02~~
Discharged D779605 10.6.88

THIRD SCHEDULE



NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

Superseded - Copy for Sketch Only

Page 1 (of 2 pages) 1800 659

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WESTERN



AUSTRALIA

REGISTER NUMBER 55/D35853	
DUPLICATE EDITION 5	DATE DUPLICATE ISSUED 8/9/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **136** FOLIO **190A**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.


REGISTRAR OF TITLES 

LAND DESCRIPTION:

LOT 55 ON DIAGRAM 35853

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

PAUL JAMES DOSSETTER
VICKI LEE NEIL
BOTH OF 32 HARWELL WAY, WEDGEFIELD, PORT HEDLAND
AS JOINT TENANTS

(T K307121) REGISTERED 15 AUGUST 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. K317444 MORTGAGE TO WESTPAC BANKING CORPORATION REGISTERED 23.8.2007.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 136-190A (55/D35853).
PREVIOUS TITLE: 1307-235.
PROPERTY STREET ADDRESS: 219 COOPER ST, WAGGRAKINE.
LOCAL GOVERNMENT AREA: CITY OF GREATER GERALDTON.

Superseded - Copy for Sketch Only

INDEXED

Transfer A84116
Volume 1307 Folio 235

WESTERN



ORIGINAL

REGISTER BOOK

AUSTRALIA

VOL 136

FOL 190A

Certificate of Title

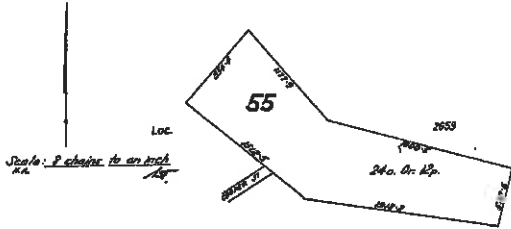
CT 0136 0190A F



UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

Her Majesty Queen Elizabeth the Second, is now the proprietor of an estate in fee simple subject to the easements and encumbrances notified hereunder in the natural surface and therefrom to a depth of two thousand feet of all that piece of land delineated and coloured green on the map hereon containing twenty-four acres and twelve perches or thereabouts, being portion of Victoria Location 2659 and being Lot 55 on Diagram 35853.

Dated the 17th day of September, 1968.



D. Brindley
REGISTRAR OF TITLES.
Transfer A84116 for John of Spennorth of 41 Fitzgerald Street, Geraldton Registered 17th September 1968 at 10.47 a.m.
D. Brindley
REGISTRAR OF TITLES.

44014/6/66 - M - 0/150

For encumbrances and other matters affecting the land see back

EASEMENTS AND ENCUMBRANCES REFERRED TO

Superseded - Copy for Sketch Only

CERTIFICATE OF TITLE

VOL. 136 FOL. 190 A

CT 0136 0190A B



WESTERN




AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 4/10/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2670** FOLIO **71**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

R. Roberts
REGISTRAR OF TITLES 

THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
LOT 81 ON PLAN 15415

**REGISTERED PROPRIETOR:
(FIRST SCHEDULE)**

VICTOR JOSEPH NEWTON
JANICE MARGARET NEWTON
BOTH OF 18A HARGRAVE STREET, STIRLING
AS JOINT TENANTS

OF THE SHARE SHOWN IN THE LAND DESCRIPTION

(XA K348804) REGISTERED 19 SEPTEMBER 2007

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)**

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-660 (81/P15415).
PREVIOUS TITLE: 1800-660.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.

WESTERN



AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 4/10/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2670** FOLIO **72**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

R. Roberts

REGISTRAR OF TITLES



THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
LOT 81 ON PLAN 15415

**REGISTERED PROPRIETOR:
(FIRST SCHEDULE)**

SEATONE NOMINEES PTY LTD OF 272 FORESHORE DRIVE, GERALDTON
AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
(XA K348804) REGISTERED 19 SEPTEMBER 2007

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)**

1. *K035831 CAVEAT BY CAVERSHAM PROPERTY PTY LTD LODGED 22.12.2006.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-660 (81/P15415).
PREVIOUS TITLE: 1800-660.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.

WESTERN




AUSTRALIA

REGISTER NUMBER N/A	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 4/10/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2670** FOLIO **73**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

JG Roberts
REGISTRAR OF TITLES 

THIS IS A SHARE TITLE

LAND DESCRIPTION:

1/3 UNDIVIDED SHARES OF
LOT 81 ON PLAN 15415

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

CAVERSHAM PROPERTY PTY LTD OF LEVEL 1, 66 KINGS PARK ROAD, WEST PERTH
AS SOLE PROPRIETOR OF THE SHARE SHOWN IN THE LAND DESCRIPTION
(XA K348804) REGISTERED 19 SEPTEMBER 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1800-660 (81/P15415).
PREVIOUS TITLE: 1800-660.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: CITY OF GERALDTON-GREENOUGH.



Application D779604
Volume 1533 Folio 683

WESTERN



AUSTRALIA

VOL. 1800
FOL. 660

CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

I certify that the person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements and encumbrances shown in the Second Schedule hereto.

R. Mulcahy



REGISTRAR OF TITLES

Dated 10th June, 1988

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of each of Victoria Locations 1809, 2659 and being Lot 81 on Plan 15415, delineated on the map in the Third Schedule hereto.
As to the said Location 2659 only: limited however to the natural surface and therefrom to a depth of 609.6 metres.

FIRST SCHEDULE (continued overleaf)

~~Jocelyn Beverley Percy of Williambury Station, Carnarvon, Station Manager and Gretchen Pty. Ltd. of 3rd Floor, 524 Hay Street, Perth, as tenants in common in equal shares~~

Checker 14

SECOND SCHEDULE (continued overleaf)

~~C501770
1. MORTGAGE D501770 to Westpac Banking Corporation. Registered 23.2.83 at 9.02 o.c.~~

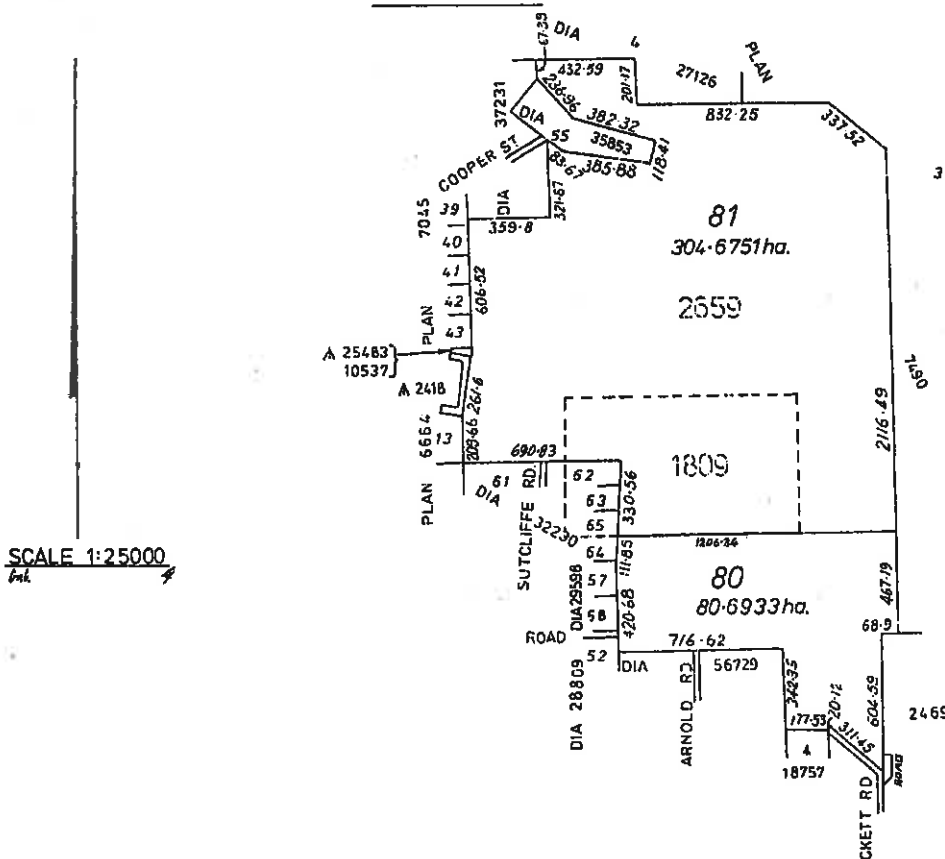
~~Assistant Registrar of Titles 3/0/88~~

~~Discharged D885832 28.9.88~~



Checker 14

THIRD SCHEDULE



NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

Page 1 (of 2 pages) 1800 660 FOL
Superseded - Copy for Sketch Only



PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

Superseded Copy for Station Only

RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.










REGISTERED PROPRIETOR

Victor Joseph Newton and Janice Margaret Newton both of 7 O'Collins Street, Geraldton as joint tenants.

NATURE	NUMBER	REGISTERED	TIME	SEAL	INITIALS
Transfer	D885833	28.9.88	9.07		

SECOND SCHEDULE (continued)

NOTE: RULING THROUGH AND SEALING WITH THE OFFICE SEAL INDICATES THAT AN ENTRY NO LONGER HAS EFFECT. ENTRIES NOT RULED THROUGH MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS.

INSTRUMENT NATURE	NUMBER	PARTICULARS	REGISTERED	TIME	SEAL	INITIALS	CANCELLATION	NUMBER	REGISTERED	OR LODGED	SEAL	INITIALS
			28.9.88	9.07		28.9.88			4.10.95			
Mortgage	D885834	to Westpac Banking Corporation.	28.9.88	9.07								
Mortgage	H38660	to Westpac Banking Corporation.	2.3.99	8.04			Discharged	F996177	4.10.95			

CERTIFICATE OF TITLE VOL. 1800 FOL. 660

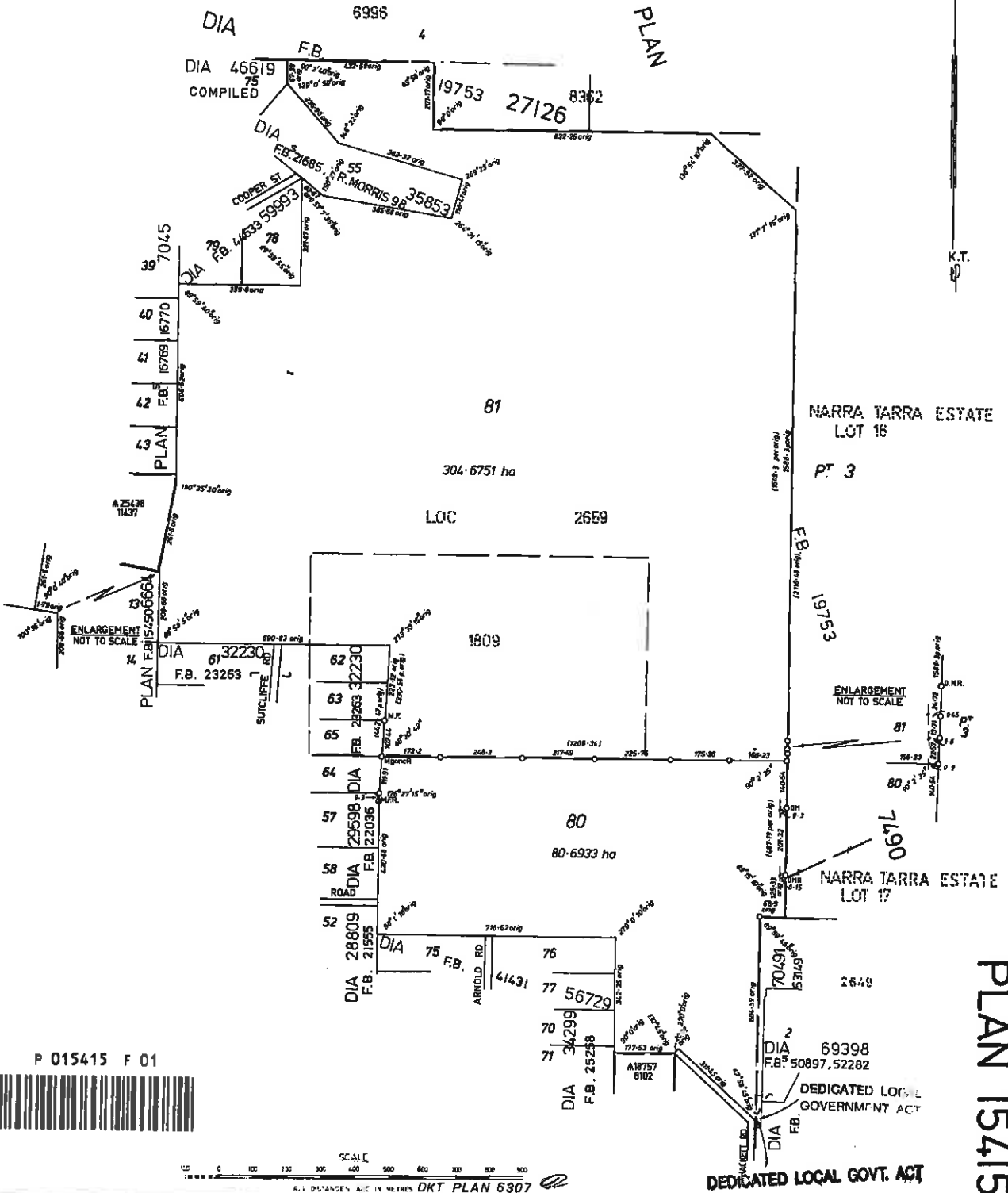
PLAN 15415

PT VICTORIA LOCS. 1809 & 2659

SURVEYOR J. J. F. DELFOS
F.B. 52435
TOTAL AREA 385.3684 ha
INDEX PLANS CHAPMAN 2000 17.24,17.25,17.26,17.27,
18.23,18.24,18.25,18.26
C.T. 1533-683

APPROVED
24.2.86

LIMITED IN DEPTH TO 609.6 METRES
AS TO LOC. 2659 ONLY



P 015415 F 01



SCALE
0 100 200 300 400 500 600 700 800 900
ALL DISTANCES ARE IN METRES DKT PLAN 6307

DEDICATED LOCAL GOVT. ACT

PLAN 15415

APPENDIX 2

Moresby Range Design Response
(Ferart Design for Shire of Chapman Valley & City of Greater Geraldton, 2010)

Table 04.1 Design responses to improve visual transitions across the foothills

Criteria affecting visual transitions	Nature of effect	Design response
Housing density and lot sizes	Number of roof tops seen in a specific area	In urban areas close to the city it is proposed that lots down to 1ha will present roughly the same density of housing as is currently found in existing outer urban areas. Close to the Foothills road and the possible Park lots should typically be 4ha in size decreasing to 2ha in size in the mid zone between the Foothills Road and the existing urban areas
Stream lines and bush land areas revegetated	Fingers of green reaching from the Range down into urban areas linking to urban bush land areas	See Recommendation 04.3
Orientation of roads and blocks	Views across the road network can either open up the landscape or help provide screens to hide buildings	Generally orientate the roads and blocks of future urban developments on the north-south/contour line axis to create the opportunity for tree plantings along the boundaries and access roads. This will provide a staggered series of tree lines across the foothills which, from distant vantage points, will merge and create the appearance of extensive tree cover spreading across the foot hills. Curvilinear suburb design is not supported because it creates visual gaps in tree screens due to the random alignment of the roads and lots
Location	Certain locations are more visible than others when viewed from high points in the City	Figure 04.1 provides a general summary of areas of high visibility compared to areas of lower visibility, based on the information shown in Figure 04.3. Areas shown as low visibility could typically have lots with a minimum size of 1ha, those shown as high visibility would have lots starting at 2ha and going up to 4ha next to the proposed Park boundary
Amount of vegetation cover	The greater the amount of vegetation cover the more it appears that the area is well vegetated and bushy	Ensure there is at least 30% vegetation cover on lots with the plantings along boundaries, roads, building envelopes and high points in the landscape with the overall objective of creating the impression that the landscape is continuously well vegetated when viewed from distant locations
Siting of buildings in the landscape	Buildings that sit high in the landscape, on ridge lines and unique features, or appear to be spreading across an area are more visually dominant	Cluster buildings on larger lots within strategically located building envelopes situated as far as possible down the side-slopes of the Range Ensure buildings are low in the local landscape to minimise visual impact on sky-lines Avoid siting buildings on, or immediately adjacent to, unique landforms e.g. rocky outcrops, stream lines, saddle points, ridge lines
Type of vegetation	Different types of vegetation can be used to improve the appearance of the landscape	Enhancing and recreating bush land areas are important particularly where there is an underlying ecological asset, e.g. creek lines or remnant bush, that can be built upon However on lots with little underlying ecological values there are opportunities for creating tree crops and other sustainable land use activities that stabilise the landscape and improve the appearance of the region
Location of recreation areas	Recreation areas can be used to improve the appearance of an area	Strategically locate urban parkland areas to link in with other vegetated features in the landscape

APPENDIX 3

Visual Impact Assessment Report (EPCAD, August 2013)

Wavecrest Estate, Geraldton

Visual and Landscape Assessment

B0749: EDIT 3 / 20.08.2013

Prepared by: EPCAD Pty Ltd Landscape Architects and Environmental Planners

Prepared for: Humfrey Land Developments



Document Control

EPCAD reports are prepared for a specific purpose for specific client requirements. EPCAD is not liable for any loss or damage incurred by any person relying on such reports or advice, except where they are created by EPCAD expressly for that person.

Nothing in these terms shall be taken as excluding, limiting or modifying any term, condition or warranty implied by any applicable act of parliament that cannot be so affected. To the extent that such a term, condition or warranty is implied, the liability of EPCAD for breach of that term, condition or warranty is, where permitted, limited at the option of EPCAD to:

The supplying of the relevant goods or services again; or

The payment of the cost of having the relevant goods or services supplied again.

Job Number	B0749
Document Title	Wavecrest Estate,Geraldton: Visual & Landscape Assessment
File Name	B0749_MH_VLA_Issue 3
Author	EPCAD pty ltd
Client	Humfrey Land Developments

Issue	Issued to	Date	Reviewed	Approved
1 / 29.10.2010	HLD (KT) CLE (PR)	29.10.2010	AD/HM	HM
2 / 09.05.2011	CLE (PR)	09.05.2011	AD	HM
3 / 20.08.2013	CLE (PR)	20.08.2013	CB	HM

1 Contents

2	Introduction	5	
2.1	Glossary of Terms Featured in this Report	5	
3	Visual Landscape Evaluation	6	
3.1	Scope and Context	6	
3.2	Site Description	6	
3.2.1	Context	6	
3.2.2	Topography	7	
3.2.3	Vegetation	9	
3.2.4	Drainage	9	
3.2.5	Built Form	9	
3.2.6	Adjacent Property	9	
3.3	District Landscape Area	13	
3.3.1	District Landscape Character	13	
3.3.2	Urban Development in the Landscape	13	
3.3.3	Viewing Experience and Values: How is the Landscape Viewed	13	
4	Visual Impact Assessment	14	
4.1	The Proposed Development	14	
4.2	Likely Changes in the Landscape	14	
4.2.1	Anticipated Short Term Effects	14	
4.2.2	Anticipated Mid-Term Effects	14	
4.2.3	Anticipated Long-Term Effects	14	
5	Key Locations & Assessment of Changes	14	
5.1	Scope	14	
5.1.1	Sydney Memorial Lookout Geraldton;	17	
5.1.2	North West Coastal Highway: Northbound at Trigg Street;	19	
5.1.3	North West Coastal Highway: Northbound at Railway Street;	21	
5.1.4	Northbound North West Coastal Highway from Railway Street to Beattie Road	23	
5.1.5	440 Roadhouse: North West Coastal Highway;	25	
5.1.6	440 Roadhouse Exit: North West Coastal Highway;	27	
5.1.7	Beattie Road: Waggrakine Rural-Residential Area	29	
5.1.8	Intersection of Beattie Road and Tramway Road;	31	
5.1.9	Tramway Road;	33	
5.1.10	Intersection of Tramway Road and David Road;	35	
5.1.11	David Road;	37	
5.1.12	Suttcliffe Road: 800m North of intersection with Drabble Road;	39	
5.1.13	Waggrakine Primary School Kiss & Ride: Hall Road;	41	
5.1.14	Lot 267 Hall Road;	43	
5.1.15	Hall Road: 1.3Km North of intersection with Chapman Valley Road	45	
5.1.16	Hackett Road: 800m North of intersection with Chapman Valley Road;	47	
5.2	Conclusions	49	
6	Visual Management Objectives	51	
6.1.1	Proposed Visual Management Measures	51	
6.1.2	Recommendations and Monitoring Assessment Criteria	51	
7	APPENDIX A	53	

2 Introduction

EPCAD have been commissioned to study the landscape qualities of the site at Lot 80 & 82 Hackett Road, Waggrakine and to assess the visual implications of development at Wavecrest Estate, Geraldton. This study has been undertaken under the instruction of Humfrey Land Developments and briefing by Chappell Lambert Everett (Town Planners) in response to comments and broad boundaries laid out in the Draft Moresby Range Management Plan (September 2009) undertaken by the Shire of Chapman Valley, City of Geraldton Greenough.

EPCAD also acknowledges recommendations made in the Moresby Range Management Strategy (WAPC, August 2009).

2.1 Glossary of Terms Featured in this Report

EPCAD/The landscape architect: EPCAD Pty Ltd, Landscape Architects and Planners; Author of this report and conductor of this Visual Amenity Impact Assessment.

HLD/ Humfrey Land Developments: client for which this assessment was conducted for.

CLE/Chappell Lambert Everett: the project Town Planners and authors of the Preliminary Development Concept (Figure 2).

Wavecrest Estate, Geraldton/ The site/ The development site/ The proposed development site/ Wavecrest Estate: The site as identified on the Location Plan (Figure 1).

CoGG: City of Geraldton Greenough as the local government authority.

DEC: Department of Environment and Conservation.

NWCH: North West Coastal Highway

WAPC: Western Australian Planning Commission

3 Visual Landscape Evaluation

3.1 Scope and Context

Guidance for undertaking a Visual Landscape Evaluation is provided by the state planning authority, Department of Planning & Western Australian Planning Commission within *Visual Landscape Planning in Western Australia;2007* (VLPWA).

This study has been undertaken in accordance with the principles set out in the VLPWA using two methods;

- Site Survey by two Landscape Architects

- Desktop study of cartographic and photographic material

This initial study is to ascertain the local and district visual assets and characteristics and to evaluate the likely effects of development of any nature at the Moresby Heights Site within the context of the overall landscape, its character and values.

3.2 Site Description

3.2.1 Context

The Site as identified in *Figure 1: Wavecrest Estate Location Plan*, is found directly at the Western base of the Moresby Ranges and 2Km North of Chapman Valley Road. It is located due north-east of the Geraldton city centre, at a distance of 10 Km.

North West Coastal Highway runs parallel to the Moresby Ranges 2km from the western-most edge of the Development Site. With the existing Waggrakine Rural Residential area sited between.

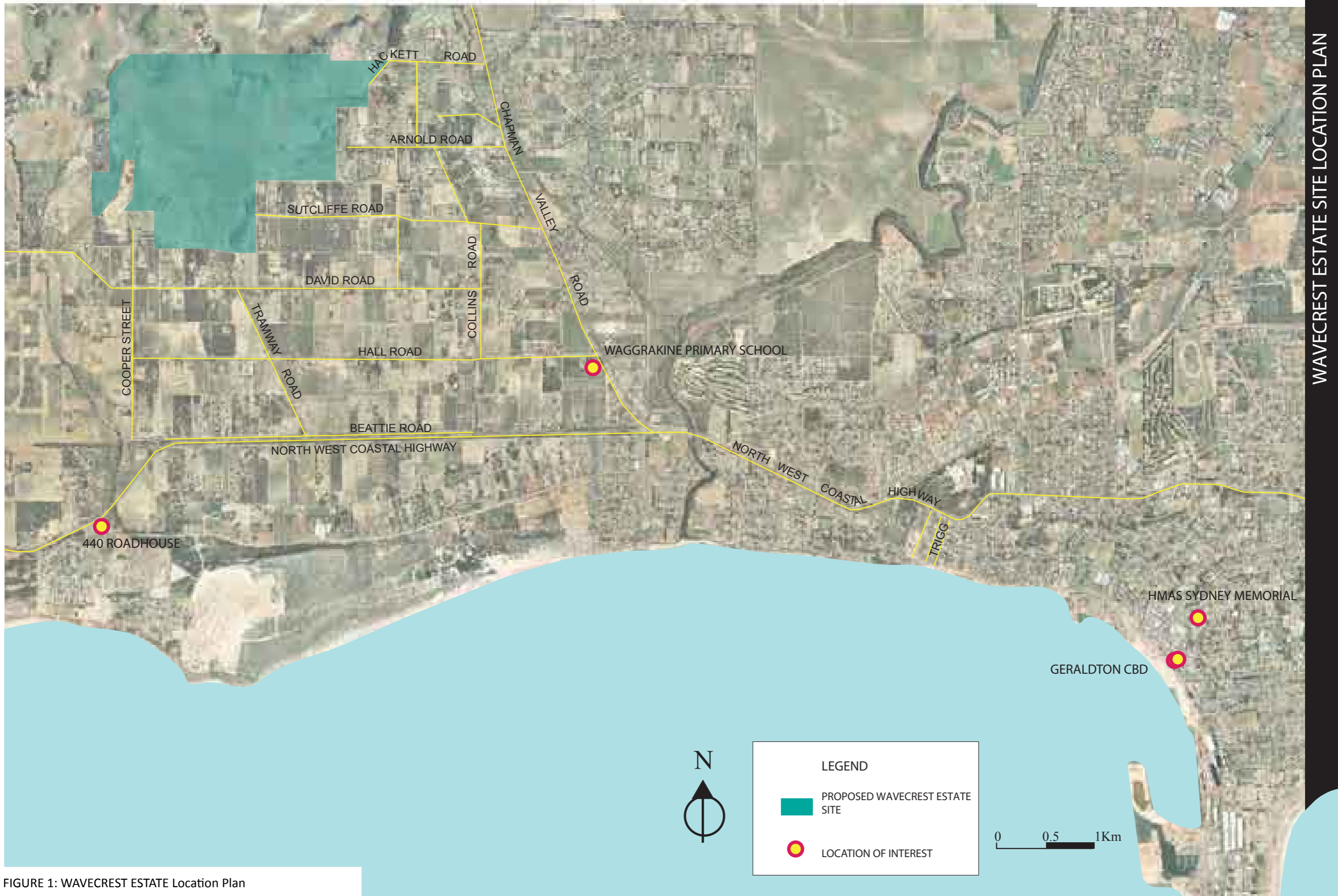


FIGURE 1: WAVECREST ESTATE Location Plan

3.2.2 Topography

Refer to *Figure 2: Wavecrest Estate Site Plan*.

The western boundaries of the site are located at an elevation of 75-95m above sea level. The ground rises gently upwards toward the base of the scarp across a distance of approximately 1.75 km, creating a long incline at on average 1:25 gradient.

The base of the scarp sits at between 140-160m above sea level. The scarp rises sharply upwards to 190-200m above sea level at a typical gradient of 1:1-1:2. The scarp produces a near-sheer face approximately 50m tall with exposed dark rock and scattered vegetation. This is the most prominent feature of the site.

The eastern-most portion of the site sits atop the Moresby Ranges at an elevation of 200m above sea level. The top of the Moresby Ranges is not flat, but instead, has a concave shape that is not clearly shown by 5m contour intervals.

Within the site there are several small features, including a shoulder that is prominent when viewed from within the site, but not prominent from outside the site. There are also two rocky knolls at the northern edge of the site. They are distinct when viewed from within the site and from nearby properties, but are difficult to distinguish when viewed from public roads due to immediate vegetation.



SITE PLAN
 LOT 80 & 82 HACKETT ROAD, WAGGRAKINE
 WAVECREST ESTATE
 CITY OF GERALDTON - GREENOUGH

REVISED: 18.09.09
 DATA: MAPS, LGR
 SCALE: 1:5000 (A1)
 PLAN NO.: 2118-07-01



TOWN PLANNING + URBAN DESIGN
 THE FIRM IS CURRENTLY REGISTERED AS AN ARCHITECTURAL SURVEY &
 ENGINEERING FIRM WITH THE PROFESSIONAL ENGINEERING BOARD

FIGURE 2: WAVECREST ESTATE Site Plan

3.2.3 Vegetation

The site is almost fully cleared of vegetation for farming purposes. The paddocks contain crops such as feed grasses and lupins that grow up to 50cm tall, but appear golden and dry most of the year.

Rows of windbreak trees dissect the site. These trees are affected by the prevailing winds and noticeably lean over. These trees are typically 3-5m tall with clear stems up to 1.5-2m below the canopy.

There are areas of remnant vegetation within the site as shown on *Figure 03: Site Features Plan*. These areas are generally degraded vegetation of a scrubby nature, growing to between 1 and 3m tall, or as groundcover species and introduced grasses. The variety of species is limited with between 5-10 tall/ upper canopy/ sheltering species across majority of the site.

An ephemeral wetland is found in the southern half of the site containing remnant vegetation, but generally degraded. Within the western corners of the development area larger pockets of remnant vegetation coincide with localised low points.

Generally the scarp within the property boundaries is not densely vegetated as is typical of the Moresby Ranges. The scarp has not been cleared of vegetation, however previous grazing of the scarp has degraded and eroded the existing vegetation. There are portions of the scarp that have been revegetated and areas of remnant vegetation, but these are generally considered to be of poor quality.

At the top of the Moresby Ranges small patches of remnant vegetation or revegetation are scattered along the western edge of the ridge. This vegetation is subject to strong prevailing winds and therefore are low growing scrubby species. These portions of vegetation are not always visible from the bottom of the scarp as they are set back from the edge. When they are visible they create a low skyline that does not detract from the horizontal nature of the top of the Moresby Ranges.

3.2.4 Drainage

Currently drainage across the site is predominantly overland runoff from the scarp. The nature of the topography and typical levels of rainfall have resulted in shallow channels that have eroded down across the site as shown in *Figure 03: Site Features*.

The sharp topography of the escarpment does not provide adequate growing conditions for plants, and seed stock and small plants are often washed away during high rainfall occasions. The lack of vegetation on the scarp face allows the overland water to flow faster, and leads to subsequent scarring down the face of the scarp.

An ephemeral dampland is located in the lowest area of the site. This supports an area of medium to tall vegetation, but typically does not have any visible surface water, except during high rainfall occasions.

3.2.5 Built Form

In the south eastern edge of the site an existing domestic building stands at the immediate base of the scarp. The existing building can be seen from limited locations where it is prominent in the landscape due to the colour of westward surfaces that do not blend with the surrounding vegetation and landscape.

The building is built on a low, limestone-block retaining wall. This building is occupied, and also has associated outbuildings.

Vegetation is kept clear from the building. There is an area of taller vegetation behind the house, that creates a backdrop to the light shades of the building, and also conceals the building from some viewpoints. Low trees planted along fence lines in front of the building do not conceal the building, but do conceal the retaining wall to some extent.

3.2.6 Adjacent Property

Properties adjacent to the site host a variety of activities and building types. Many properties are vegetated with informal plantings of local and introduced plant varieties to create a bushland setting. Other properties are cleared of trees and large scrub, and are used for agistment or hobby farming.

Large sheds are built on some properties for the storage of large vehicles (trucks, tractors etc) or for workshops. Sheds vary in colour and materials and can stand out visually in the landscape.

Most properties are separated by rural-style fences, post and wire with a barbed wire running along the top row. The fence typically runs down the centre of a maintained firebreak that is void of any vegetation. This is not visually obvious unless viewed from close proximity or from above in an elevated position (like on top of the scarp) or from an aerial photograph.

Some properties are more visual obtrusive than others, with lightly coloured buildings or with reflective surfaces. Properties with a large clearing around the building envelop are also more prominent in the landscape. Occasional mature palm trees (likely to have been planted 10-20 years ago) are also obvious in the landscape as they easily stand 10-15m above any local vegetation.

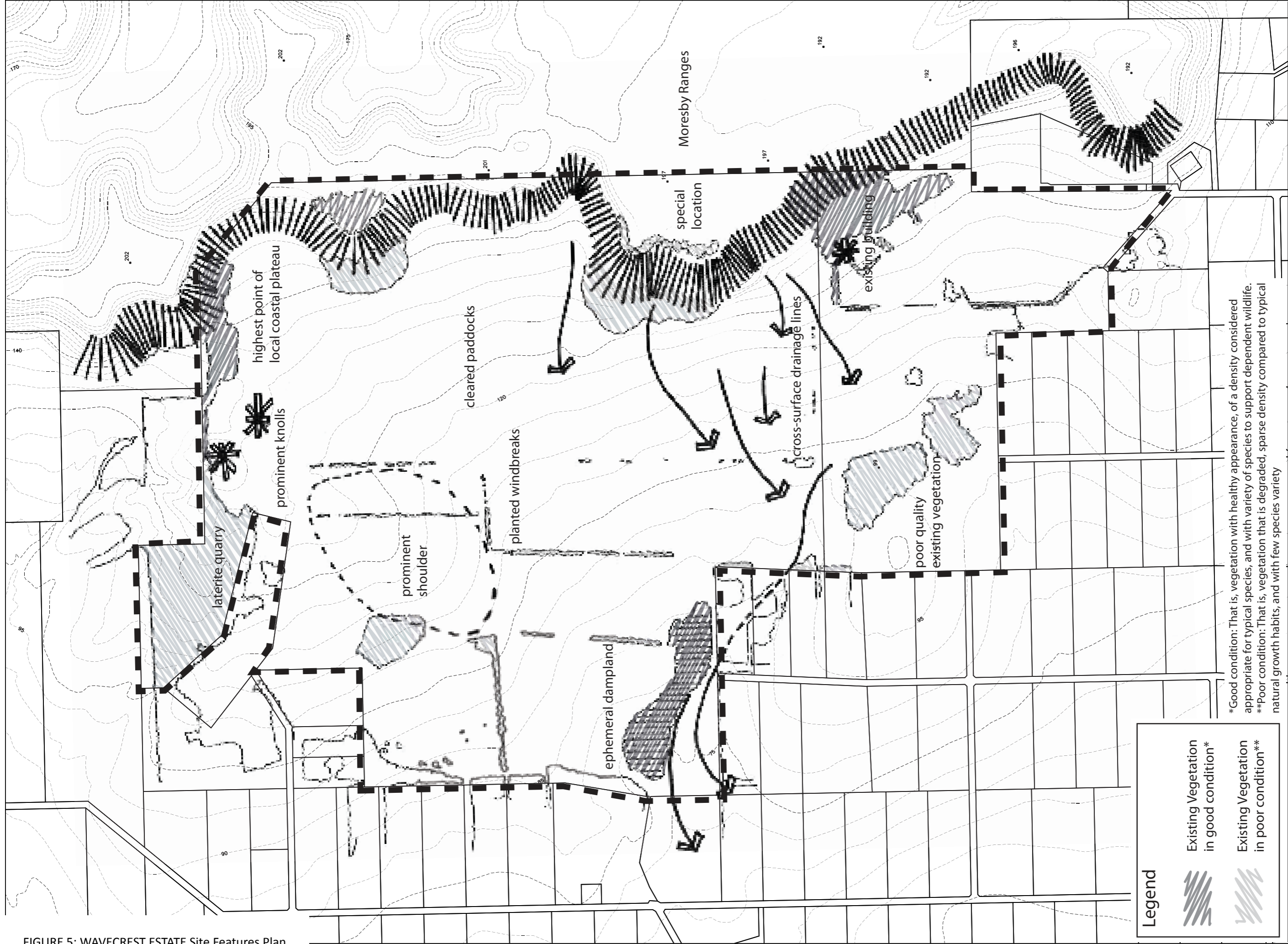
The figures opposite illustrate existing buildings that are lightly coloured and are very prominent in selected views, whilst those that are darker colours blend into the landscape, especially when viewed from a distance.



FIGURE 3: Existing adjacent dwelling with light coloured roof at base of scarp.



FIGURE 4: Dwellings and associated sheds with scarp in the background. View East from Hall Road.



Legend

- Existing Vegetation in good condition*
- Existing Vegetation in poor condition**

*Good condition: That is, vegetation with healthy appearance, of a density considered appropriate for typical species, and with variety of species to support dependent wildlife.
 **Poor condition: That is, vegetation that is degraded, sparse density compared to typical natural growth habits, and with few species variety

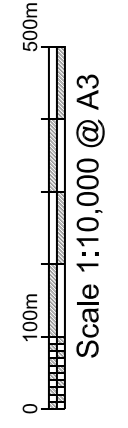


FIGURE 5: WAVECREST ESTATE Site Features Plan

3.2.7 Key Views and Viewing Locations

From within the site, panoramic views of the Geraldton coastline can be accessed from almost every location, over than low points and at the western and southern boundaries where immediate vegetation restricts views out of the site.

There are two particularly special viewing locations within the site.

The first special viewing location is in the north eastern corner of the site at the base of the scarp. Tucked into the elbow of the scarp, this location is the highest point of the local coastal plateau at 140m above sea level and allows panoramic views of the City of Geraldton, Point Moore, Geraldton Port, Drummonds Cove and the associated coastline, in excess of 15km in optimum conditions.

The second special viewing location is at the top of the Moresby Ranges. This location sites at a spot height of 197m above sea level and allows views to the Greenough River, Point Moore, The Fairway Marker and north to Buller River, as far as 20km in optimum conditions.

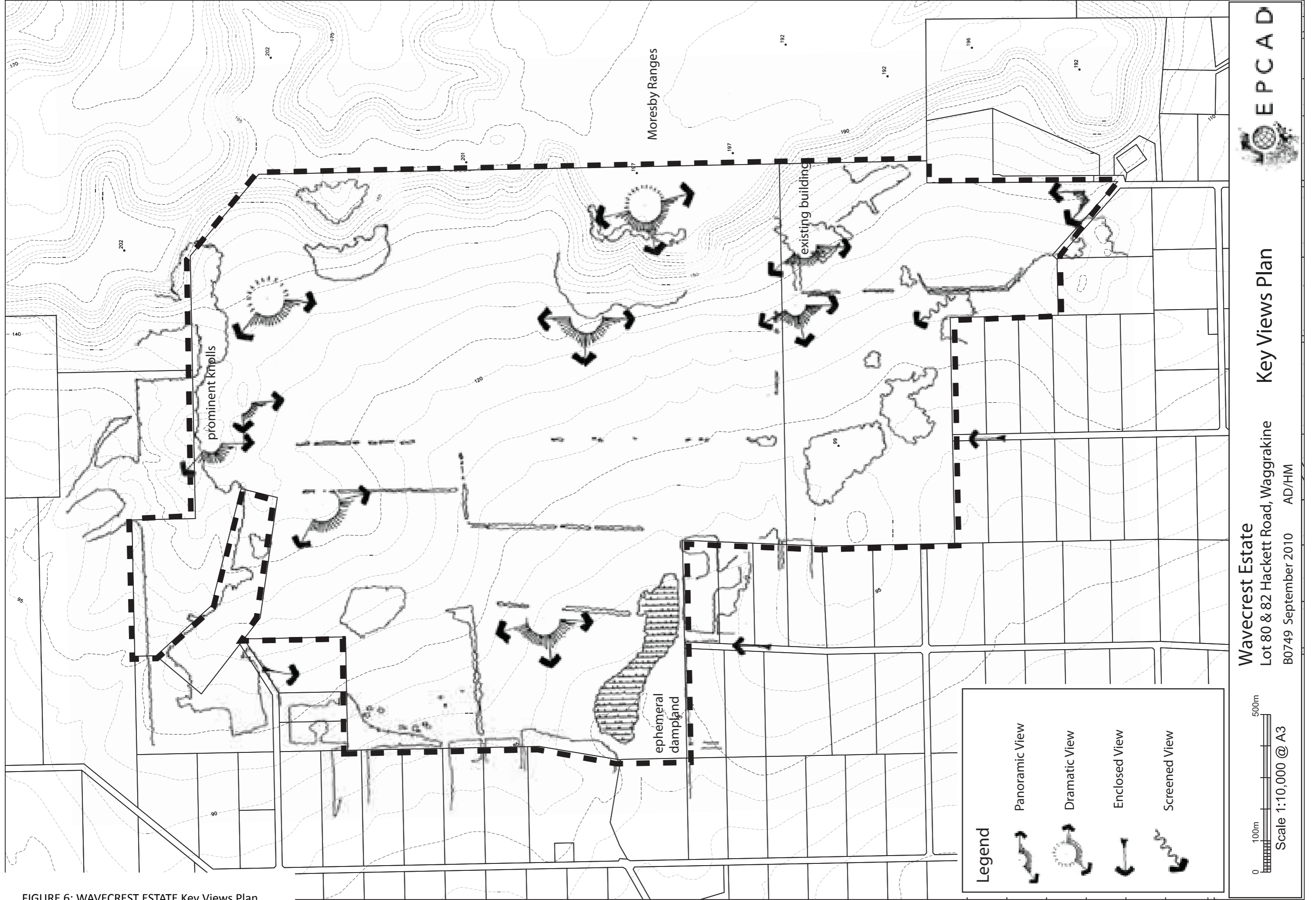
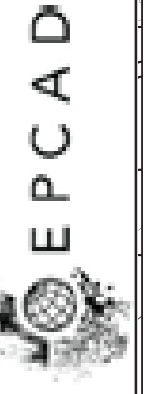


FIGURE 6: WAVECREST ESTATE Key Views Plan



Wavecrest Estate
 Lot 80 & 82 Hackett Road, Waggrakine
 B0749 September 2010 AD/HM

Key Views Plan

Scale 1:10,000 @ A3

3.3 District Landscape Area

3.3.1 District Landscape Character

The key landscape character of the Waggrakine and proposed Wavecrest Estate Areas are as follows;

A matrix of large lots separated by mature trees and shrubs;

Gently sloping land, generally down to the west; and

A visual mix of built form and vegetation.

3.3.2 Urban Development in the Landscape

The district surrounding the proposed development area has been subject to subdivision, however urban development is not a strong characteristic of the district landscape. There are individual urban-style buildings located on subdivided rural-residential lots. These buildings are not typically rural structures, quite often resembling suburban housing.

South of the subject land there is a combination of newly developed urban-form and well-established urban-form on opposing sides of Chapman Valley Road. The most distinguishing feature between the two urban forms is the prominence and abundance of tall trees and established back and front yard vegetation (especially upper-storey) within the established urban areas (averaging approximately 20 years old).

The divisive fencing is also prominent in the newly developed urban form. *Hardy Fencing* or *Super-6* has since been substituted with *colourbond neighbourhood friendly* fencing. Although a great colour variety is available, the density of lots constrains opportunities to grow screening vegetation between buildings and fences.

Rural Residential lots within the district have a diverse character with varied building styles and amounts of medium to tall vegetation. Most building envelopes are located in the centre of the lot, allowing for maximised buffering between homes, typically in the form of vegetation. Most driveways are aligned along maintained firebreaks and crossovers occur at the corner of the lot, rather than in the centre of the frontage of the lot.

3.3.3 Viewing Experience and Values: How is the Landscape Viewed

In publicly accessible locations the landscape character is experienced from roads. The roads and traffic conditions allow speeds of 60 to 110 kilometres-per-hour and typically do not host footpaths or Dual-Use paths. Pedestrian viewing is therefore not normal and views are generally obtained from vehicles.

The North West Coastal Highway (110 kilometre-per-hour) is flanked by dense vegetation and passengers within a vehicle are usually more likely to be looking westward towards the ocean and southward at views of Geraldton central and the Geraldton port.

Local roads within the Waggrakine Rural Residential area, allow speeds up to 70 kilometres-per-hour and traffic is typically local-only and mostly only light-vehicles (Cars and 4-wheel-drives). Views of the site can be achieved at very specific locations and only with intention of seeking out a view as the roads are typically flanked by dense vegetation to a height typically 2-7m. Where these specific views are possible, the foreground is occupied by existing buildings and vegetation. The site is almost always viewed from a distance, with the perimeter vegetation restricting views to internal areas.

There are no designated walking trails or tourist lookouts within the district from which the site can be seen.

The Sydney Memorial, is located within the centre of Geraldton and grants near 180° views from Point Moore (due West), Geraldton Marine Terrace (below, and stretching to the North-west), Bluff point to Drummonds Cove (due North) and the full length of the Moresby Ranges (as covered within the Moresby Range Management Plan Draft September 2009). The site is located 10km (as the crow-flies) from the Sydney Memorial.

From the Sydney Memorial the site is not easily identified within the greater landscape context. Development on the site would not be prominent if visual management measures and guidelines are in place. The distance of the site is such that only a very small area of the site can be seen and this is the scarp which is not proposed to be subdivided.

5 Visual Impact Assessment

5.1 The Proposed Development

This assessment has been undertaken prior to the development concept in order to outline the opportunities and constraints for planning and design at the site.

5.2 Likely Changes in the Landscape

Landscape is not a static amenity and the local character is continuously changing and has evolved in response to mans actions in the area.

The likely changes described here are based on professional opinion and based on development of varying nature and scale. It is also anticipated that the recommendations made at the end of this report will be undertaken to ensure any visual changes occurring at a district level are minimised.

5.2.1 Anticipated Short Term Effects

Initially the site will remain similar to its current state and relatively indistinct from adjacent property. During construction portions of the site may become more visible from viewpoints until buildings are completed (in accordance with colour and material recommendations and guidelines).

During the initial stages of development the site will host various activities associated with development and construction of infrastructure such as roads. The movement of construction vehicles may be more obvious than any other activity as they are brightly coloured for safety purposes. In these circumstances the site may be more visually obvious when viewed from close proximity and more easily discernable from the distant views. However, these views are at a distance of up to 10 kilometres and will typically be a very small part of a large expansive panorama view and are unlikely to be discernable when viewing the broader landscape.

Works associated with construction would be staged, driven by financial implications, workforce availability, property sales releases and design documentation by project consultants.

The scarp will be largely unchanged. Lower areas of the scarp may be revegetated by seed and planting of small tubestock. These will germinate and grow over several years before being visible from distant views.

Preliminary street lighting may be visible at night, until such a time as recommended street tree vegetation grows to maturity.

5.2.2 Anticipated Mid-Term Effects

During the mid-life of the development the site will be partially built-out and partially undergoing construction at various stages. A proportion of the site will be developed with dwellings. The majority of roads and other infrastructure will be installed. Trees and vegetation planted within the initial stages of works will be more mature, and will begin to screen built form and infrastructure. The introduction of new vegetation in the area is likely to result in a change of texture over the area of the site from un-vegetated farmland to vegetated development. Incremental buildings and structures combined with new street tree planting are

likely to be seen but typically from a distance of 5-10km and only in the context of other existing development.

The scarp will remain largely unchanged, other than lower areas where revegetation will mature.

5.2.3 Anticipated Long-Term Effects

The growth of trees will aid to screen built form at Moresby Heights from most viewpoints in the district. The site will constitute a small portion of the greater landscape and panorama when viewed from tourist viewpoints including the Sydney Memorial.

When viewed from specific locations along nearby roads roofs could be prominent if colours are not restricted to those that relate to the local landscape.

There is likely to be textural changes of the view resulting from planted vegetation and roof materials within the development site. These changes are unlikely to be detrimental to the experience of the viewer. Revegetation will be associated with Public Open Space throughout the development area and parts of the Moresby Scarp and lower slopes.

6 Key Locations & Assessment of Changes

6.1 Scope

The following chapter assesses locations along public and tourist routes, at key tourist locations and at areas where the viewer is most likely to be able to see the development area at the proposed Wavecrest Estate.

Comments and assessments are based on experience and professional opinions and refer to the possible impact, and ability to lessen the impact of any development at Moresby Heights on the visual qualities and characteristics of the district landscape.

Note: "Panorama #a" refers to the colour photograph image, whilst "Panorama #b" refers to the black & white annotated duplicate image.

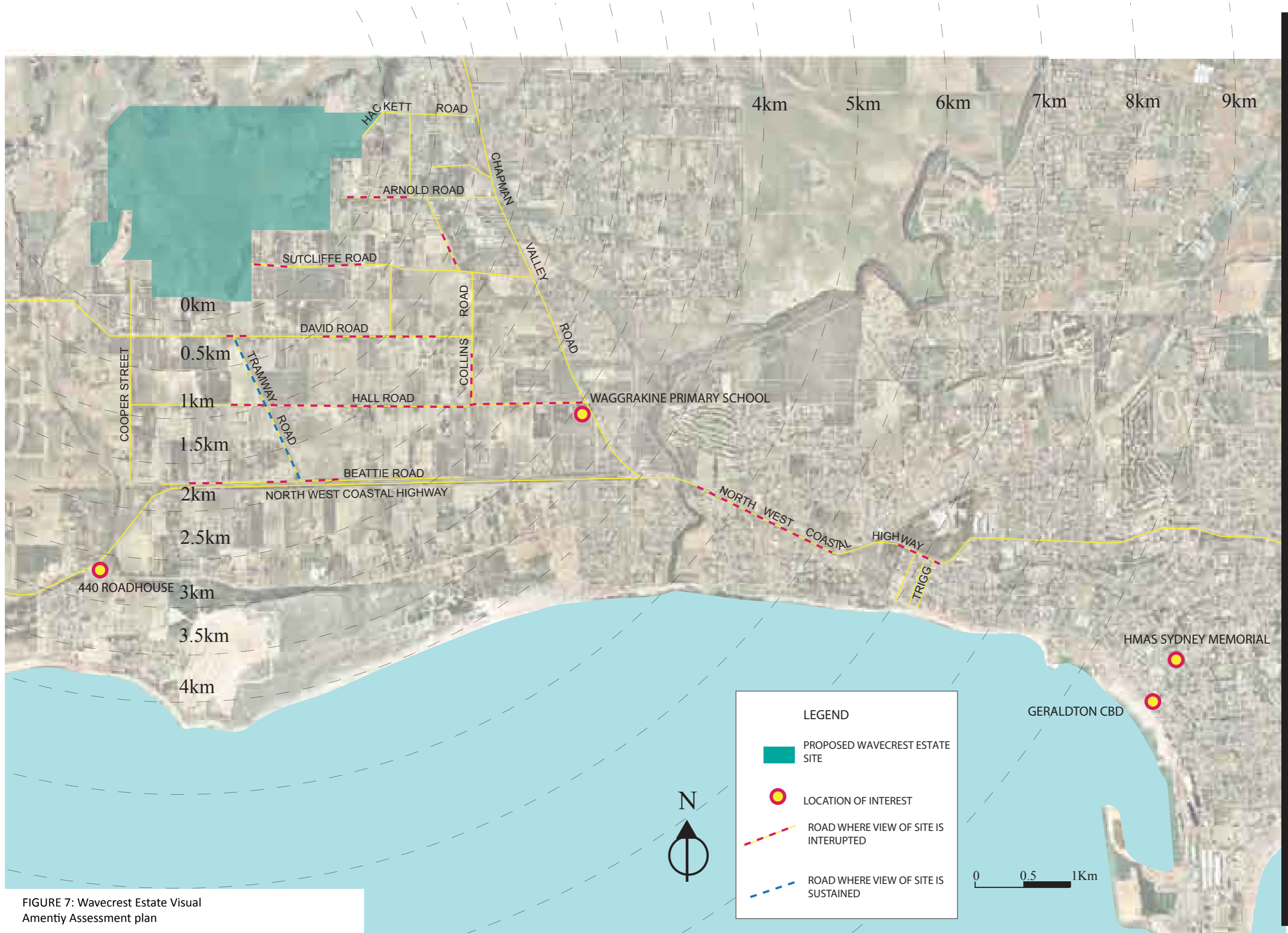


FIGURE 7: Wavecrest Estate Visual Amenity Assessment plan

6.1.1 **Sydney Memorial Lookout Geraldton;**

6.1.1.1 **The key characteristics of this viewpoint are;**

- The scale of the sky and clouds;
- The rooftops and buildings;
- The distant landform forming the horizon; and
- Elements in the immediate foreground associated with the memorial (walls, paths, planting etc.).

6.1.1.2 **Other important features of this view are;**

- Monotone colours and textures of vegetation when viewed from this distance;
- Existing suburban form that is an accepted component of the view; and
- The communications aerials above the site are barely discernable from this distance.

6.1.1.3 **Changes likely to occur in this view are;**

- A pocket of low density development proposed at Wavecrest Estate will hardly be visible from this distance of 10km. If the viewer is intending to view the site it may appear as a very small portion of the larger view, as a variation in texture to the surrounding landscape;
- Any built form, infrastructure or human activity that occurs on top of the scarp may be visible at certain instances;
- Planting and revegetation works on the face of the scarp may be visible from this distance as a change in texture and colour compared with the degrading existing landscape under enabling light conditions.

6.1.1.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings;
- Align roads to ensure that they do not bisect slopes or expose large faces of un-vegetated earth;
- Further visual assessment of detailed design should occur in relation to any built form, infrastructure or human activity that occurs on top of the scarp; and
- Ensuring that all roof surfaces are coloured to blend with the surrounding landscape with dark shades.



FIGURE 8b: Sydney Memorial Lookout



FIGURE 8a: Sydney Memorial Lookout

6.1.2 **North West Coastal Highway: Northbound at Trigg Street;**

6.1.2.1 The key characteristics of this viewpoint are;

- The road itself, with frequent vehicles travelling at 60 Kilometres-per-hour;
- The overhead powerlines within the road reserve; and
- The corridor created by tall trees and fencelines.

6.1.2.2 Other important features of this view are;

- The portion of Ranges visible at a distance of 9Km;
- Existing suburban infrastructure; and
- Other road users including light to heavy vehicles.

6.1.2.3 Changes likely to occur in this view are;

- Development proposed at Wavecrest Estate is not likely to be visible due to existing vegetation and structures;
- Built form and/or associated infrastructure (vehicular or pedestrian access route) on top of the scarp may be visible at certain instances, eg. a windscreen may reflect the sun causing and instantaneous flash in the distance; and
- Planting and revegetation works on the face of the scarp may be visible from this distance as a change in texture and colour compared with the degraded existing landscape.

6.1.2.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings;
- Align roads (especially tourist route to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated earth;
- Further visual assessment of detailed design should be undertaken with regards to any activity or built form proposed on top of the scarp; and
- Roof surfaces should be coloured to blend with the surrounding landscape in dark shades.



FIGURE 9b: NWCH intersection with Trigg Street



FIGURE 9a: NWCH intersection with Trigg Street

6.1.3 **North West Coastal Highway: Northbound at Railway Street;**

6.1.3.1 The key characteristics of this viewpoint are;

- The road carriageway and associated light poles;
- The frequency of intersections and traffic hazards along this stretch of road, travelling at 60-70 kilometres-per-hour; and
- The broad, flat shape of the Moresby Ranges;

6.1.3.2 Other important features of this view are;

- Existing suburban infrastructure;
- Texture and colour variations on the escarpment at 8Km; and
- Existing vegetation between 3-7m and as high as 12-18m along the verge reserve.

6.1.3.3 Changes likely to occur in this view are;

- Urban development proposed at Wavecrest Estate may be visible behind the existing and recommended street vegetation at a distance of 8Km;
- Built form and associated infrastructure (vehicular or pedestrian access route) may be visible on top of the Moresby Ranges; and
- Planting and revegetation works at the base of the scarp will be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.3.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Align roads to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in relation to any built form or infrastructure that is proposed on top of the Moresby Ranges or lower slopes of the scarp;
- Situate any built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 10b: NWCH intersection with Railway Street



FIGURE 10a: NWCH intersection with Railway Street

6.1.4 Northbound North West Coastal Highway from Railway Street to Beattie Road

(Not photographed due to traffic speed, and that views are only taken from travelling vehicles)

Glimpses of the Moresby Ranges and the Development Site can be seen from the highway travelling at speeds between 60 and 110 Kilometres-per-hour. These views are typically short and can only be sustained for a length of 100m at the most between stretches of verge-side vegetation and low-density urban development.

As the viewer travels further from Geraldton, past Chapman Valley Road intersection, the viewing lengths are shortened to brief moments between spaces in roadside vegetation 3-8m tall. The dense vegetation restricts views of the Moresby Ranges and also restricts immediate views into the adjacent Waggrakine Rural-Residential Area.

When the viewer can see the Moresby Ranges they are usually looking at the top of the ranges and the smooth table-top shape, or the scarp face that is illuminated at the end of the day. The viewer is rarely looking for the existing lightly coloured buildings that protrude from areas of dark vegetation and therefore these areas are considered a part of the view but not a key characteristic.



This page is intentionally clear

6.1.5 **440 Roadhouse: North West Coastal Highway;**

6.1.5.1 The key characteristics of this viewpoint are;

- The expanse of bitumen associated with the service station; and
- The dense mid-level vegetation at a height of 3-7m tall;

6.1.5.2 Other important features of this view are;

- Signage and elements of the service station display characteristics associated with urban development; and
- The two-lane highway carrying light to very-heavy vehicles at speeds up to 110kilometres-per-hour.

6.1.5.3 Changes likely to occur in this view are;

- A pocket of urban development proposed at Wavecrest Estate may be visible at precise locations behind the existing vegetation at a distance of 3Km;
- Built form and especially associated infrastructure (vehicular or pedestrian access route) may be visible on top of the ranges; and
- Planting and revegetation works at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.5.4 Measures advised to reduce visual impact on this view are;

- Vegetate lateral road reserves with species that grow to between 4-8m minimum;
- Minimise reflective materials used in buildings and private development;
- Align roads (especially any tourist route to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in relation to any proposed development on top of the Moresby Ranges;
- Situate any built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 11b: 440 Roadhouse, NWCH



FIGURE 11a: 440 Roadhouse, NWCH

6.1.6 **440 Roadhouse Exit: North West Coastal Highway;**

6.1.6.1 The key characteristics of this viewpoint are;

- The road carriageway that disappears into the adjacent vegetation and corners, also the associated approaching vehicles at 100 kilometres-per-hour;
- The expanse of sky above the horizon created by the Moresby Ranges; and
- The rural character and lack of buildings in the immediate vicinity;

6.1.6.2 Other important features of this view are;

- Existing mid-level vegetation between 3-7m tall;
- Clear view of the Moresby Ranges and development area at a distance of 3Km that is more prominent under optimum light conditions; and
- The stretch of highway that enters into a corridor of verge-side vegetation.

6.1.6.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate may be visible from this location at a distance of 2-3Km;
- Any built form and associated infrastructure (vehicular or pedestrian access route) may be visible at the top of the ranges; and
- Planting and revegetation works at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.6.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves within the development area with species that grow to between 4-8m tall as a minimum;
- Align roads (especially to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in relation to any proposed development on top of the Moresby Ranges;
- Situate any built form and associated infrastructure back from the edge of the escarpment; and
- roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 12b: 440 Roadhouse Exit, NWCH



FIGURE 12a: 440 Roadhouse Exit, NWCH

6.1.7 **Beattie Road: Waggrakine Rural-Residential Area**

6.1.7.1 The key characteristics of this viewpoint are;

- The ridgeline is important as a backdrop to this rural scene;
- The expanse of sky;
- The very flat topography of the local landscape;
- The existing buildings and activity in the foreground; and
- Mid-level vegetation behind the buildings forms a dense definition of the boundary;

6.1.7.2 **Other important features of this view are;**

- Lack of vegetation within the verge-reserve enables clear view into and through this private property;
- The scale of this building is associated with light-industrial or rural uses, rather than rural-residential; and
- Existing buildings with white or lightly coloured surfaces do not blend with colours of vegetation or landscape.

6.1.7.3 **Changes likely to occur in this view are;**

- The low-density development proposed at Wavecrest Estate is not likely to be visible from this exact location due to the existing buildings and rural infrastructure;

6.1.7.4 **Measures advised to reduce visual impact on this view are;**

- There is not likely to be any visual impact as the site is not visible from this particular location.



FIGURE 13b: Beattie Road



FIGURE 13a: Beattie Road

6.1.8 **Intersection of Beattie Road and Tramway Road;**

6.1.8.1 The key characteristics of this viewpoint are;

- The road carriageway that is long, straight and flat;
- The expansive sky above the Moresby Ranges;
- The dense verge-side vegetation and pockets of pastoral land-use; and
- The framed view of the Moresby Ranges scarp and its texture and vegetation of the site at a distance of 2-3km. (See Figure 13c)

6.1.8.2 Other important features of this view are;

- Existing buildings with white or lightly coloured surfaces can be seen across the middle-ground of the panorama;
- This road is typically used by local traffic; and
- Vision into adjacent properties is restricted by verge-side vegetation to 3-5m height.

6.1.8.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of 2-3Km;
- Built form and associated infrastructure (carpark) may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible at this location; and
- Any future planting and revegetation works on the face and at the base of the scarp are very likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.8.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves within the development area with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur in relation to any development on top of the Moresby Ranges
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.

FIGURE 14b: Intersection Beattie Road and Tramway Road
 WAVECREST ESTATE



FIGURE 14c: Zoomed view focusing on the development site

FIGURE 14a: Intersection Beattie Road and Tramway Road



6.1.9 **Tramway Road;**

6.1.9.1 **The key characteristics of this viewpoint are;**

- The expanse of sky above the distant Moresby Ranges;
- The long, flat carriageway that continues into the distance;
- The corridor created by verge-side vegetation; and
- The framed view of the Moresby Ranges scarp and its texture and vegetation of the site at a distance of approximately 2km. (see Figure 14c)

6.1.9.2 **Other important features of this view are;**

- Existing buildings with white or lightly coloured surfaces can be seen across the middle-ground of the panorama;
- This road is typically used by local traffic; and
- Vision into adjacent properties is restricted by verge-side vegetation to 3-5m height.

6.1.9.3 **Changes likely to occur in this view are;**

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 2Km;
- Built form and associated infrastructure (carpark) may be visible atop the ranges;
- Vehicular access to the top of the scarp may be visible at this location; and
- Any future planting and revegetation works on the face and at the base of the scarp are very likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.9.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves within the development area with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially any route to top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur in relation to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.

FIGURE 15b: Tramway Road



FIGURE 15c: Zoomed view focusing on the development site

FIGURE 15a: Tramway Road



6.1.10 **Intersection of Tramway Road and David Road;**

6.1.10.1 The key characteristics of this viewpoint are;

- The rural, semi-degraded infrastructure (fence and overhead power pole)
- The verge-side vegetation; and
- The vegetation within the immediate private lot;

6.1.10.2 Other important features of this view are;

- The firebreak behind the fence-line delineates the property, but when travelling along the road at 70 kilometres-per-hour the viewer will hardly see into the property through the verge-side vegetation
- Glimpses of the ranges are barely discernable through the tops of the immediate vegetation; and
- Apart from the local road there is no visible habitation in this view.

6.1.10.3 **Changes likely to occur in this view are;**

- A pocket of low-density development proposed at Wavecrest Estate will not be visible from this location due to the density of immediate vegetation.

6.1.10.4 **Measures advised to reduce visual impact on this view are;**

- There is not likely to be any visual impact as the site is not visible from this particular location.



FIGURE 16b: Intersection of Tramway Rd and David Rd



FIGURE 16a: Intersection of Tramway Rd and David Rd

6.1.11 David Road;

6.1.11.1 The key characteristics of this viewpoint are;

- The cleared land in the foreground for rural/agricultural purposes;
- Mid-level vegetation creates a band across the middle of the image;
- An existing building with a lightly coloured roof at one side of the view; and
- The expanse and scale of the sky.

6.1.11.2 Other important features of this view are;

- Existing vegetation between 3-10m along the edges of this particular property create the mid-level band;
- The property gateway; and
- This road is typically used by local traffic.

6.1.11.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 1Km, buildings on lower elevations are less likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible at this location; and
- Future planting and revegetation works on the face of and at the base of the scarp are very likely to be visible from this distance as a change in texture and colour compared with the degrading existing landscape.

6.1.11.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should be undertaken with regards to any development proposed on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 17b:David Rd



FIGURE 17a: David Rd

6.1.12 **Suttcliffe Road: 800m North of intersection with Drabble Road;**

6.1.12.1 **The key characteristics of this viewpoint are;**

- The horizontal landscape;
- The unimpeded skyline (other than vegetation);
- The lack of built form within this view;
- Low to medium height broken vegetation on either side of the road;
- The road that disappears over a low ridge in 80m from this location; and
- The expanse and scale of the sky.

6.1.12.2 **Other important features of this view are;**

- The overhead power line and power poles that continue into the mid-ground;
- The cleared land in the distance for rural/agricultural purposes;
- The line of trees just below the horizon in the distance;
- This road that is typically used by local traffic; and
- The view 90° to the left is of the Indian Ocean. (see Figure 17c)

6.1.12.3 **Changes likely to occur in this view are;**

- The low-density development proposed at Wavecrest Estate will be visible from this location;
- This road may be extended into the development area as one of the main entry routes for proposed local traffic; and
- Future planting of street trees will be introduced to this view.

6.1.12.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially any route to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should be undertaken in regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 18b:Sutcliffe Rd



FIGURE 18a: Sutcliffe Rd



FIGURE 18c: View 90° to the left of the Indian Ocean

6.1.13 **Waggrakine Primary School Kiss & Ride: Hall Road;**

6.1.13.1 **The key characteristics of this viewpoint are;**

- The flat cleared land in the foreground for agricultural purposes;
- The scale of the sky that is not impeded by any human intervention; and
- The strong presence of urban structures, especially the pocket of urban development within 500m to the right-hand-side of the panorama.

6.1.13.2 **Other important features of this view are;**

- Small groups or clumps of existing vegetation in the immediate view;
- The Moresby Ranges that form the horizon at a distance of 2-3km; and
- Existing building with a stand of tall vegetation to the left-hand-side of the view.

6.1.13.3 **Changes likely to occur in this view are;**

- A pocket of urban development proposed at Wavecrest Estate may be visible from this location at a distance of approximately 2-3km, development on lower elevations are not likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges; and
- Future planting and revegetation works on the face and at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing rural landscape.

6.1.13.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;
- Further visual assessment of detailed design should occur in regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 19b:Waggrakine Primary School Kiss&Ride



FIGURE 19a:Waggrakine Primary School Kiss&Ride

6.1.14 Lot 267 Hall Road;

6.1.14.1 The key characteristics of this viewpoint are;

- The expansive sky above the horizon created by the Moresby Ranges;
- The existing cleared land in the foreground for agricultural uses;
- The agricultural/rural landscape infrastructure (eg. Fences, gates and sheds) and
- The band of mid-level vegetation;

6.1.14.2 Other important features of this view are;

- Existing buildings with lightly coloured surfaces scattered throughout the middle-ground;
- The communications towers are visible atop the Moresby Ranges;
- This road is typically used by local traffic; and
- The Moresby Ranges form the horizon at a distance of 2-3km.

6.1.14.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 1-2Km, development on lower elevations are not likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible from this location; and
- Future planting and revegetation works on the face and at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.14.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Recess all Eastward windows and/or extend eaves from buildings;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur with regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 20b: Lot 267 Hall Road



FIGURE 20a: Lot 267 Hall Road

6.1.15 **Hall Road: 1.3Km North of intersection with Chapman Valley Road**

6.1.15.1 **The key characteristics of this viewpoint are;**

- The expansive sky above the Moresby Ranges;
- The band of mid-level vegetation;
- The existing cleared land in the foreground for agricultural uses; and
- The agricultural/rural landscape infrastructure (eg. Fences).

6.1.15.2 **Other important features of this view are;**

- Along Hall Road views of the site can be achieved in particular positions along stretches of up to 100m long due to existing verge-side vegetation. This view shows the existing rural-residential development which will be viewed in the foreground when viewing the proposed development site.

6.1.15.3 **Changes likely to occur in this view are;**

- The proposed low-density development will be visible from this location at a distance of 500m;
- The bitumen road surface will be extended into the development, rather than changing to gravel road surface within 60m of this location;
- Further vegetation will supplement existing vegetation patterns and banding;
- Built form and its users on top of the Moresby Range may be visible from this location, depending on the position in relation to the edge of the table-top. Vehicular access route to the top of the Moresby Ranges would not be visible from the location; and
- The proposed low-density development is not likely to introduce any elements that are not already a part of this view.

6.1.15.4 **Measures advised to reduce visual impact on this view are;**

- Minimise reflective materials used in buildings and private development;
- Recess all West-facing windows and/or extend eaves from buildings;
- Vegetate road reserves with species that grow to between 4-8m (minimum) in height;
- Further visual assessment of detailed design should occur in regards to development on top of the Moresby Ranges; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



FIGURE 21b:Hall Road



FIGURE 21a: Hall Road

6.1.16 **Hackett Road: 800m North of intersection with Chapman Valley Road;**

6.1.16.1 The key characteristics of this viewpoint are;

- The expansive sky;
- The sudden rise of the Moresby Range;
- The agricultural/rural landscape infrastructure (eg. Fences, gates and sheds); and
- The band of mid-level vegetation;

6.1.16.2 Other important features of this view are;

- Existing buildings with lightly coloured surfaces;
- The existing cleared land in the foreground for agricultural uses; and
- The expansive scale of the sky.

6.1.16.3 Changes likely to occur in this view are;

- A pocket of low-density development proposed at Wavecrest Estate is likely to be visible from this location at a distance of approximately 1-2Km, development on lower elevations are not likely to be seen, whereas higher elevations may be visible if there are no design guidelines in place;
- Built form and associated infrastructure may be visible atop the ranges;
- Vehicular access to the top of the ranges may be visible from this location; and
- Future planting and revegetation works on the face and at the base of the scarp are likely to be visible from this distance as a change in texture and colour compared with the existing agricultural landscape.

6.1.16.4 Measures advised to reduce visual impact on this view are;

- Minimise reflective materials used in buildings and private development;
- Recess all West-facing windows and/or extend eaves from buildings;
- Vegetate lateral road reserves with species that grow to between 4-8m (minimum) in height;
- Align and design roads (especially routes to the top of Moresby Ranges) to ensure that they do not bisect slopes or expose large faces of un-vegetated rock;

- Further visual assessment of detailed design should occur in regards to development on top of the Moresby Ranges;
- Situate built form and associated infrastructure back from the edge of the escarpment; and
- Roof surfaces should be coloured to blend with the surrounding landscape with dark shades.



WAVECREST ESTATE

MORESBY RANGES



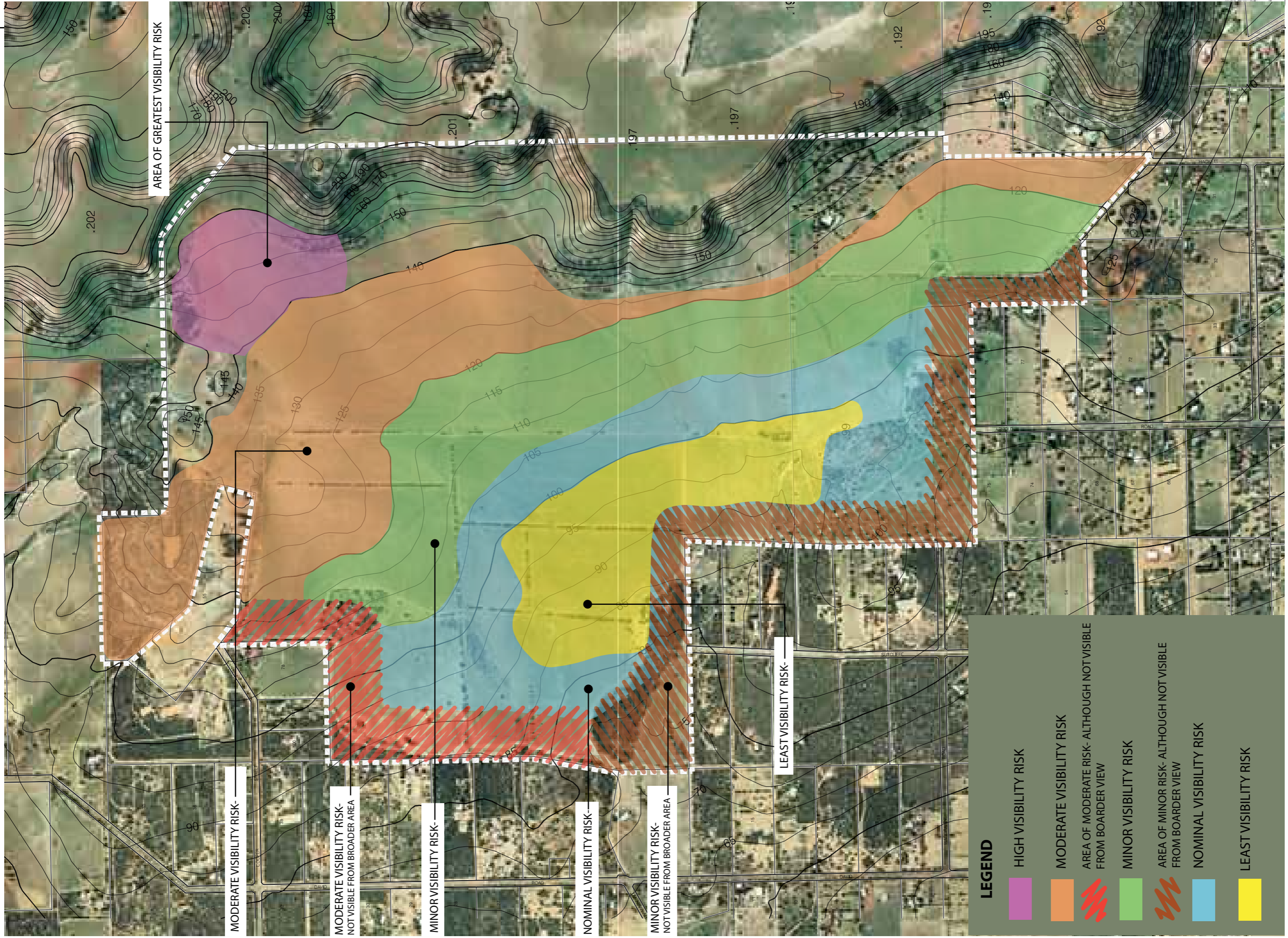
FIGURE 22b:Hackett Road



FIGURE 22a: Hackett Road

6.2 Conclusions

- The site is seen from many areas but only at a distance and where the site is a minor component of a broader extensive view;
- The Development Site can be seen from a number of specific locations along local roads within 2-3km of the Development Site by local traffic users, tourists do not typically use these roads;
- The existing landscape character includes many structures and from viewing points of 3-10 km distance, low-density development at Wavecrest Estate will not introduce an element that does not already exist. Nor does low-density development at Moresby Heights create a feature that will be prominent or dominant in these views;
- The proposed development does not break the skyline created by the Moresby Ranges from any key view; and
- The siting and design of any development (tourist or otherwise) on top of the Moresby Ranges or at the immediate base of the scarp will require detailed analysis of the design to ensure that the construction and location of elements including roads, paths and built form will not be prominent in the overall view.
- The subject site is not prominent in the broader landscape and if developed, taking into consideration proposed visual management measures (refer to Items 7.2.1.1 and 7.2.1.2) urban development in this location will be integrated within the contextual landscape and will not be an obtrusive element, and thus preserving public views of the scarp.



LEGEND

- HIGH VISIBILITY RISK
- MODERATE VISIBILITY RISK
- AREA OF MODERATE RISK- ALTHOUGH NOT VISIBLE FROM BOARDER VIEW
- MINOR VISIBILITY RISK
- AREA OF MINOR RISK- ALTHOUGH NOT VISIBLE FROM BOARDER VIEW
- NOMINAL VISIBILITY RISK
- LEAST VISIBILITY RISK

WAVECREST ESTATE

LOT 80 & 82 HACKETT ROAD, WAGGRAKINE

CITY OF GERALDTON - GREENOUGH

VISIBILITY RISK ASSESSMENT

NOTE: THIS ILLUSTRATION SHOWS APPROXIMATE AREAS OF SENSITIVITY TO VISUAL CHANGE WHEN VIEWED FROM PUBLICLY ACCESSIBLE LOCATIONS.

REV B. 29.10.10
OCTOBER 2010
SCALE: 1:5000 @ A1



FIGURE 23: WAVECREST ESTATE Visibility Risk Assessment

7 Visual Management Objectives

The most important aspect of the district landscape character is the integrity of the skyline defined by the Moresby Ranges.

On this basis the development objectives at Wavecrest Estate are;

- Integration of development within the broader landscape character;
- Maintaining an uninterrupted skyline of the Moresby Range when viewed from the west; and
- Preserving the character of the scarp (in topography, vegetation and specifically the skyline).

7.2.1 Proposed Visual Management Measures

7.2.1.1 Landscape Response

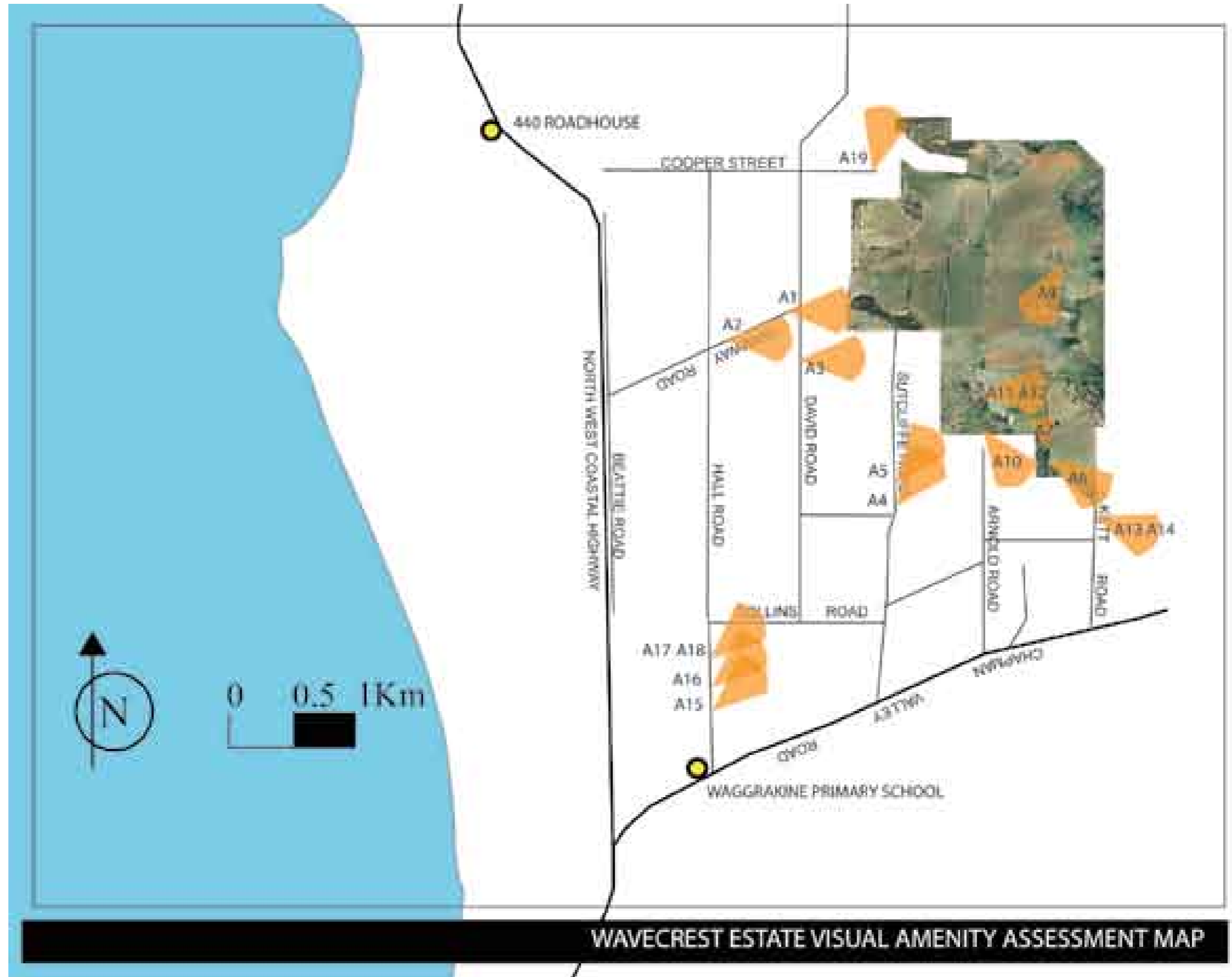
- Vegetation should be retained inside the development site within public open space, verges and private properties where possible to maintain as much mature vegetation and canopy as possible.
- Street tree planting of trees along all new roadsides within the development will reduce the visibility of roads and road-users from viewpoints outside of the development site.
- Where possible local plant species should be used or plant species with similar colour and textural characteristics as local plant species within the public open space and street landscape proposals.
- Promotion of local tree and shrub species-use by residents within the development site will reduce contrasts between existing vegetation adjacent to the development site and new or introduced vegetation within the development site.
- Revegetation of the scarp will generate a change to the visual character, however the environmental benefits outweigh the visual change. The visual change caused by revegetating the degraded slopes is not considered to be detrimental to the visual landscape experience.

7.2.1.2 Development Response

- Secure the escarpment as Open Space.
- Detailed design of development on top of the scarp (tourist or otherwise) should be assessed to ensure visual integration and appropriate siting.
- More intensive or dense development should be focused on areas of lesser visual risk within the site (refer to figure 23).
- Larger lot sizes should be designed in higher areas of the site.
- Roads should be aligned so as not to transect slopes or expose un-vegetated rock face. Detailed design of access to the top of the scarp will require assessment to ensure visual intergration and appropriate siting.
- Formulate effective building design guidelines that address the following aspects;
 - Building materials should be non-reflective,
 - Facade colours of buildings should be selected from a palette of local landscape colours to reduce contrasts with existing and proposed vegetation,
 - Minimise light colours (especially white) and restrict primary colours,
- To ensure that the development fits into the local and district landscape character and to ensure that no buildings are seen as dominant in the landscape Building Requirements must address the following at such a time that Building Approval is assessed and granted;
 - Roof colours of all built form and structures within the development site will be darkly coloured to minimise contrast with existing vegetation;
 - Any built form within the northern and southern edges of development must have facade colours that are selected from a palette of dark and muted local landscape shades.
 - All windows are to either feature over-hanging eaves or be recessed into walls.

7.2.2 Recommendations and Monitoring Assessment Criteria

These visual management objectives should be reviewed on a two-yearly basis during construction phases, and any changes to the recommendations should be made accordingly.



WAVECREST ESTATE VISUAL AMENITY ASSESSMENT MAP



Figure A1: P1020244.jpg
20m East of Tramway Rd + Hall Rd Intersection



Figure A2: P1020248.jpg
20m West of Tramway Rd + David Rd Intersection

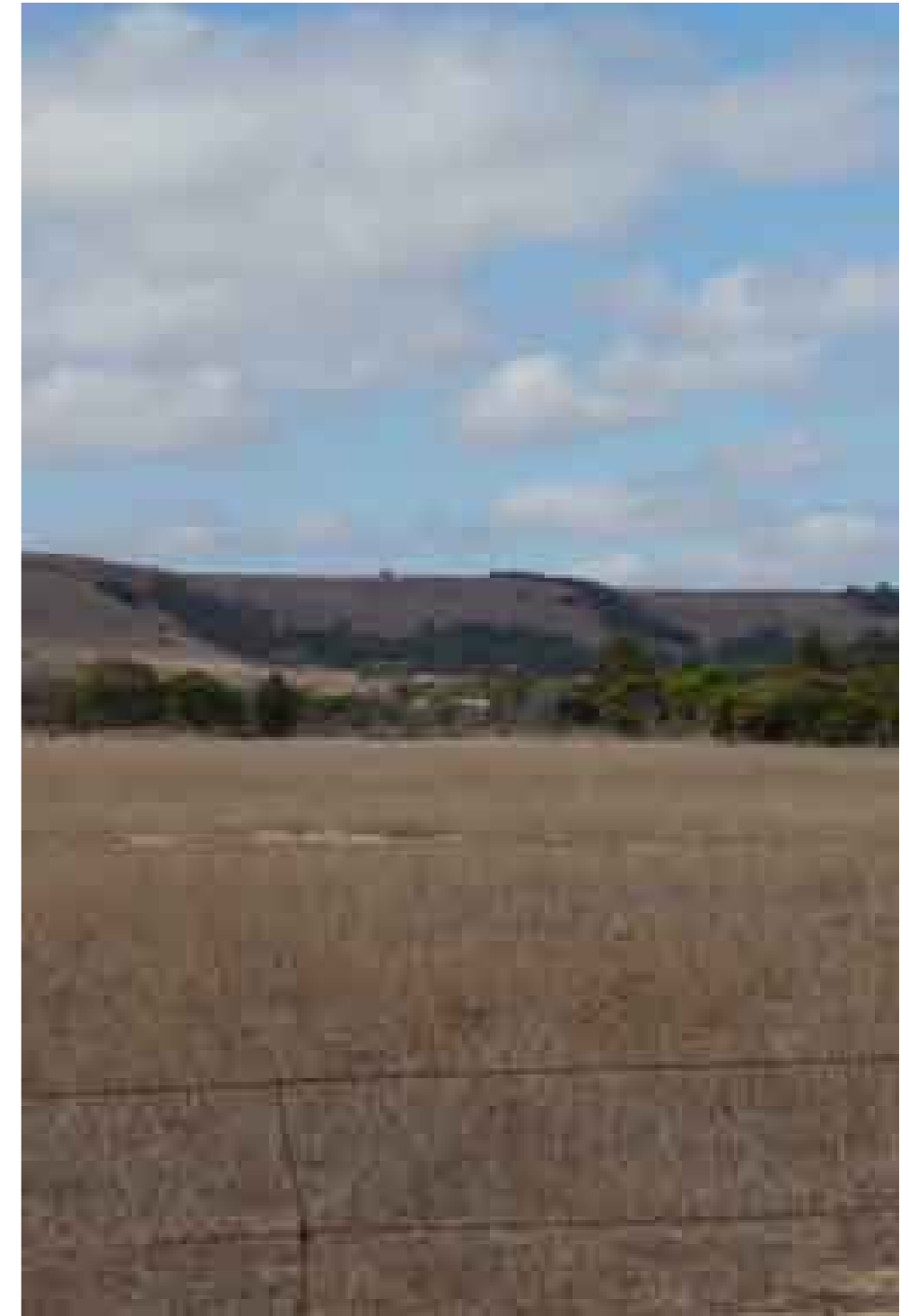


Figure A3: P1020255.jpg
David Road: Zoomed image showing vegetation down scarp



Figure A4: P1020262.jpg
20m North of Sutcliffe Rd + Drabble Rd Intersection



Figure A5: P1020267.jpg
100m North of Sutcliffe Rd + Drabble Rd Intersection



Figure A6: P1020271.jpg
800m North of Hackett Rd + Chapman Valley Rd Intersection:
Looking South-Eastward at adjacent property.



Figure A7: P1020274.jpg
1Km North of Hackett Rd + Chapman Valley Rd Intersection:
Travelling into the proposed Development Site.
Existing mature vegetation along future road verges could restrict internal views of buildings. Strong vegetation will be visible from outside the development site as bands of vegetation rather than roads/tracks across the site.



Figure A8: Composed Panorama
 2Km North of Chapman Valley Road: Onsite Internal View
 Looking South-South West.
 Existing site is cleared for agricultural purposes.
 View to Geraldton town is very distant (9-12Km)
 Scarp is degraded. There are no erosion controls in place.



Figure A9: P1020288.jpg
 2Km North of Chapman Valley Road: Onsite
 Looking South-South West.
 Zoomed view of Geraldton City Centre and Port.



Figure A10: P1020305.jpg
30-50m Due East of the terminus of Arnold Road.
Existing adjacent property 'tucked' into vegetation.
Roof colour contrasts with vegetation colours



Figure A13: P1020310.jpg
1Km North of Hackett Rd + Chapman Valley Rd
View of existing adjacent property 'tucked' into vegetation.
Darker house roof colour blends with adjacent vegetation while lighter shed colour contrasts with vegetation colours.

Below: Figure A14: P1020311.jpg
Zoomed view of above



Figure A11: P1020306.jpg
100m Due East of the terminus of Arnold Road.
Existing adjacent property.
Roof colour contrasts with vegetation colours



Figure A12: P1020307.jpg
100m Due East of the terminus of Arnold Road.
Zoomed view of existing adjacent property. No development is proposed to be higher than this building.
Roof colour contrasts with vegetation colours





Figure A15: P1020317.jpg
 500m North of Hall Road + Chapman Valley Road
 Zoomed view of existing rural residential development.
 Prominent roof colours at same height as vegetation would be less visible if colours were closely matched to vegetation.



Figure A17: P1020322.jpg
 1Km North of Hall Road + Chapman Valley Road
Zoomed view of existing rural residential development with portion of the proposed development site behind.
 This pocket of the site may be visible from various locations in a context of existing visible rural-residential buildings and proposed vegetation onsite.



Figure A16: P1020320.jpg
 800m North of Hall Road + Chapman Valley Road
 Zoomed view of existing rural residential development.
 Prominent roof and buildings coloured white do not fit with the landscape and detract from the Ranges.



Figure A18: P1020323.jpg
 1Km North of Hall Road + Chapman Valley Road
 View of existing rural residential development with indistinct portion of the proposed development site behind. This pocket of the site may be visible from various locations in a context of existing visible rural-residential buildings and proposed vegetation onsite.



Figure A19: P1020336.jpg
 At the Terminus of Cooper Street
 An example of exposed unvegetated retaining walls. It is recommended that built form of this nature is restricted within Moresby Heights to reduce visual prominence.

APPENDIX B: Outline Design Guidelines for Eco-Tourist Site

1 Introduction

The identified eco-tourist site, as illustrated on the Preliminary Development Concept Plan by Chappell Lambert Everett (2118-33) is located on the plateau of the Moresby Ranges above the proposed Wavecrest Estate Development Site. The tourist site is located to optimise views and the experience of the Moresby Range. It is therefore located in an area that may be seen in an elevated location.

In response to the findings of the Visual Amenity Impact Assessment this brief outline design guide has been prepared to guide further detailed site planning and building design at the eco-tourist site. Additional detailed landscape and visual analysis should be undertaken for the eco-tourist site at the appropriate planning stages to fully inform the planning and design of the tourist node.

The objective is to integrate the tourist node, reduce its prominence when viewed from the west and south, and to respect the landform of the Moresby Ranges.

2 Eco-tourist Site

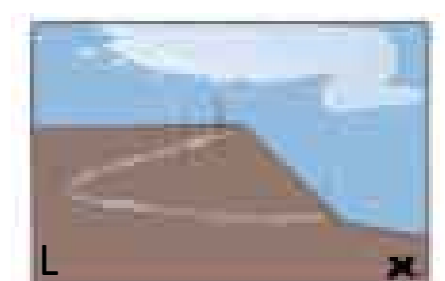
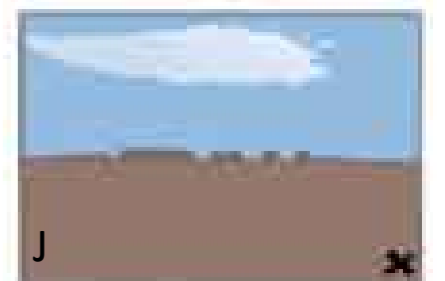
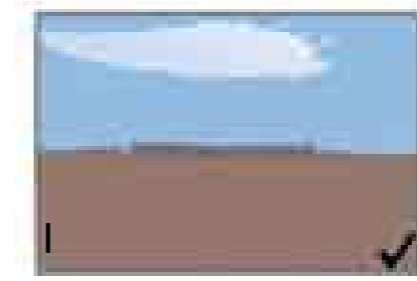
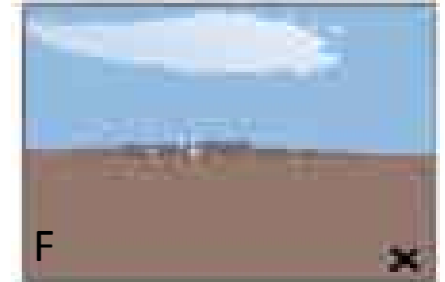
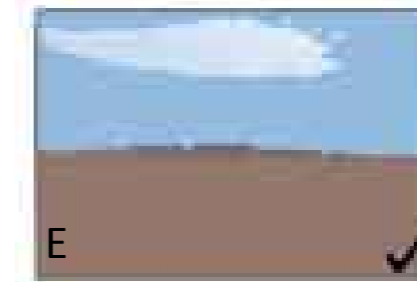
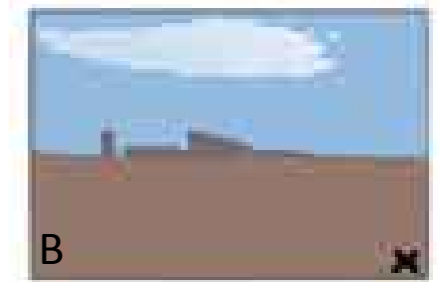
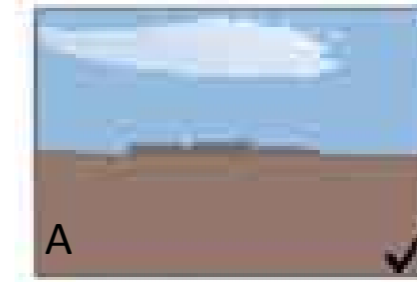
The eco-tourist site, currently shown as being setback from the edge of the plateau, is likely to feature built-form and public facilities including a carpark. Following is general guidance to visually integrate development into the landscape, all built-form and facilities should be subject to this guidance.

- Built-form should be horizontal in-nature when viewed from the west. See Figures A-B right.
- Buildings should be sited 30m back from the 190m contour. See Figures C-D right.
- Ground modelling should be incorporated to integrate and reduce the scale of the buildings and to emphasise the horizontal nature of the site. See Figure E right.
- Minimise any reflective surfaces. See Figure F. That is;
 - Eaves should be constructed to create appropriate shading of reflective surfaces.
 - Zincalume or metallic surfaces should not be situated in places where they can or may reflect.
 - Windows or glass should be tinted, glazed or detailed in such a manner as will not create a highly reflective surface especially late in the day.
- Siting of carparks and roads should minimise visibility and reflectivity towards Geraldton central, especially the Sydney Memorial Lookout.
- Vegetation should not create strong vertical accents along the skyline. See Figures G-H right.
- Siting of out-buildings should not detract from the natural skyline created by the scarp when viewed from below. See Figures I-J right.

3 Access Road

The detailed alignment and design of the road, its lighting, treatments of any necessary abutments, retaining structures, walls and barricades need to address the issue of visibility from the west and south. To minimise the potential of visual intrusion;

- The greatest proportion of the route should not be visible from the south,
- The road should be designed so as to minimise the need for cut,
- The road should be designed so as to minimise exposing faces of rock taller than 2m,
- The verge should be designed so as to allow revegetation works to occur,
- It should be noted that significant street lighting or pole lights may have a negative visual impact on the broader landscape and therefore alternatives should be investigated. See Figures K-L right.



APPENDIX 4

EPA Comments on Amendment 5 to Local Planning Scheme No. 5 (October 2011)



Chief Executive Officer
City of Greater Geraldton
PO Box 101
GERALDTON WA 6531

Your Ref LP/15/0001
Our Ref A412136
Enquiries Patrick Cavalli
Phone 6467 5411

Attention: Mr Murray Connell

Dear Sir/Madam

**DECISION UNDER SECTION 48A(1)(a)
*Environmental Protection Act 1986***

SCHEME AMENDMENT TITLE: City of Greater Geraldton Local Planning
Scheme 5 Amendment 5 - rezoning from
'Rural' to 'Development' zone
LOCATION: Lots 80 & 81 Hackett Road
LOCALITY: Waggrakine
RESPONSIBLE AUTHORITY: City of Greater Geraldton
DECISION: Scheme Amendment Not Assessed –
Advice Given (no appeals)

Thank you for referring the above scheme amendment to the Environmental Protection Authority (EPA).

After consideration of the information provided by you, the Environmental Protection Authority (EPA) considers that the proposed scheme amendment should not be assessed under Part IV Division 3 of the *Environmental Protection Act 1986* (EP Act) but nevertheless provides the following advice and recommendations.

ADVICE AND RECOMMENDATIONS

1. Environmental Issues

- Moresby Ranges

2. Advice and recommendations regarding Environmental Issues

Moresby Ranges

Environmental Values

The majority of the amendment area occurs within City of Greater Geraldton's (CGG) Moresby Range Landscape Special Control Area (SCA 2) and is included

in the *Moresby Range Management Strategy 2009* and *Moresby Range Management Plan 2010* documents as part of a Detailed Investigation Area. The focus of these documents, in terms of use and management, was on areas most commonly recognised as the Moresby Range, and these were labelled Detailed Investigation Areas. Thus management measures described in these documents should apply to the amendment area.

Native vegetation in the amendment area is known to be remnants of Geraldton Regional Flora and Vegetation Survey (GRFVS) Plant Communities 10, 13 and 15, which are poorly represented in the GRFVS area (i.e. <30%). Vegetation in the northwest of the amendment area is known to sustain populations of Priority 1 and 3 Flora species. Additionally, the amendment area is considered to contain potential foraging habitat for Carnaby's Black Cockatoo and other general habitat values for specially protected fauna.

The EPA considers that the environmental report submitted with the scheme amendment documentation adequately documents these factors combined with proposed management to minimise the potential impacts of the proposed rezoning within SCA 2.

Proposed Management

The amendment report and supporting documentation demonstrates consideration of the significant values the amendment area possesses, and seemingly proposes adequate management to preserve the majority of these values.

The amendment report states that approximately 30% of the amendment area is proposed for retention as Public Open Space (POS), which appears to include the large majority of the existing remnant vegetation located within the amendment area. The report also states that all portions of the amendment area containing Priority Flora will be retained in POS or larger covenanted lots and a linear section of POS will be provided in the eastern portion of the site to protect the most significant portion of the Moresby Range that occurs in the amendment area. Revegetation with native species is also proposed to be undertaken within areas of POS following development.

Conclusion

The EPA considers the proposed delineation of POS and preparation of a POS Management Plan in accordance with the proposed Local Structure Plan provisions (Appendix F) to the satisfaction of the Western Australian Planning Commission on the advice of the CGG and Department of Environment and Conservation (DEC), to be a suitable measure for ensuring the long term protection and viability of the environmental values that exist within the amendment area. However the indicative Development Concept Plan provided is considered to be a rough sketch and does not adequately demonstrate the proposed POS delineation and provisions. The EPA expects the proposed allocation of POS and its provisions should be formalised prior to subdivision and that this should be done to the satisfaction of the DEC to ensure consistency with that proposed in the amendment documentation.

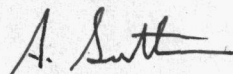
3. General Advice

- For the purposes of Part IV of the EP Act, the scheme amendment is defined as an assessed scheme amendment. In relation to the implementation of

the scheme amendment, please note the requirements of Part IV Division 4 of the EP Act.

- There is no appeal right in respect of the EPA's decision on the level of assessment of scheme amendments.
- A copy of this advice will be sent to relevant authorities and made available to the public on request.

Yours faithfully

A handwritten signature in black ink, appearing to read 'A. Sutton', written in a cursive style.

Anthony Sutton
Director
Assessment and Compliance Division

17 October 2011

APPENDIX 5

Environmental Assessment Report (Coterra, January 2013)



COTERRA ENVIRONMENT



Environmental Assessment Report Local Structure Plan

Lots 80 & 81 Hackett Road, Waggrakine

Revision 1, January 2013

CALIBRE | COMMITMENT | COLLABORATION

This report was prepared by:

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): Luke Rogers
Report Version: Rev 1
Date: January 2013

This report was prepared for:

Sutcliffe Road JV
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Sutcliffe Road Joint Venture (JV) are proposing to develop Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre.

The site is currently being rezoned to 'Development' under the City of Geraldton-Greenough Local Planning Scheme (LPS) No. 5 (Figure 3).

As part of the rezoning of the site, the scheme amendment was referred to the Environmental Protection Authority (EPA) under Section 48A of the *Environmental Protection (EP) Act (1986)*. The EPA resolved to not assess the amendment (Ref: A412136), but provided advice and recommendations regarding environmental issues. This advice discussed the significance of the Moresby Ranges, and the remnant vegetation, however noted that the environment report submitted with the scheme amendment adequately documents these factors combined with proposed management to minimise the potential impacts of the proposed rezoning within SCA 2.

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009), and is bordered by Rural Residential development to the south and west.

The proponent is now progressing the submission and approval of the Local Structure Plan (LSP) with the recently formed City of Greater Geraldton (CoGG).

As part of the LSP documentation, this Environmental Assessment Report (EAR) has been prepared to inform the CoGG of the key environmental characteristics of the site, and how the proposed LSP reflects the environmental features and constraints, along with proposed management measures to minimise, avoid or mitigate potential environmental impacts.

The site is elevated and rises from 75m AHD on the western edge of the property, up to 210m AHD at the commencement of the Moresby Ranges to the east. The site has been previously used for agricultural purposes and is therefore mostly cleared, however some small pockets of vegetation remain scattered across the site (Figure 2).

Land Capability mapping for the site indicates that the soils on the site are generally suitable for development and on-site effluent disposal.

The site's vegetation condition and type has been assessed and mapped (Figure 9). The majority of the site can be broadly classified as cleared paddocks in 'Degraded' to 'Completely Degraded' condition, mainly consisting of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives. Remnant vegetation in the north to northwest portion of the site was in 'Excellent' condition, with only small patches of cleared vegetation (Figure 9). Remaining patches of vegetation were assessed as being in 'Good' to 'Completely Degraded' condition.

Regional vegetation mapping by Beard et. al. (1976) indicates the following vegetation associations as occurring within the site:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The site contains two areas subject to seasonal inundation, which have been historically grazed and are subsequently degraded. The areas are not recognised as regionally significant in the *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention (1971).

TABLE OF CONTENTS		Page
1.0	INTRODUCTION	1
1.1	Project Description and Planning Context.....	1
1.2	EPA Scheme Amendment Assessment	1
1.3	Scope of Report	2
2.0	KEY ENVIRONMENTAL POLICIES	3
2.1.1	Environmental Protection Act 1986.....	3
2.1.2	Moresby Range Management Strategy.....	3
2.1.3	Moresby Range Management Plan.....	3
2.1.4	Geraldton Regional Flora Survey 2010	4
2.1.5	EPA Bulletin 891 . Geraldton Region Plan	4
2.1.6	Guidance Statement No. 33 . Environmental Guidance for Land Development.....	5
3.0	EXISTING ENVIRONMENT.....	6
3.1	Site Location and Land Use.....	6
3.2	Topography, Landforms and Soils.....	6
3.2.1	Topography	6
3.2.2	Landforms and Soils.....	6
3.2.3	Land Soil Capability for Erosion and On-site Effluent Disposal	7
3.2.4	Acid Sulfate Soils	8
3.3	Hydrology	8
3.3.1	Groundwater	8
3.3.2	Wetlands	9
3.3.3	Surface Water and Drainage	9
3.4	Vegetation and Flora.....	10
3.4.1	Interim Biogeographical Regionalisation of Australia.....	10
3.4.2	Beard Vegetation Associations	10
3.4.3	Geraldton Regional Flora and Vegetation Survey.....	11
3.4.4	Vegetation Type and Condition.....	12
3.4.5	Flora.....	13
3.5	Fauna and Habitat	14
3.6	Cultural Heritage	16
3.7	Potential Contamination	16

4.0	LOCAL STRUCTURE PLAN.....	17
4.1	Description	17
4.2	Environmental Aspects of the LSP Design	17
4.2.1	Public Open Space and Regional Open Space	17
5.0	IMPACTS AND MANAGEMENT	19
5.1	Vegetation and Flora.....	19
5.1.1	LSP Design Measures	19
5.1.2	Other Management Measures	20
5.2	Fauna and Habitat	21
5.2.1	LSP Design Measures	21
5.2.2	Other Management Measures	21
5.3	Wetlands.....	22
5.4	Moresby Ranges.....	22
5.5	Acid Sulfate Soils.....	23
5.6	Construction Impacts.....	23
5.7	Water Management	24
5.8	Erosion and On-site Effluent Disposal.....	24
6.0	IMPLEMENTATION STRATEGY	26
6.1	Vegetation.....	26
6.2	Fauna and Habitat	26
6.3	Additional Environmental Management Items	26
7.0	REFERENCES	27

TABLES (Compiled within the report)	Page
Table 1: Land Capability of the Soil Units On-site	8
Table 2: Vegetation Complex Statistics.....	11
Table 2: GRFVS Plant Communities.....	11
Table 3: Explanation of Vegetation Condition Rating.....	13
Table 4: List of Threatened Fauna Species.....	15

FIGURES (Compiled at the end of the report)

Figure 1: Site Location
Figure 2: Aerial Photo
Figure 3: City of Geraldton-Greenough Local Planning Scheme Zoning
Figure 4: Topography and Geology
Figure 5: Acid Sulfate Soils
Figure 6: Wetlands and Surface Water Flow
Figure 7: Regional Vegetation Complexes
Figure 8: Site Assessed Vegetation Complexes
Figure 9: Vegetation Condition and Locations of Priority Flora
Figure 10: Draft Local Structure Plan

APPENDICES

Appendix A: Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007)
Appendix B: Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011)
Appendix C: DEC Threatened Fauna database search results
Appendix D: Protected Matters Search Result – EPBC ACT
Appendix E: Department of Indigenous Affairs – Registered Sites Search Results
Appendix F: Results of UXO Search and FESA Confirmation
Appendix G: Proposed draft Local Planning Scheme text provisions

1.0 INTRODUCTION

1.1 Project Description and Planning Context

Sutcliffe Road JV are proposing to develop Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Greater Geraldton (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. An aerial photograph of the site is shown as Figure 2.

The site is currently being rezoned from 'Rural' to 'Development' under the City of Greater Geraldton Local Planning Scheme (LPS) No. 5 (Figure 3).

A Local Structure Plan (LSP) has now been prepared by project planning consultants CLE, proposing a mixture of Residential, Special Rural, Town Centre and Tourism land uses, and the proponent wishes to now advance approval of the LSP.

In order to facilitate development of the site in accordance with this LSP, this environmental assessment report has been prepared to inform and support the LSP. As a result, this Environmental Assessment Report (EAR) is to be read in conjunction with the LSP documentation prepared by CLE.

The LSP has been prepared to respond to the site's key opportunities and constraints and provides for an integrated planning outcome, complementing the site's context between Waggarakine Rural Residential area and the Moresby Range, whilst making best use of its strategic attributes (CLE, 2011).

The LSP provides for:

- Development of a residential community of between 1500-2000 lots, centring around a main-street style village centre;
- Provision of a local primary school adjoining the village centre;
- Retention of the majority of existing native vegetation on site within open space or as covenanted vegetation on large lots;
- Provision of an integrated network of public open space including:
 - Preservation of the Moresby Range 'tops' as regional park land;
 - District Open Space (playing fields and the like);
 - A variety of local open spaces, to service the local community, allow retention and enhancement of remnant vegetation and wetlands, and to provide recreation linkages to the Range;
- Integrated urban water management; and
- Establishment of a tourist facility on top of the Range to enhance public access to the range and provide a genuine tourist destination for both regional and local visitors.

1.2 EPA Scheme Amendment Assessment

As part of the rezoning of the site to 'Residential' under the City's TPS No. 5, the amendment was referred to the Environmental Protection Authority (EPA) under Section 48A of the *Environmental Protection (EP) Act (1986)*. To assist the EPA in determining the level of assessment on the proposed land use change, a detailed

environment report was submitted with the amendment documentation to outline the environmental features and proposed management measures to ensure the development would progress in a manner that would limit potential environmental impact in accordance with the EPA's objectives.

As a result, the EPA resolved to not assess the amendment (Ref: A412136), but nevertheless provided advice and recommendations regarding environmental issues. This advice discussed the significance of the Moresby Ranges, and the significance of the remnant vegetation as detailed in the Geraldton Regional Flora and Vegetation Survey. The EPA also noted that the environment report submitted with the scheme amendment documentation adequately documents these factors combined with proposed management to minimise the potential impacts of the proposed rezoning within SCA 2. The EPA advice concludes:

"The EPA considers the proposed delineation of POS and preparation of a POS Management Plan in accordance with the proposed Local Structure Plan provisions (Appendix F) to the satisfaction of the Western Australian Planning Commission on the advice of the CGG and Department of Environment and Conservation (DEC), to be a suitable measure for ensuring the long term protection and viability of the environmental values that exist within the amendment area. However the indicative Development Concept Plan provided is considered to be a rough sketch and does not adequately demonstrate the proposed POS delineation and provisions. The EPA expects the proposed allocation of POS and its provisions should be formalised prior to subdivision and that this should be done to the satisfaction of the DEC to ensure consistency with that proposed in the amendment documentation".

1.3 Scope of Report

This Environmental Assessment Report (EAR) has been prepared to inform the CoGG on the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives by detailing proposed management measures and appropriate planning design to minimise, avoid or mitigate potential environmental impacts. This report will also adequately address the advice of the EPA as detailed in their decision letter on the CoGG Scheme Amendment for the site (dated the 17th October, 2011) and summarised above. The DEC will be consulted and a copy of this report along with the structure plan design, will be forwarded to the regional DEC office in Geraldton to demonstrate the formalisation of the location and alignment of the POS areas in accordance with the EPA advice.

2.0 KEY ENVIRONMENTAL POLICIES

2.1.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* ('the Act') is the pre-eminent environmental legislation in Western Australia. Development projects are regulated under Part IV of the Act.

Assessment opportunities under the Act occur at the rezoning stage (Region Scheme and/or Town Planning Scheme) under Section 48A of the Act and the subdivision/ development stage under Section 38 of the Act.

2.1.2 Moresby Range Management Strategy

The Moresby Range Management Strategy was prepared by the Western Australian Planning Commission and adopted in 2009. It recognises the high landscape significance of the Range, and seeks to:

- Protect, conserve and enhance its natural values;
- Protect the indigenous and non-indigenous cultural values;
- Improve public access and recreation opportunities;
- Manage the risk of erosion and bushfire; and
- Ensure a consistent and coordinated policy approach to the areas planning.

To achieve these objectives, the WAPC makes a range of recommendations, of which the following are relevant to this site:

- Opportunities to retain biodiversity through the eradication and control of weeds and feral animals, and the protection and rehabilitation of remnant vegetation;
- Revegetation around areas of conservation significance with key target corridors identified. A small patch of remnant vegetation is identified in the south-west corner of the subject site;
- To ensure that development proposals maintain and enhance conservation values;
- Incorporation of public access to watercourses in development proposals;
- To incorporate linkages and walk trails through the area;
- To limit and manage erosion and bushfire risk;
- Minimisation of intensive development on the flat tops and side slopes, and in key view corridors and ensuring that that which occurs is consistent with the Strategy objectives; and
- To ensure that the landscape value of the area is taken into account in any development proposal and appropriate management responses are incorporated.

2.1.3 Moresby Range Management Plan

The Moresby Range Management Plan was prepared for the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning to provide further

direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range (closest to Geraldton).

It states that any development proposal should address the objectives stipulated for the area west of the Range, namely:

- Ensuring that the ecological dynamics of the landscape are protected and enhanced;
- Placing larger lots closer to the Range Precinct and in areas of high visibility;
- Ensuring that the transport network minimises trip distances, allows for walking, bicycling and other forms of transport, provides easy linkages to commonly used facilities and the Range, and provides the basis for strategic tree plantings and ecological linkages between the foothills and the Range;
- Creating a visually smooth transition from the obvious dominance of buildings in the centre of the City to the bushy and green appearance of the Range;
- Ensuring that buildings sit in with the landscape and create the overall impression that buildings become more sensitive and integrated into the landscape the closer the observer is to the Range.

2.1.4 Geraldton Regional Flora Survey 2010

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed in 2010 by the WAPC. The objective was to provide a regional context for land use planning and environmental impact assessment of proposals affecting native vegetation in the Geraldton region.

Information collected through the GRFVS is intended to assist land use planning by the Department of Planning (DoP) and local governments, environmental impact assessments by the EPA, and conservation planning by DEC.

The report, associated maps and data provide useful information for landowners and developers, but does not preclude the requirement for site-based ecological assessments of areas likely to be impacted by development. Importantly, the GRFVS will inform conservation and regional planning in the Geraldton region, including the preparation of a local biodiversity strategy that will identify priority natural areas for consideration in future land use planning.

2.1.5 EPA Bulletin 891 – Geraldton Region Plan

The Geraldton Region Plan was prepared by the WAPC in 1997, to provide a regional framework for planning decisions and to recognise the regional centre for the mid-west.

The stated objective of the EPA for native vegetation is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation types and communities. In assessing the Geraldton Region Plan under Section 16 of the *Environmental Protection Act 1986* (EPA Bulletin 891, 1998), the EPA supported the development of a remnant vegetation inventory in the Geraldton region and the conservation of regionally significant vegetation in both private and government ownership. A list of recommendations were also made by the EPA in respect to the

Regional Plan. Those recommendations that are potentially applicable for the site are listed below:

- *“Areas supporting regionally significant vegetation should be identified and appropriately designated for conservation”.*
- *“The regional landscape values of the Moresby Ranges should be appropriately protected in the Region Plan”.*

2.1.6 Guidance Statement No. 33 – Environmental Guidance for Land Development

Guidance Statement No. 33 (EPA, 2005) outlines the environmental protection process and provides the EPA’s advice on a range of environmental factors in order to assist in the protection, conservation and enhancement of the environment during the land planning and development process.

3.0 EXISTING ENVIRONMENT

3.1 Site Location and Land Use

The site is located within the City of Greater Geraldton (CoGG), and is bordered by Rural Residential development to the south and west, agricultural land to the north, and the Moresby Ranges to the east.

The site has been historically, and currently still is, used for cattle and sheep grazing. The site has therefore mostly been cleared for pasture, with some pockets of remnant vegetation scattered across landholding. A single residence is located at the base of the Moresby Ranges, near the south eastern corner which is occupied by the current farming caretaker of the property.

A gravel pit which is no longer in operation is located outside the north western tip of the site.

3.2 Topography, Landforms and Soils

3.2.1 Topography

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009). The site is therefore elevated with the topography rising from approximately 75 metres Australian Height Datum (mAHD) on the western edge, up to 210 mAHD at the highest point of the ranges on the eastern edge (Figure 4).

Within 100m to 200m of the eastern boundary is the steepest section of the site, where the Moresby Ranges scarp descends to the foothills.

3.2.2 Landforms and Soils

Regional geological mapping (WA Geological Survey, 1971) identifies the main geological unit over the site as being the Chapman Group, which is characterised as exhibiting Moonyonooka Sandstone (yellow feldspathic sandstone and arkose) and Greenough Sandstone (variegated clayey sandstone).

The lower slopes and the top of the ranges are classified as being Laterite with overlying quartz sand and underlying highly weathered rock. The steep portions along the scarp along the eastern side of the site are classified as either Champion Bay Group or Yarragadee Formation, characterised by non-marine fluviatile feldspathic, poorly sorted sandstones which are porous and poorly cemented, hence allowing for considerable groundwater reserves.

The Western Australian Geological Survey (2001) regional mapping indicates that the project site contains primarily colluvial foot slopes, with silty sand over mottled sandy clay soils. The other less prevalent soil units occurring in the site are outlined below:

- Alluvial stream channels (including stream beds and banks; seasonally active, silty sand clay, slope deposits and weathered bedrock).

- Alluvial swamps, having waterlogged organic soil over silty sandy clay.
- Eolian formed, deflated dunes of residual quartz sand over calcarenite.
- Residual ferruginous pisolitic duricrust and mottled soil (weathered bedrock).
- Colluvial formed, talus slope to the escarpement, consisting of weathered rock debris, gravel and boulders and the Cadda Formation of shale, siltstone and sandstone with shelly sandy limestone.

3.2.3 Land Soil Capability for Erosion and On-site Effluent Disposal

The Moresby Range Management Strategy (WAPC, 2009) discusses the risk of erosion based on the geology of the foothills and foot slopes of the Moresby Range in consideration of the steepness of these slopes.

Steep, shallow, rocky side slopes and recent colluvial foot slopes wrap around the flat tops. The profile of the side slopes is fairly uniform, with the slope increasing with height. The steepest side slopes are at Wokatherra Hill and north of White Peak Road, extending for a horizontal length of around one kilometre (WAPC, 2009).

The side slopes and sandy soils of the range are susceptible to wind and water erosion. This is particularly apparent on steeper slopes of the range, where there is clear evidence of landslips. Many sections of the side slopes are unstable and bare rock faces are visible (WAPC, 2009).

In addition the 'Geraldton Rural Residential Land Capability Study' prepared by the Department of Agriculture (DoAg, 1990) identifies the following land capability units within the development site (in order of area of representativeness) and are outlined on Figure 4:

(Ysp) – Yellow sandplain: Rapidly drained uniform yellow sand with a single grain structure. These soils commonly have a loose, brown or dark brown loamy sand surface soil over a yellowish brown loamy sand.

(Mf2) – Footslopes: Well drained red duplex soils with a brown or red sand to sandy loam surface texture, over sandy clay loam or sandy clay at depths between 40-100 cm.

(Mf1) – Footslopes: Yellow duplex soils with brown sand to loamy sand over mottled subsoil with texture ranging from sandy clay to heavy clay at depths between 40-120 cm.

(GrS) – Sandstone rises: Shallow, very gravelly sands (note this land capability unit only associated).

(Ty) – Deep yellow sands: Rapidly drained uniform yellow loamy sand with a single grain structure. These soils commonly have a dark brown loamy sand top soil overlying a yellowish brown to yellow loamy sand (note - only associated with far northern corner of site).

(Mss) – Sideslopes: Eroded duplex soils (note the ‘Mss’ unit is mapped almost entirely outside the intended development area, and as such is not assessed for its suitability for development or on-site effluent disposal).

Each of these land capability units has been assessed for the suitability for housing and road construction and on-site effluent disposal, and can be summarised in the table below:

Table 1 – Land Capability of the Soil Units On-site

<i>Unit</i>	<i>Ysp</i>	<i>Mf2</i>	<i>Mf1</i>	<i>Ty</i>
<i>Housing and Road Construction suitability</i>				
Wind Erosion Hazard	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>
Water Erosion Hazard	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Ease of Excavation	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Foundation Soundness	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>
Slope instability risk	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>
Flood Hazard	-	-	-	-
<i>Onsite Effluent Disposal</i>				
Microbial purification ability	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>
Soil absorption ability	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>

These results indicate the soils on the site are generally suitable for housing and road construction, and are capable of supporting on-site effluent disposal.

3.2.4 Acid Sulfate Soils

The Department of Environment and Conservation Acid Sulfate Soils risk mapping (WA Atlas, 2011), indicates that there is a small area (approximately 2ha) at the western boundary of the site which is mapped as having a high risk of encountering ASS within 3m of the natural surface (Figure 5). An additional small sliver of ‘moderate to low risk’ is located near the south west corner of the site. The remainder of the site is mapped as having a low to no risk of encountering ASS within 3 m of natural surface level (Figure 5).

3.3 Hydrology

3.3.1 Groundwater

The Department of Water has approximately 40 bores located within a 5 km radius of the centre of the landholding, including one bore which is located within the site. This bore (bore no. 20002923) indicated that the depth to groundwater at this location was at 6 metres below ground level. This depth however is not necessarily indicative of the average depth to groundwater across the entire site given the variability in the topographic levels. Depth to groundwater is therefore likely to vary considerably at different points. Data obtained from the nearby Department of Water (DoW) bores indicates a range in groundwater depths of between 1.8 m to

36.5 m below ground level (GHD, 2006). However based on the data obtained from the DoW, the depth to groundwater is likely to be on average greater than 6 metres below ground level across the site.

The site is situated within the proclaimed Arrowsmith Groundwater Area, which covers the northern-most extent of the Northern Perth Basin, from Geraldton to Green Head and east to Coorow, in the state's Mid West region. A groundwater allocation plan has been prepared by the Department of Water (2010) which details the objectives of the proclaimed Arrowsmith Groundwater Area and broad management requirements. These include:

- A guideline for the allocation and licencing of groundwater in the Arrowsmith Groundwater Area.
- Details on the effects of abstraction on groundwater quality and groundwater-dependent ecosystems.

This plan will guide the assessment of groundwater licence applications in respect to allocations entitlements in the Arrowsmith Groundwater Area.

3.3.2 Wetlands

There are two areas of seasonal inundation within the site, located in the south-west and near the western edge (Figure 6). These areas are not identified as wetlands, or are recognised as regionally significant in the *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention (1971).

The southern-most wetland, located near the south western corner of the site is labelled as a 'non-perennial swamp' by available Landgate mapping data (Landgate, 2011), with the wetland located near the central western area of the site labelled as 'an area subject to flooding or inundation'.

Therefore these areas of inundation have no level of significance or protection status as identified by the Department of Environment and Conservation or the Department of Water.

Furthermore, the vegetation condition for both wetland areas was noted as being between 'Good to Degraded' and 'Degraded' as determined through the botanical assessment (detailed in Section 3.4 below).

The developer intends on retaining and managing these areas, given they represent natural drainage features, and retain some environmental value with the remnant vegetation. However because boundaries of these wetlands are not well defined, the remnant vegetation will be used as a general guide for the area of wetland intended to be retained.

3.3.3 Surface Water and Drainage

Three natural drainage lines are present through the site, which have been highly modified due to clearing of vegetation (Figure 6). The drainage lines appear to be natural drainage channels for rainwater flowing off the scarp, however they remain

dry most of the year, with limited flow reported from the last few years (GHD, 2006).

3.4 Vegetation and Flora

The vegetation and flora data relevant to this site has been obtained from the following sources:

- Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007) – Attached as Appendix A.
- Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011) – Attached as Appendix B.
- Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).

Where overlap on the assessments exists, the more recent data obtained in the Level 1 Flora and Vegetation survey (Coterra, 2011) supersedes the results of the previous Priority Flora Survey (GHD, 2007).

Based on review of the above documents a summary of the vegetation and flora on the site is outlined below.

3.4.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway and Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2,242,033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

3.4.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The remaining extent of these two vegetation associations' within WA and the Geraldton Regional Flora and Vegetation Survey area (GRFVS), are presented in Table 1 below (WAPC, 2010).

Table 2 Vegetation Association Statistics

Area	Beard vegetation association 675	Beard vegetation association 359
Pre-European extent in GRFVS	3, 148 ha	17, 805 ha
Current (remaining) extent within GRFVS	240 ha (7.62%)	3, 077 ha (17.3%)
Area protected within GRFVS	79.4 ha	1.4 ha
Pre-European extent in WA	51, 850 ha	44, 493 ha
Current (remaining) extent in WA	10, 992 ha (21%)	8, 366 ha (19%)
Area protected in WA	328 ha	1.25 ha

The EPA conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) is 30% retention of pre-European vegetation complex extent outside of constrained areas (i.e. Perth Metropolitan Area is a constrained area). This retention target has therefore not been met for the above vegetation associations that are located within the site, for both the Geraldton region and in WA generally.

The locations of each of these vegetation associations are outlined in Figure 7.

3.4.3 Geraldton Regional Flora and Vegetation Survey

The Geraldton Regional Flora and Vegetation Survey (GRFVS) aims to provide information to assist in the assessment of proposals that may affect the native vegetation within the Geraldton region (GRFVS, 2010).

Using Beard's (1976) regional vegetation associations, the GRFVS maps vegetation at a local scale which are referred to as GRFVS plant communities. The original vegetation of study area, is likely to have consisted of three GRFVS plant communities, these are detailed in Table 2.

Table 3 GRFVS Plant Communities

Plant Community	Description	Beard Vegetation Association
10	Near Coastal: <i>Acacia rostellifera</i> shrubland	359
13	Sandplain: <i>Banksia prionotes/ Acacia rostellifera</i>	359
15	Thicket: <i>Melaleuca</i> spp. /mixed spp.	675

The GRVFS outlines the following in respect to the local conservation significance of each of the recognised plant communities occurring within the site:

"Plant community 10 is more widespread than the other identified communities in the GRFVS area; however better condition representatives have local conservation significance" (WAPC, 2010).

"Plant community 13 occupies 754.39 ha in the GRVFS area, however much of this area is degraded. The better representatives of this plant community occur in the Glenfield and Waggrakine areas. A low heath variant of this plant community occurs in Karloo and Utakarra. This plant community is considered to have conservation significance because, although it has a greater natural extent than most the other communities, it is largely degraded or threatened" (WAPC, 2010).

"Plant community 15 includes the area which matches the description of the 'natural value' ecosystem 'Moresby Ranges' (Australian Natural Resources Atlas 2009) and the P1 priority ecological community 'Plant assemblages of the Moresby Range system' (DEC 2009a). Consequently, this area is considered to have conservation significance (WAPC, 2010)".

The GRVFS recognises the local significance of these plant communities due to the lack of original pre-European extent and due to ongoing degradation and clearing of the vegetation within the GRVFS study area.

The locations of the beard vegetation associations across the site are shown in Figure 7.

3.4.4 Vegetation Type and Condition

The majority of the site has been cleared due to historical agricultural uses, however there are some small pockets of vegetation remaining across the site. In most of these areas, the vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these remnants.

The dominant remnant vegetation units across the site were noted as being the following (Coterra, 2011):

- Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.
- *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladius asper*, **Avena barbata* and *Poaceae* sp.? Open Herbland/Grassland.
- *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
- Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, *?Austrostipa* sp. and *Desmocladius asper* Herbland/ Grassland.

The vegetation units and their locations across the site are presented in Figure 8.

The condition of the vegetation present across the site was mapped during the Level 1 Flora and Vegetation survey undertaken in 2011 (Figure 9), and is described further below.

- The site can be broadly classified as cleared paddocks in 'Degraded' to 'Completely Degraded' condition (Figure 9). The vegetation that is present in the 'Degraded' to 'Completely Degraded' (cleared paddocks) areas consisted of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives.
- The remnant vegetation in the north to northwest portion of the site was in 'Excellent' condition, with only small patches of cleared vegetation (Figure 9).
- Remaining patches of vegetation were assessed as being in 'Good' to 'Completely Degraded' condition.

The condition ratings have been rated in accordance the vegetation condition scale used in Keighery (1994) outlined below:

Table 4 Explanation of Vegetation Condition Rating (Keighery, 1994)

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive specie
3	Very Good	Vegetation structure altered, obvious signs of disturbance
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species

Some of the results of the assessment of the vegetation condition in April 2011, vary from the vegetation condition results determined in 2007. This is likely due to continued degrading land uses (predominantly grazing activities) and could also be partly attributed to a regional reduction in rainfall (Bureau of Meteorology, 2011).

3.4.5 Flora

A search of the DEC Threatened (Declared Rare) Flora Database and the Western Australian Herbarium Specimen database for species of rare and priority flora located within the vicinity of the site was undertaken by GHD in 2007. Of the rare or priority species that were identified by the DEC as potentially occurring within the area, two priority flora species were confirmed as being located within the site as determined through the Level 1 Flora and Vegetation survey completed in April 2011. These species are:

- *Melaleuca huttensis* (Priority 1 Flora), and;

- *Grevillea triloba* (Priority 3 Flora).

A description of the significance of the priority species classification by the DEC is outlined below:

- *Priority 1 species are species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes (DEC, 2011).*
- *Priority 3 species are species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them (DEC, 2011).*

One individual *M. huttensis* was recorded within the northwest corner of the site. *G. triloba* was recorded in the northern and northwest corners of the site, in the areas classified as being in 'Good' to 'Excellent' condition, at densities of 20%, 5% and patches of 20% respectively. The location of these species across the site is shown in Figure 9.

A search of the DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database indicated that there was no previously known TECs or PECs identified as occurring within the site area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca macecephala* and *Hakea pycnoneura* thickets on the Morseby Range.

3.5 Fauna and Habitat

As the majority of the site is cleared and used for grazing of livestock, the fauna habitat value of the site is limited. However, pockets of remnant vegetation will provide islands of habitat for some species.

Vegetation condition is often used as an indicator of fauna habitat value. The majority of the remnants were rated as being in 'Good' to 'Completely Degraded' condition (Section 3.4.3), thereby offering varying habitat value for native fauna. The portion of vegetation in the very north-west tip, which has been assessed as being in 'Excellent' condition, is likely to contain greater fauna habitat value and viability (Figure 9).

A search of the DEC's Threatened Fauna database, and the federal Department of Sustainability, Environment, Water, Populations and Community's (DoSEWPC) database of listed matters of National Environmental Significance protected under

the Environmental Protection and Biodiversity Conservation Act (EPBC Act) (1999) was undertaken. The search indicated that the following Rare or Threatened fauna species could potentially occur within the site. This has been determined based on a comparison between the available fauna habitats within the site, and the information provided on the habitat requirements of each of the listed species:

Table 5 - List of Threatened Fauna Species

Fauna Species	Conservation Status	Likelihood of Being on-site
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)	Threatened	Possible - Limited foraging habitat available
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)	Threatened	Possible - Limited foraging habitat available
<i>Cyclodomorphus branchialis</i> (Slender Blue Tongue Skink)	Threatened	Possible, though unlikely due to lack of suitable habitat
<i>Falco peregrinus</i> (Peregrine Falcon)	Specially Protected Fauna	Unlikely - lack of suitable habitat
<i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)	Threatened	Possible, though unlikely due to disturbed nature of site
<i>Lerista lineata</i>	Priority 3	Possible, though unlikely due to disturbed nature of site
<i>Macropus irma</i> (Western Brush Wallaby)	Priority 4	Unlikely - habitat disturbed onsite
<i>Morelia spilota subsp. imbricata</i> (Carpet Python)	Specially Protected Fauna	Possible, though unlikely due to disturbed nature of site
<i>Pomatostomus superciliosus subsp. ashbyi</i> (White-browed Babbler (western wheatbelt))	Priority 4	Possible, though unlikely due to disturbed nature of site
<i>Psacadonotus seriatus</i> (Cricket)	Priority 1	Possible, though unlikely due to disturbed nature of site
<i>Tyto novaehollandiae subsp. Novaehollandiae</i>	Priority 3	Unlikely - lack of suitable habitat

The DEC database search results are presented in Appendix C, with the results of a protected matters search under the EPBC Act presented in Appendix D.

Whilst some of the habitats present within the site are considered suitable for a number of the Rare or Priority species listed above, the likelihood that these species can sustain viable populations within the site is low due to the fragmented and disturbed nature of the remnant habitats available.

Some of these species are listed as possibly occurring within the site, primarily due to the area of intact vegetation in the northwest corner. Ground dwelling species such as reptiles and insects may inhabit this portion of the site.

Foraging habitat for Carnaby's and Baudin's Cockatoo is present in some areas of existing vegetation across the site.

The level of impact on these species will need to be determined following final planning design, when the area of foraging habitat required to be cleared can be fully assessed in consideration of the significant impact thresholds under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act), 1999.

3.6 Cultural Heritage

A search of the Department of Indigenous Affairs website determined that there are no sites of Aboriginal significance which have been recorded on the site (Appendix E) (DIA, 2011). The closest registered site is located approximately 3km north-west of the northern edge of the site.

All contractors working on the development need to be made aware of their responsibilities under the *Aboriginal Heritage Act 1972* with regard to finding potential archaeological sites. In the event a site is discovered, all work in the area is required to cease and the Department of Indigenous Affairs is to be contacted.

3.7 Potential Contamination

The use of the site for agricultural and pastoral purposes is not viewed historically as intensive, therefore it is unlikely that contamination has occurred. Additionally, the site is not listed on the Department of Water, Water Information (WIN) information database for potentially contaminated sites, nor under the DEC's Contaminated Sites Database (DEC, 2011).

A former Shire of Greenough landfill was once located immediately west of the site, however operations ceased approximately 15 years ago and no contamination has been identified. Additionally groundwater flows in a westerly direction under the former landfill, away from the site.

A threat of UXO's (Unexploded Ordinances) from an area 2km north east of the site called Red Peak has previously been identified. A subsequent UXO threat analysis has, however, resulted in the Unexploded Ordinance Services section of FESA concluding that this area poses a minimal risk as, and that further searching for UXO is unnecessary (refer Appendix F). FESA advise that an Advice Note only will be recommended to be placed upon any subdivision approvals issued for the site.

4.0 LOCAL STRUCTURE PLAN

4.1 Description

The LSP has been developed to guide the subdivision and development of the 385ha of undeveloped land across Lots 80 and 81 Hackett Road, Waggrakine. The LSP is described in detail in the structure plan report (CLE, 2012) to which this report forms an Appendix.

Given the land use and environmental features and constraints to this landholding, the LSP details a number of separate land uses (Figure 10), including the following:

- Residential
- A Primary School
- Public Open Space
- Regional Open Space
- A local Commercial Centre
- Tourist Nodes
- Rural Residential (minimum 1ha Lots)

This report is primarily concerned with the natural areas to be retained within the LSP site.

4.2 Environmental Aspects of the LSP Design

4.2.1 Public Open Space and Regional Open Space

There are a number of environmental objectives which underpin the LSP design, these are to:

- Preserve areas of highest conservation value and create ecological linkages.
- Conserve examples of different natural areas on site and preserve biodiversity.
- Create sustainable conservation areas.
- Incorporate natural areas into new urban fabric.
- Interpret existing landscape and site memory in development areas.
- Incorporate the natural local landscape character within new public domain planting.
- Develop community awareness and involvement.

Retention of landform and natural vegetation and the preservation of key landscape features is one of the driving elements of the LSP design. The LSP design response was to include the retention of the Moresby Ranges within the developable area of the LSP in Regional Open Space (ROS). This area along with the portions of the site identified as containing area of environmental significance will be retained within Public Open Space (POS) areas in the future urban environment. The retention of these areas will provide examples of the pre-development landforms of the site and

will contribute to the retention of flora and fauna species and the preservation of biodiversity on the site.

Land attributes and functional values which have been accounted for in the process of identifying POS and ROS areas in the LSP include the following:

- conservation values;
- retention of significant landform;
- recreation opportunities;
- linkage values;
- fauna habitat values; and
- significant vegetation values (retention of areas vegetation containing Priority Flora species).

Areas of POS in the LSP have been developed to provide the necessary active recreation opportunities for the future residents of the area whilst also preserving as many ecological values as practicable on “Development” zoned land within the LSP area. Areas of native vegetation to be preserved in POS have been strategically located in order to maintain strategic linkages across the LSP site for flora and fauna, with a focus on connecting natural areas to the ROS and the Moresby Ranges.

The area allocated to open space within the LSP area is approximately 133 ha (or approximately 34% of the structure plan area). The total area of POS with a conservation function is approximately 95 ha (or 25% of the total area covered by the structure plan and 71% of the total area of POS and ROS). This represents a considerable portion of the structure plan area, and is reflective of the intent to retain the environmental features and landform associated with the Moresby Ranges.

Specific LSP design measures to manage and preserve the areas of most environmental value are detailed in the subsequent section below.

5.0 IMPACTS AND MANAGEMENT

5.1 Vegetation and Flora

The site contains limited pockets of vegetation due to historical agricultural uses that have resulted in the majority of the site being cleared. Most of the remaining vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these vegetation remnants.

However, the vegetation in the very north to northwest portion of the site is the exception, assessed as being in 'Excellent' condition, with only small patches of cleared vegetation. This area also sustains populations of Priority 1 and 3 species.

The EPA's conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) of 30% retention of pre-European vegetation complex extent has not been met for the vegetation complexes present within the site, for both the Geraldton region and in WA generally.

In addition, both the Moresby Range Management Strategy, the EPA's assessment of the Geraldton Region Plan, and the GRVFS refer to the significance of remnant vegetation and the need to ensure that development proposals maintain and enhance conservation values.

Therefore, despite the condition of the remnant vegetation, it is considered appropriate to retain existing vegetation wherever possible in an effort to preserve and enhance the ecological integrity of the site, and to increase amenity for prospective residents.

5.1.1 LSP Design Measures

The LSP is attached as Figure 10, and outlines the areas of vegetation proposed for retention within the development. The proposed development will allow for the retention of almost all vegetated areas. In addition, all areas with Priority Flora located in them will be retained in Public Open Space (POS) and in large covenanted lots. The LSP is compliant with the conservation measures demonstrated in the initial development concept submitted with the proposed Scheme Amendment, and therefore meets the EPA's expectations for the formalisation of the areas of POS aimed at conserving areas of environmental value, including:

- Two pockets of remnant vegetation located near the central western edge of the site and within the south western corner, are proposed to be reserved for POS. A long linear section of POS will also be provided on the eastern portion of the site to protect this section of the Moresby Range and associated vegetation.

Additional development design measures detailed in the LSP to preserve the environmental integrity of the site include:

- Large covenanted lots – proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will be designed and

conditioned for minimal clearing. Building envelopes will be designated in this portion of the site where vegetation is degraded or already cleared.

- Revegetation with native species will be undertaken following development, predominantly within selected areas of the open space and in streetscape landscaping. The proposed species list for revegetation will be approved by the CoGG prior to subdivision.
- Approximately 34% of the structure plan area is proposed for open space, to preserve areas of environmental and landform significance.
- The proposed reservation of these areas in POS and the covenanted large lot designs in the north-west of the site will be designed to ensure an ecological corridor runs between the vegetated larger semi-rural blocks to the west of the site, to the Moresby Ranges in the eastern portion of the site.
- This corridor will include the area of existing vegetation within the western portion of the site, with the objective of retaining this vegetation and enhancing its ecological integrity through revegetation and proposing a link to other areas of vegetation in open space.

5.1.2 Other Management Measures

To ensure the future viability of retained vegetated and revegetated areas the following management strategies are proposed:

- Delineate POS areas containing retained vegetation and revegetation zones from the development by separating them by a road or significant pedestrian access ways.
- Preparation of a POS Management Plan, to be signed off by the Local Authority in consultation with the DEC, which will provide details on the following:
 - minimisation of clearing and vegetation disturbance during construction,
 - access control (during construction and post-construction),
 - revegetation species and establishment,
 - weed control,
 - dieback control and management,
 - stormwater management,
 - ongoing maintenance and management of the vegetated areas,
 - protection of wetlands,
 - fire management, and
 - interface management.

This will ensure the long term protection and viability of the vegetation and associated vegetation retained in POS. The POS management plan will be prepared as a requirement of subdivision to the satisfaction of the Western Australian Planning Commission.

5.2 Fauna and Habitat

Habitat is generally limited due to the fragmented and degraded nature of the existing vegetation across the site. Key species of conservation significance which have been identified as potentially utilising habitat present at the site include Carnaby's Black Cockatoo and Baudin's Black Cockatoo.

Black Cockatoo's typically utilise areas of Banksia, Allocasuarina and Eucalyptus woodland, which can be found intermittently amongst the remnant vegetation areas across the site. The northwest corner of the site also contains potential habitat for some species of conservation significance, as well as other fauna species.

5.2.1 LSP Design Measures

The LSP is attached as Figure 10, and outlines the areas of vegetation and fauna habitat proposed for retention within the development. As is evident in this plan, the majority of the vegetation and habitat currently existing on the site will be retained in open space.

One of the key design initiatives, which underpins the environmental and aesthetic objectives of this project, is the retention and development of an ecological corridor, between the vegetated larger semi-rural blocks to the west, to the Moresby Ranges in the eastern portion of the site. This corridor will include the area of existing vegetation within the western portion of the development, with the objective of retaining this vegetation and enhancing the ecological integrity through revegetation and linking it with other areas of vegetation in open space.

This corridor will allow for the safe movement of fauna across the site, ensuring a continuous link between fauna habitats that are currently separated by agricultural land and increasing the overall fauna habitat viability of the landholding.

Large covenanted lots are also proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will ensure minimal clearing. Building envelopes will be strategically located in this portion of the site where vegetation is degraded or already cleared.

Overall, the majority of the existing vegetation is proposed for retention in Public Open Space, in large covenanted lots or as part of the Moresby Ranges open space. In addition individual and small clusters of trees will be retained where possible.

5.2.2 Other Management Measures

A POS Management Plan will be prepared at subdivision stage, prior to development, to be signed off by WAPC in consultation with the Local Authority and the DEC, which will provide details regarding:

- minimisation of clearing and vegetation disturbance during construction,
- access control (during construction and post-construction),
- revegetation species and establishment,
- weed control,
- dieback control and management,
- stormwater management,

- ongoing maintenance and management of the vegetated areas,
- protection of wetlands,
- fire management, and
- interface management.

This will ensure the long term protection and viability of the vegetation and associated fauna habitats retained in POS.

5.3 Wetlands

There are two areas of seasonal inundation within the site, which have been labelled as wetlands. These are situated in the southwest and the western edge of the site (Figure 6). The central eastern wetland will be retained in POS including a buffer of 30 m from the edge of the wetland to minimise edge effects from surrounding development. The southern wetland will also be entirely retained within POS, with a buffer varying from 0m to 30m from the edge of the wetland vegetation.

As outlined above, these wetlands have no current protection status and retain limited environmental value, however it is intended to retain and manage these wetlands as part of the development, with the allowance of passive open space within the buffer area.

Given the value of these wetlands, the application of these buffers along with some revegetation, and the commitment to retain and manage these areas for passive open space will likely result in a better environmental outcome.

Management measures for these wetlands will be detailed in the POS Management Plan.

5.4 Moresby Ranges

The WAPC prepared the *Moresby Range Management Strategy* in 2009 with the aim of protecting, enhancing and promoting the regional significance of the Moresby Range over the next 25 years.

In addition to this, the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning prepared the Moresby Range Management Plan in 2010, to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range.

The visual and landscape significance of the Range as a backdrop to Geraldton, and icon to the region, is recognised and discussed throughout both documents. Recognition of the biodiversity values and retention of these values within the Moresby Ranges is also recommended in these plans.

A specific set of recommendations applying to the site is outlined in Section 2 above. These recommendations in respect to environmental management are generalised and have been addressed through incorporation of the key objectives of this plan into the LSP. The Moresby Ranges will remain in ROS as part of this development, and will be retained and managed. Therefore the biodiversity values of the range will not be compromised. Further, management recommendations for

the foothills, in which the development portion of this site is part of, have been considered into the LSP design, and in this document.

In addition a specific visual and landscape assessment has been prepared for the site by EPCAD (2011) to determine limitations to development and to guide the preparation of the concept and structure plans. This provided a framework for the development of a development plan. This assessment concluded that:

“The development area of the site... will not be prominent in the landscape from contextual views, therefore the regionally important landscape of the scarp is not adversely affected from public viewpoints.” (EPCAD, 2011).

5.5 Acid Sulfate Soils

WAPC mapping indicates that the site contains a small area near the western edge of the site mapped as having a high risk of ASS (Figure 5).

In accordance with DEC guidelines, a Preliminary Site Assessment (PSA) will be undertaken prior to subdivision. Depending upon the results of the PSA, an Acid Sulfate Soil Assessment and Dewatering Management Plan will be prepared if required. This plan will be approved for implementation by the DEC prior to any ground disturbing works being undertaken.

5.6 Construction Impacts

Construction activities need to be managed to minimise the impact to adjacent residents, retained vegetation and wetlands. Impacts can include:

- Nuisance dust generation during bulk earthworks.
- Disturbance of Acid Sulfate Soils during earthworks and/or installation of services (if applicable).
- Silt and sediment run-off from uncontrolled run-off during site works.
- Inadvertent damage to trees and other vegetation earmarked for retention.
- Inappropriate disposal of waste building material and poor housekeeping on building sites leading to wind blown litter.

All of these potential impacts are manageable through appropriate engineering design and appropriate site management practices. Management of these potential impacts will be detailed in the POS Management plan for the protection of existing vegetation during construction, and through the provision of standard subdivision conditions on the subdivision approval.

5.7 Water Management

Infiltration within the site appears good with little current surface runoff. All additional runoff generated by the development will be contained within the site and disposed of through a network of infiltration basins integrated into POS.

AECOM has prepared a Local Water Management Strategy (LWMS) (2012) as part of the LSP submission. In accordance with the state government planning framework as outlined in *Better Urban Water Management* (BUWM) (WAPC, 2008), an LWMS is required for a local planning scheme amendment (or rezoning) application. The LWMS is attached to the LSP submission.

The LWMS details a conceptual stormwater management strategy, for the appropriate management of stormwater following development of the site, through the provision of safe conveyance of excess runoff from minor and major storm events. The stormwater management system has been prepared in accordance with the expectations of the DoW and the CoGG. Preliminary sizing of infiltration basins has also been provided, along with a groundwater management strategy.

Specific details on the management measures for water across the proposed development are outlined in the LWMS, attached to the planning submission.

Urban Water Management Plans (UWMP) will be required to accompany the subsequent development applications. This LWMS has been prepared for approval by the Western Australian Planning Commission (WAPC) on the Department of Water's (DoW) advice as part of the Local Planning scheme amendment endorsement and shall also be submitted for approval to the CoGG (AECOM, 2012).

The LWMS is attached to the LSP documentation.

5.8 Erosion and On-site Effluent Disposal

As detailed in Section 3.2.3, the following land capability units and their suitability for development and on-site effluent disposal can be summarised in the following table:

Table 6: Land Capability of the Soil Units On-site

	<i>Ysp</i>	<i>Mf2</i>	<i>Mf1</i>	<i>Ty</i>
<i>Housing and Road Construction suitability</i>				
Wind Erosion Hazard	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>	<i>Moderate to high</i>
Water Erosion Hazard	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Ease of Excavation	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>	<i>Moderate</i>
Foundation Soundness	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>	<i>Fair</i>
Slope instability risk	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>	<i>Very Low</i>
Flood Hazard	-	-	-	-
<i>Onsite Effluent Disposal</i>				
Microbial purification ability	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>
Soil absorption	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>

ability				
---------	--	--	--	--

This indicates a general suitability for development and on-site effluent disposal, with some management potentially required for possible erosion issues, particularly for the steeper slopes associated with the foothills in the eastern portion of the site.

The Moresby Range Management Strategy (WAPC, 2009) recommends minimising clearing, limiting use, appropriate boundary allocation and revegetation. The steepest portion of the foothills within the site have been excluded from the development area to ensure that development and general use of these areas are excluded from any development or public use (Figure 10). Some revegetation will also be undertaken within the foothills outside the development area, where considered applicable, and where the soils are conducive to plantings. This will be detailed further in the POS Management Plan. Other specific management measures relative to potential water erosion and runoff will be detailed in the Local Water Management Strategy.

6.0 IMPLEMENTATION STRATEGY

The key environmental considerations for the site relate to vegetation and fauna and habitat. The findings and conclusions from this assessment are presented above.

Detailed management strategies will be determined through the POS Management Plan identified above, prepared through an appropriate schedule in the Local Structure Plan, to be approved by the Local Authority. This will provide statutory assurance that this plan will be completed in accordance with the objectives outlined above, as the CoGG Local Planning Scheme states that development must be in accordance with an approved Structure Plan. Therefore Proposed draft Local Structure Plan provisions are included in Appendix G.

6.1 Vegetation

Approximately 34% of the site is proposed for retention in Public Open Space, which includes almost all existing remnant vegetation located across the site.

Degraded land at the site which is identified as POS is proposed to be rehabilitated through the planting of locally endemic species.

To ensure the future viability of retained vegetated and revegetated areas, the management strategies which will be implemented will include delineation of retained vegetation, management of stormwater flow and preparation of a POS Management Plan.

6.2 Fauna and Habitat

Viability of fauna habitat is directly linked to the viability of the remnant vegetation across the site. Therefore the management measures pertaining to the retention and rehabilitation of the remnant vegetation across the site will ensure the long term sustainability of the existing fauna habitat.

Approximately 30% of the site is proposed for retention in POS, which includes almost all existing remnant vegetation located across the site, and also includes the formation of an ecological corridor between the vegetated larger semi-rural blocks to the west and the Moresby Ranges in the eastern portion of the site.

To ensure the future viability of retained habitat a POS Management Plan will detail specific management strategies to the satisfaction of the Local Authority in consultation with the DEC.

6.3 Additional Environmental Management Items

Please refer to the other accompanying reports appended to the LSP submission for the LWMS, prepared by AECOM (2012). A Preliminary Acid Sulfate Soil Investigation will be undertaken prior to subdivision.

7.0 REFERENCES

AECOM, (2012), *Moresby Heights Local Water Management Strategy*, prepared for Sutcliffe Road Joint Venture. AECOM, Geraldton.

Bureau of Meteorology, (2011) *Climate of Geraldton*, Overview [Online] <http://www.bom.gov.au/wa/geraldton/climate.shtml>

Coterra Environment (2011) *Level 1 Flora and Vegetation Survey of Moresby Heights*. Coterra, Perth

Department of Agriculture and Food, (2011) *Declared Plants Database* [Online] http://agspsrv95.agric.wa.gov.au/dps/version02/01_plantsearch.asp

Department of Agriculture, Dye R.A., Van Vreeswyk A.M.E., and Moore G.A, (1990) *Geraldton rural-residential land capability study - Land Resources Series No. 4*, Department of Agriculture, Perth, W.A.

Department of Environment and Conservation and the West Australian Herbarium (2006) *FloraBase*. [Online] <http://florabase.calm.wa.gov.au>

Department of Environment and Conservation. (2001-2010). *Contaminated Sites Management Series*. DEC, Perth.

Department of Environment and Conservation, Contaminated Sites Database [Online] <https://secure.dec.wa.gov.au/idelve/css/>

Department of Indigenous Affairs. (2001) [Online] <http://www.dia.wa.gov.au/>

Department of Sustainability, Environment, Water, Population and Communities (2010) *Environment Protection and Biodiversity Conservation Act 1999*, Overview [Online] <http://www.environment.gov.au/epbc/about/index.html> (Accessed 02/09/2010).

Department of Minerals and Energy (1986). *Serpentine sheet (Jordan JE 1986b Serpentine Sheet part of Sheets 2033 II and 2133 III. Environmental Geology Series. Geological Survey of Western Australia, Perth, Western Australia.)*

Desmond & Chant (2001) *Geraldton Sandplains 2 (GS2 Geraldton Hills Subregion)* DEC, Perth.

Environmental Protection Act 1986 Environmental Protection Authority (1998) *EPA Bulletin 891 - Geraldton Region Plan*, EPA, Perth

Environmental Protection Authority (2004) *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*. Environmental Protection Authority, Perth.

Environmental Protection Authority (2005) - *Guidance Statement No. 3 for the separation distances between industrial and sensitive land uses*. Final Guidance No. 3. Environmental Protection Authority, Perth.

Environmental Protection Authority (2008) - *Guidance Statement No. 33: Environmental Guidance for Planning and Development*. Environmental Protection Authority, Perth.

Geological Survey of Western Australia (1971) Geraldton - Houtman Abrolhos 1:250,000 Geological Series, Sheet SH 50-1 and Part of Sheet SH 49-4.

Geological Survey of Western Australia (2001) Howatharra 1:50000 Regolith - Landform Resource Series Sheet 1840 - IV First Edition

GHD (2006) *Humphrey Land Developments: 80 & 81 Hackett Road, Waggrakine, Environmental Assessment*. GHD, Perth

GHD (2007) *Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine*. GHD, Perth

Keighery, B.J. (1994). *Bushland Plant Survey: a Guide to Plant Community Surveys for the Community*. Wildflower Society of Western Australia (Inc.) Nedlands, Western Australia

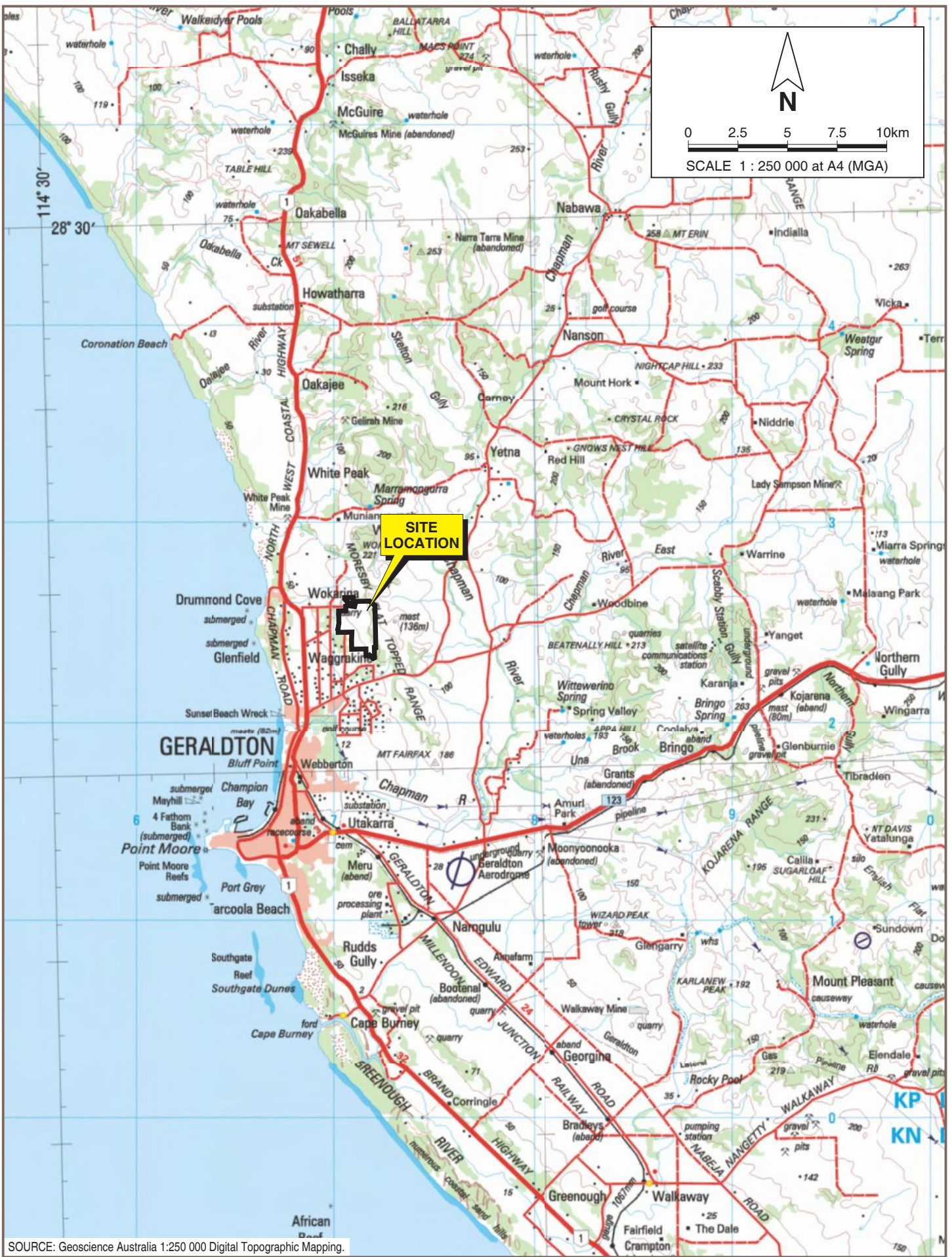
Landgate -Hydro (polygon) data feature (2011) - Accessed online at:
<https://www2.landgate.wa.gov.au/bmvf/app/waatlas/>

Thackway, R. & Cresswell I. D. 1995, *An Interim Biogeographical Regionalisation for Australia: a Framework for Setting Priorities in the National Reserves System Cooperative Program*, Australian Nature Conservation Agency, Canberra, ACT.

Western Australian Planning Commission (2010) *Geraldton Regional Flora and Vegetation Survey*. WAPC, Perth

Western Australian Planning Commission (2009) *Moresby Range Management Strategy*, WAPC, Perth

FIGURES



SOURCE: Geoscience Australia 1:250 000 Digital Topographic Mapping.

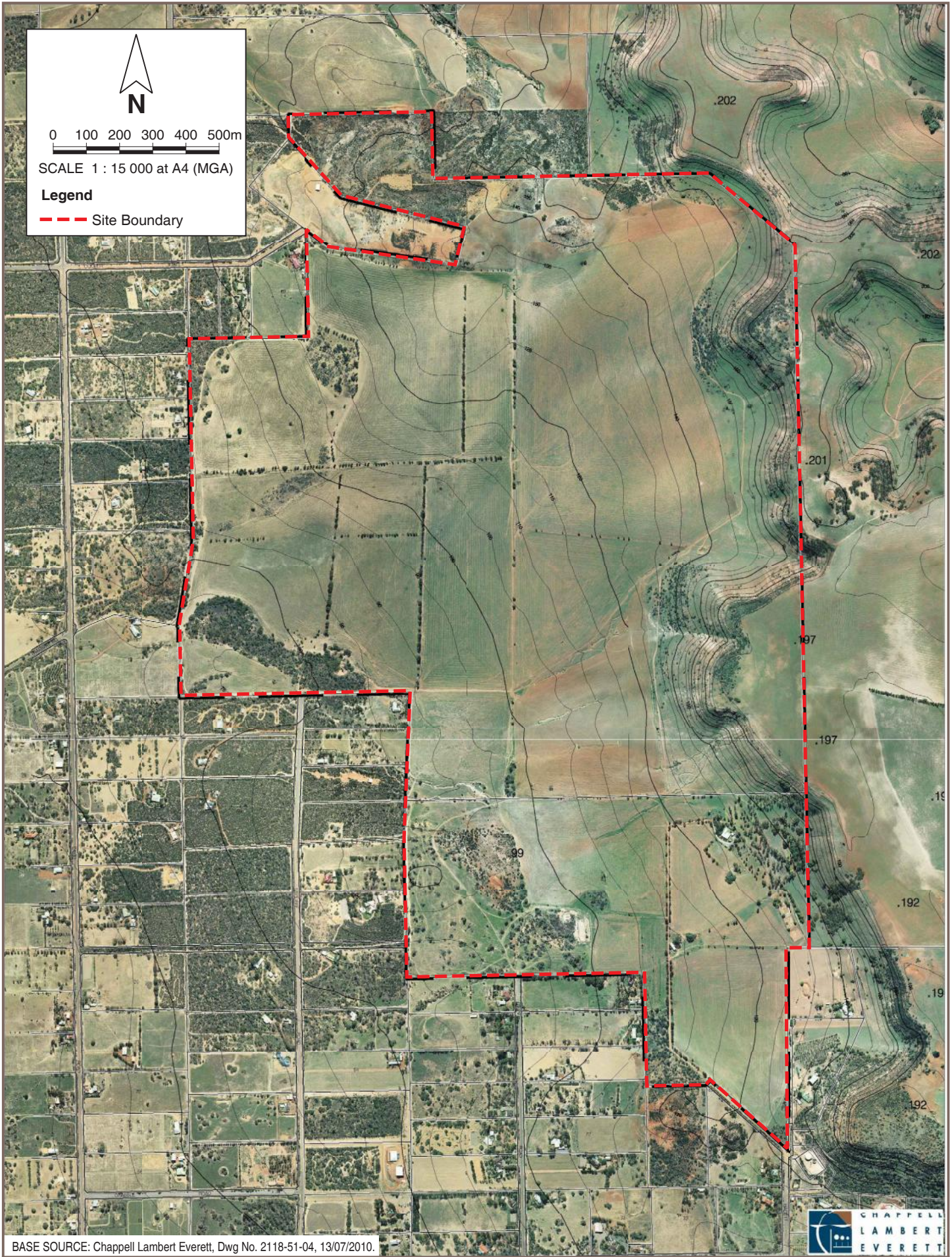
COTERRA
ENVIRONMENT


Humfry Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

SITE LOCATION

Figure 1




N

0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend

- - - Site Boundary

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



COTERRA
ENVIRONMENT

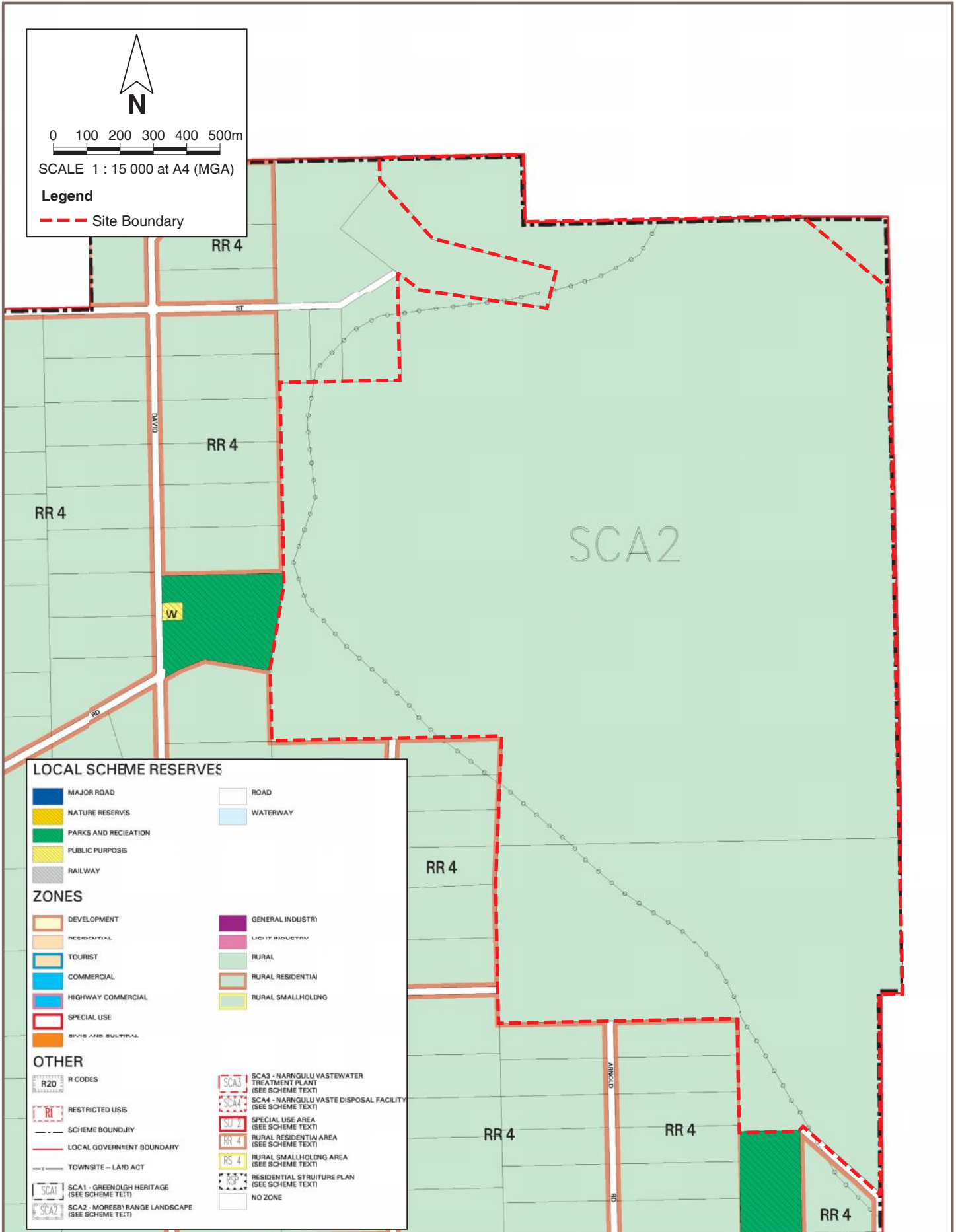
Humfrey Land Developments
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
 GERALDTON

Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

AERIAL PHOTOGRAPH

Figure 2

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f02.dgn



SOURCE: Department of Planning, February 2011.

COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers

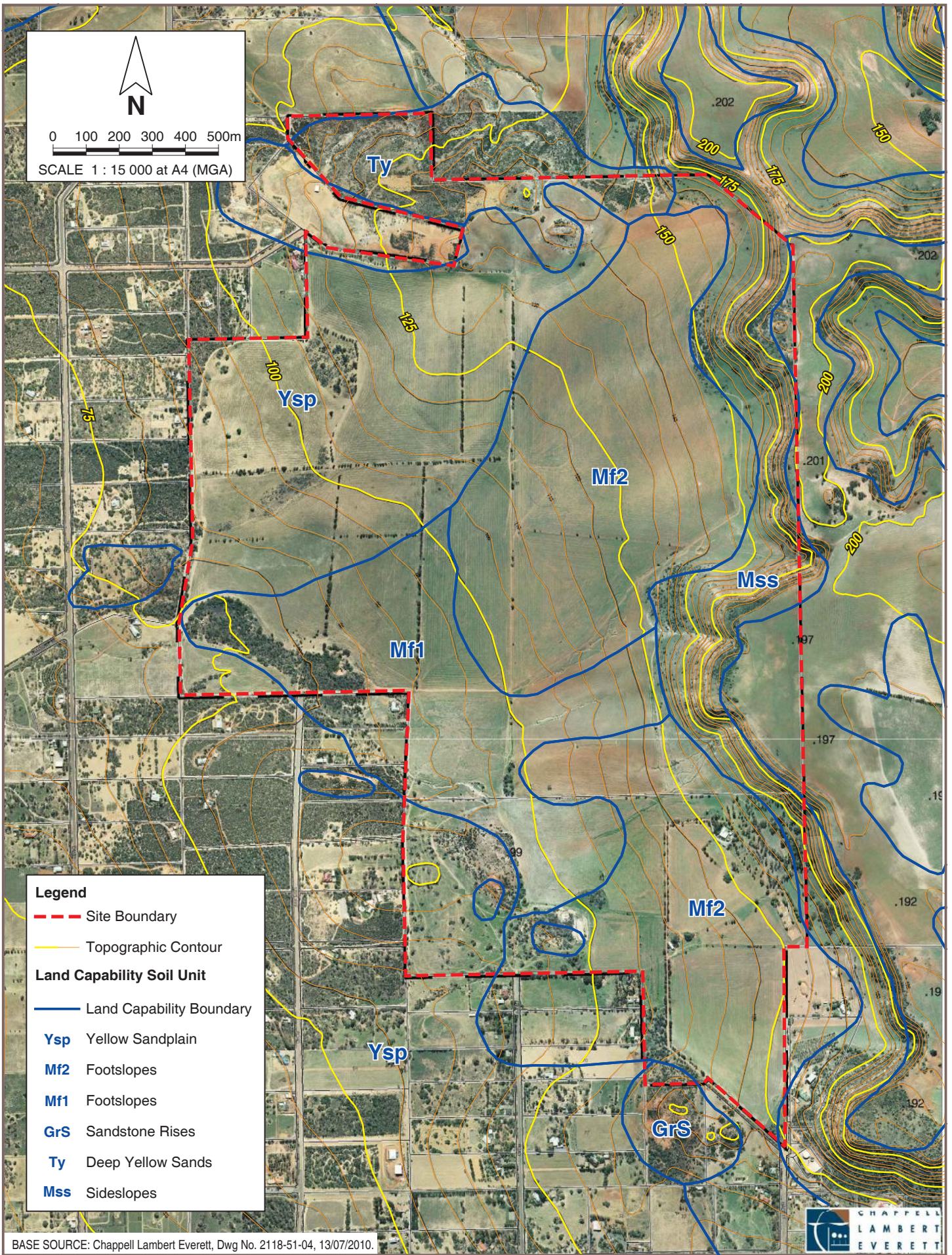
Date: 17 Jan 2013

Job: HUMMOR02

Revision: A

**CITY OF GERALDTON-GREENOUGH
LOCAL PLANNING SCHEME ZONING**

Figure 3



Legend

- - - Site Boundary
- Topographic Contour

Land Capability Soil Unit

- Land Capability Boundary
- Ysp** Yellow Sandplain
- Mf2** Footslopes
- Mf1** Footslopes
- GrS** Sandstone Rises
- Ty** Deep Yellow Sands
- Mss** Sideslopes

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f04.dgn

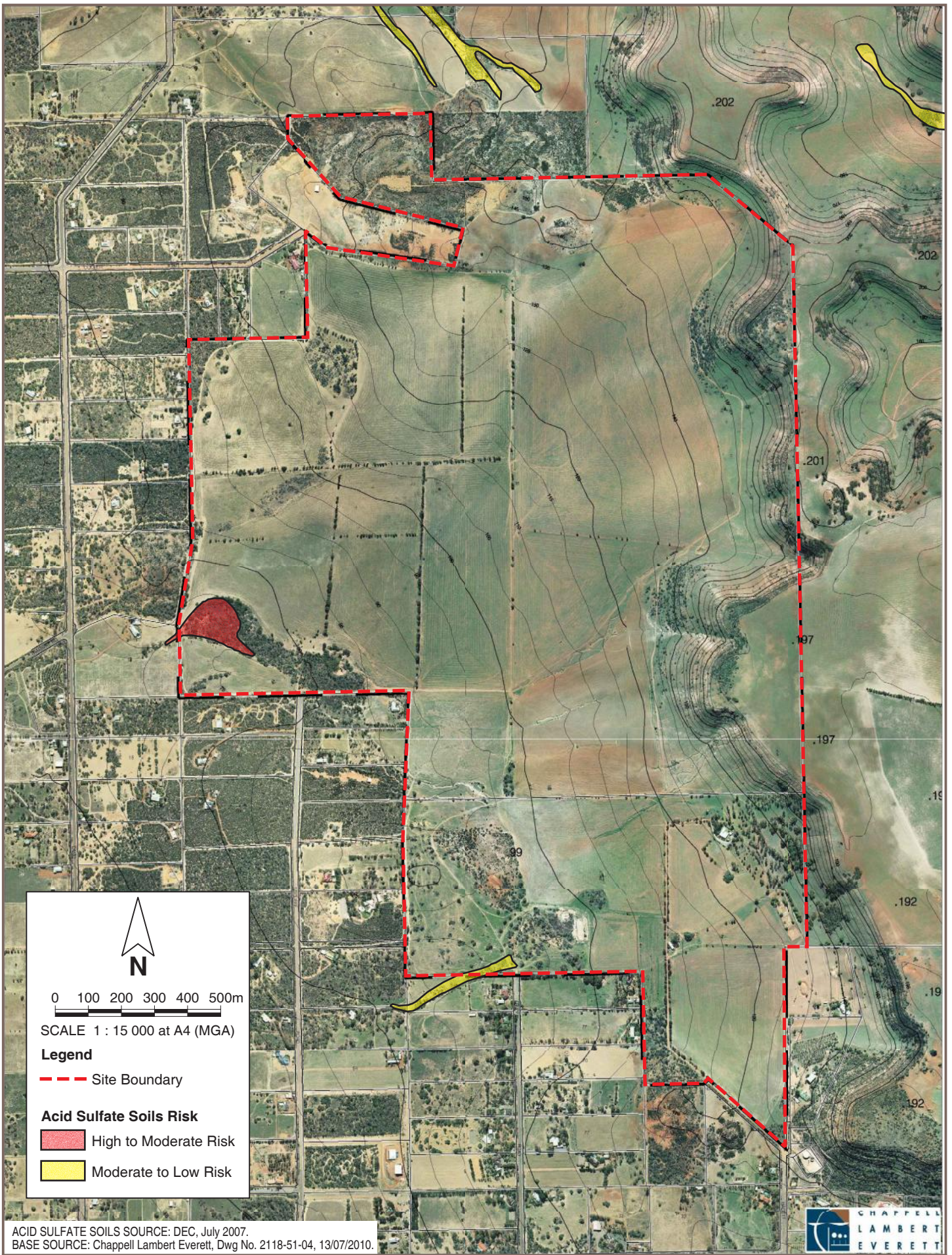
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON


Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A


**TOPOGRAPHY AND LAND CAPABILITY
SOIL UNITS**

Figure 4



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f05.dgn


N


 SCALE 1 : 15 000 at A4 (MGA)

Legend


- - - Site Boundary

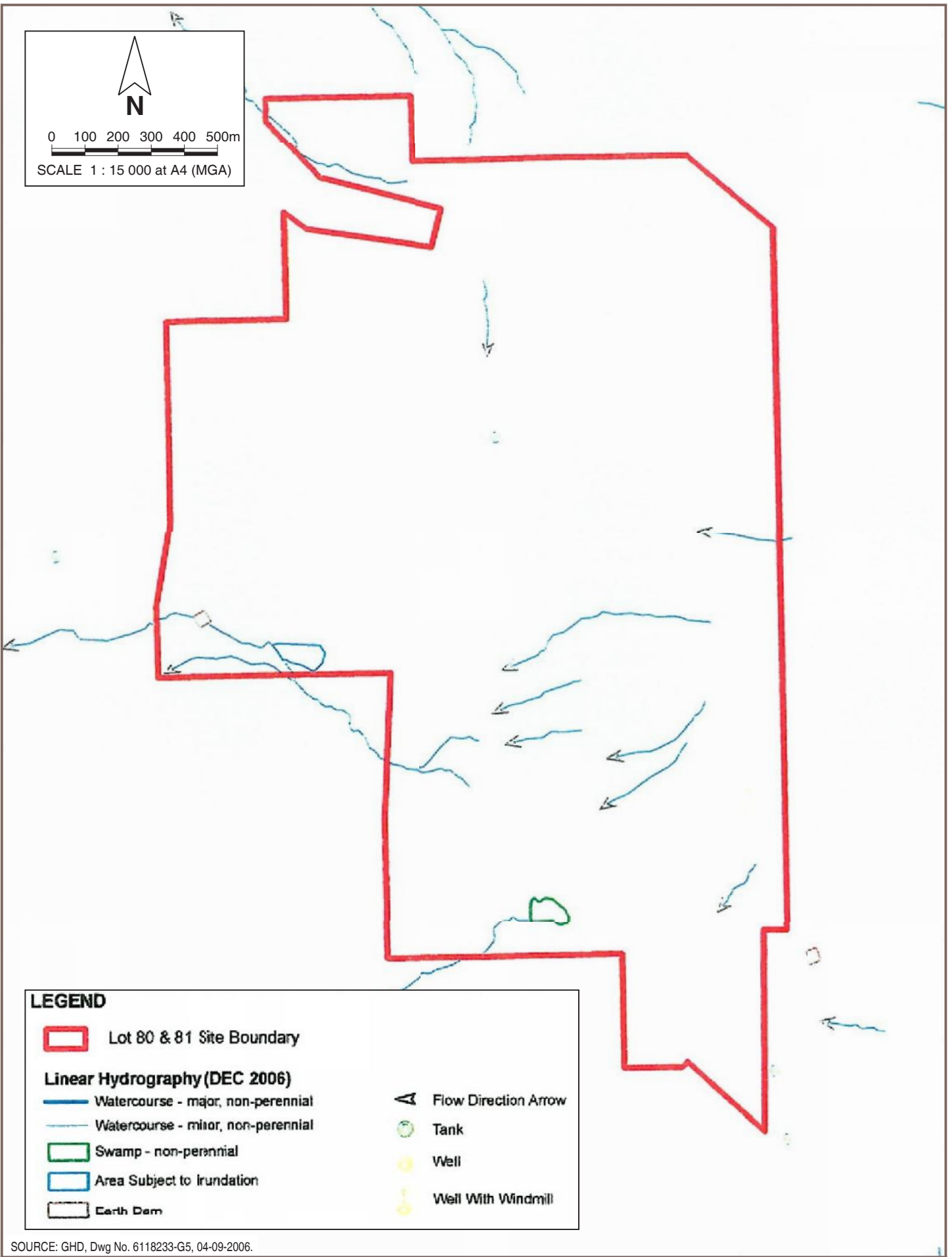
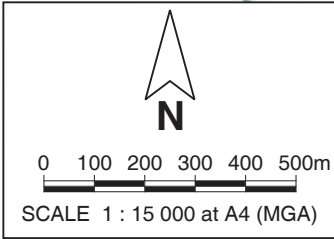
Acid Sulfate Soils Risk

- High to Moderate Risk
- Moderate to Low Risk

ACID SULFATE SOILS SOURCE: DEC, July 2007.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON	Figure 5
Drawn: L. Rogers	Date: 17 Jan 2013	ACID SULFATE SOILS	
Job: HUMMOR02	Revision: A		



LEGEND

- Lot 80 & 81 Site Boundary
- Linear Hydrography (DEC 2006)**
- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to Irrigation
- Earth Dam
- Flow Direction Arrow
- Tank
- Well
- A

 Well With Windmill

SOURCE: GHD, Dwg No. 6118233-G5, 04-09-2006.

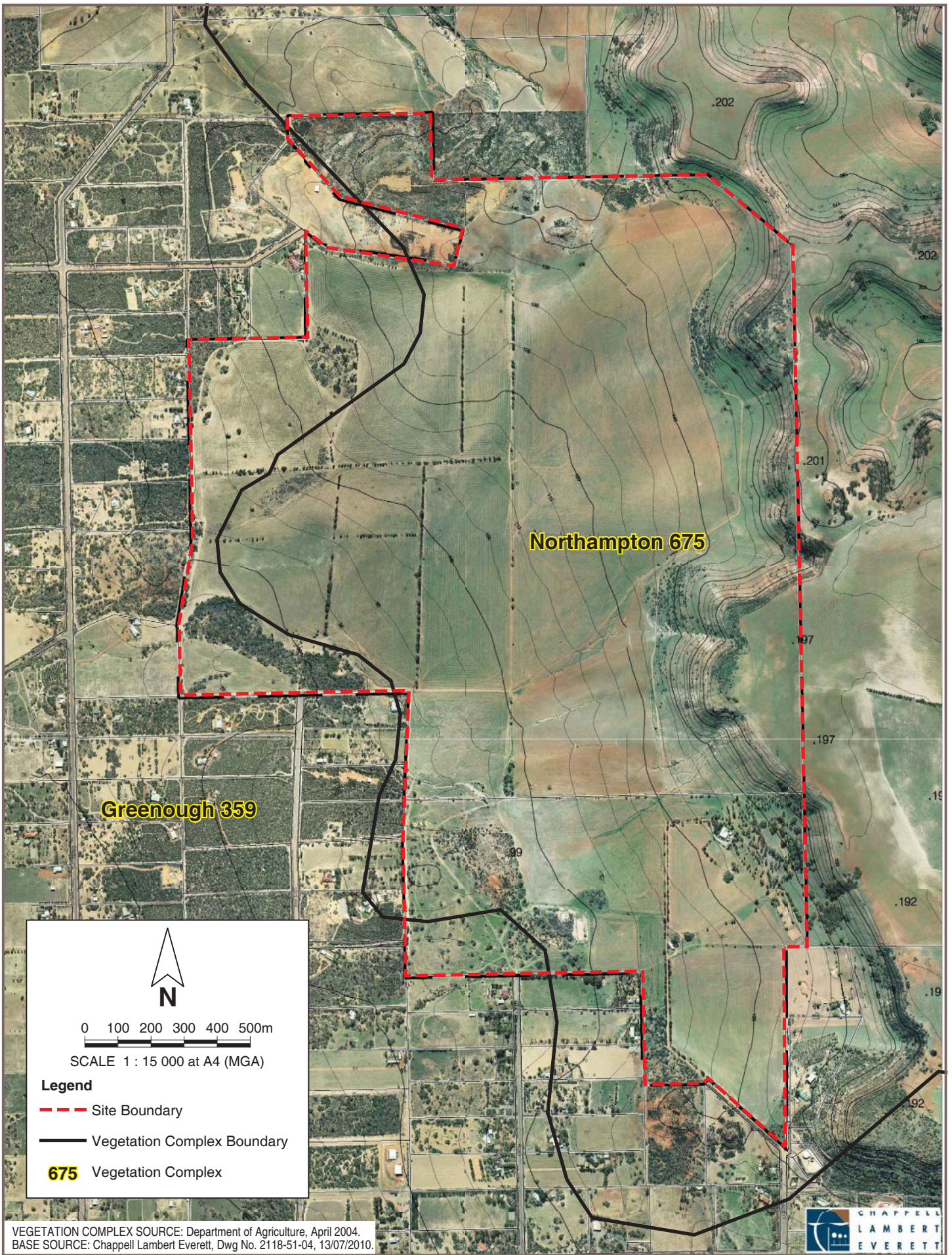
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON


Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

WETLANDS AND SURFACE WATER FLOW

Figure 6



HUMMOR02-607.dgn
 PINPOINT CARTOGRAPHICS (08) 9562 7136


N


0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

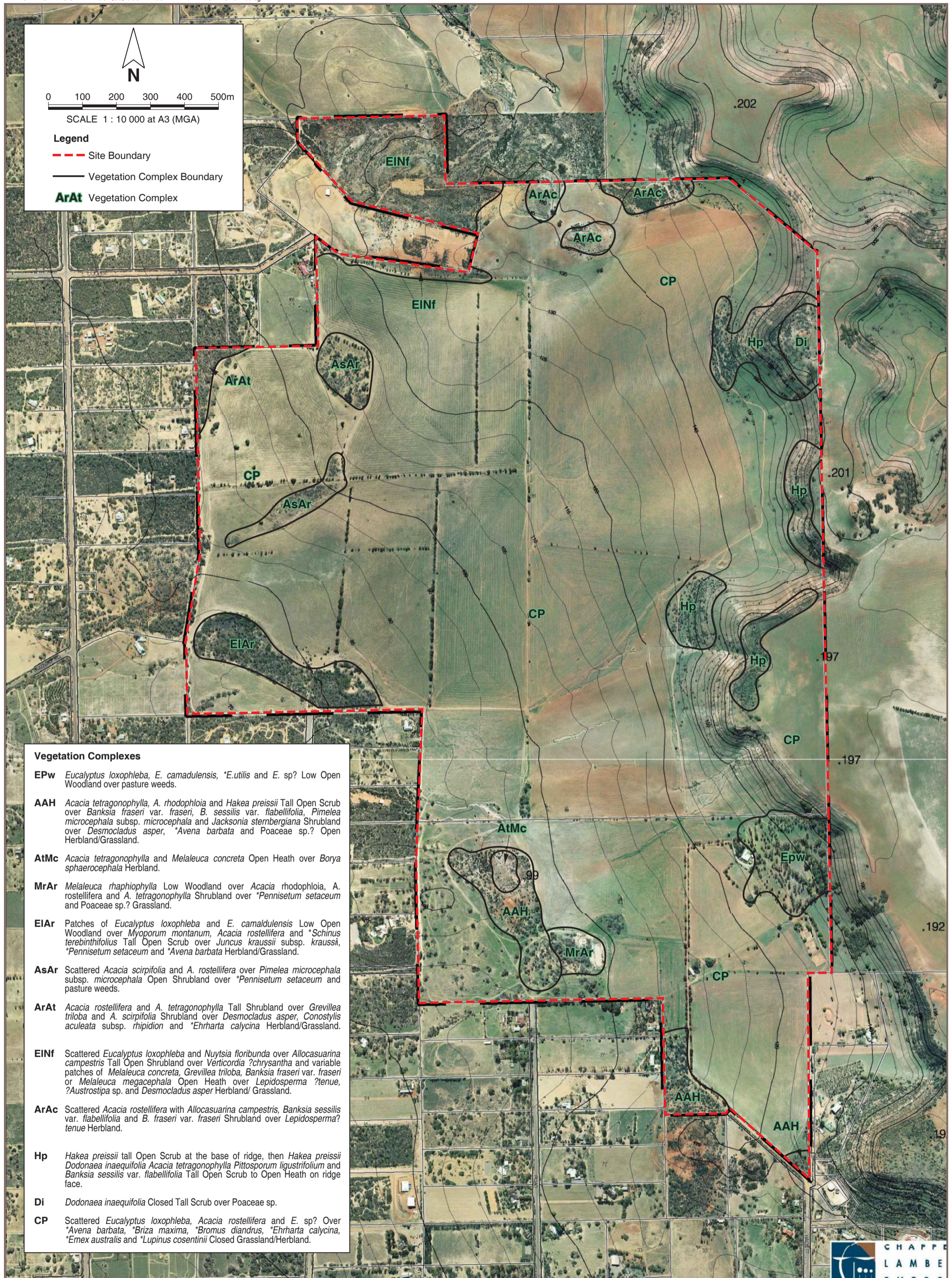
Legend

- - - Site Boundary
- Vegetation Complex Boundary
- 675 Vegetation Complex

VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.

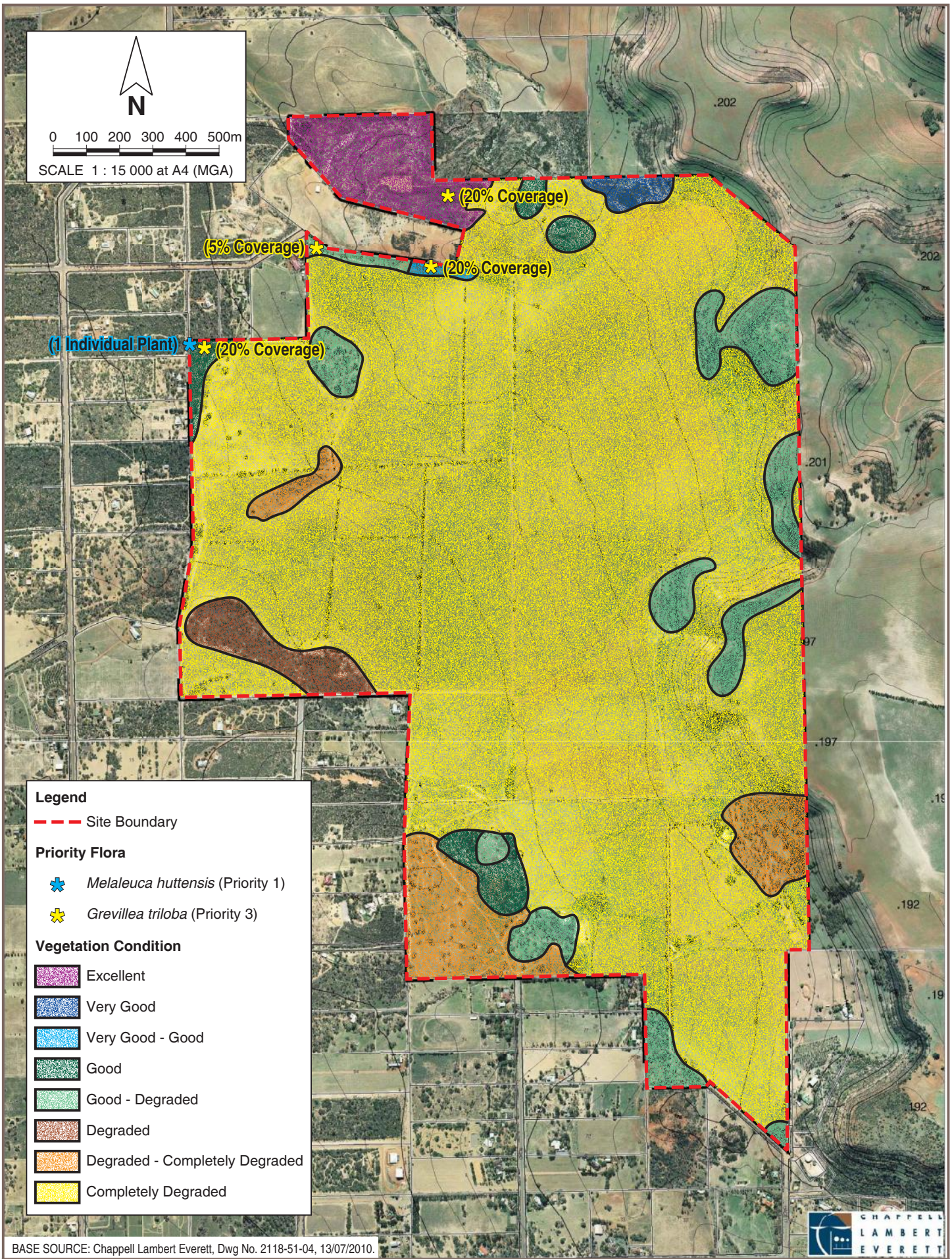


		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON	Figure 7
Drawn: L. Rogers	Date: 17 Jan 2013	REGIONAL VEGETATION COMPLEXES	
Job: HUMMOR02	Revision: A		



Vegetation Complexes

- EPw** *Eucalyptus loxophleba*, *E. camadulensis*, **E. utilis* and *E. sp?* Low Open Woodland over pasture weeds.
- AAH** *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmodcladus asper*, **Avena barbata* and *Poaceae* sp.? Open Herbland/Grassland.
- AtMc** *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland.
- MrAr** *Melaleuca rhapsiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostelifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and *Poaceae* sp.? Grassland.
- EIAr** Patches of *Eucalyptus loxophleba* and *E. camadulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostelifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.
- AsAr** Scattered *Acacia scirpifolia* and *A. rostelifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds.
- ArAt** *Acacia rostelifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmodcladus asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
- EINF** Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, **Austrostipa* sp. and *Desmodcladus asper* Herbland/ Grassland.
- ArAc** Scattered *Acacia rostelifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland.
- Hp** *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
- Di** *Dodonaea inaequifolia* Closed Tall Scrub over *Poaceae* sp.
- CP** Scattered *Eucalyptus loxophleba*, *Acacia rostelifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland.



Legend

--- Site Boundary

Priority Flora

- ★ *Melaleuca huttensis* (Priority 1)
- ★ *Grevillea triloba* (Priority 3)

Vegetation Condition

- Excellent
- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f09.dgn

COTERRA
ENVIRONMENT

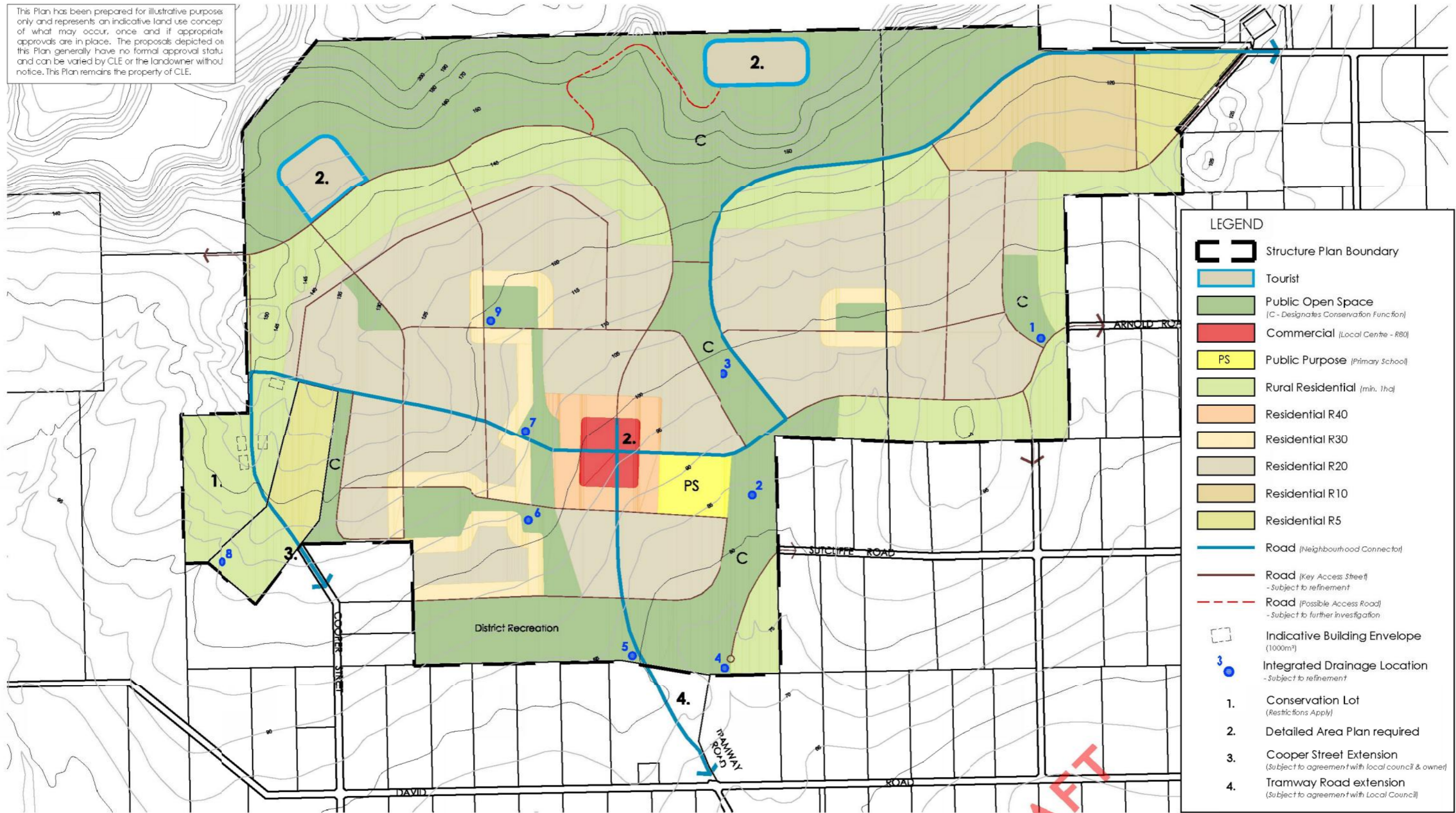
Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 17 Jan 2013
Job: HUMMOR02	Revision: A

VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA

Figure 9

This Plan has been prepared for illustrative purposes only and represents an indicative land use concept of what may occur, once and if appropriate approvals are in place. The proposals depicted on this Plan generally have no formal approval status and can be varied by CLE or the landowner without notice. This Plan remains the property of CLE.



LEGEND

- Structure Plan Boundary
- Tourist
- Public Open Space
(C - Designates Conservation Function)
- Commercial *(Local Centre - R80)*
- PS Public Purpose *(Primary School)*
- Rural Residential *(min. 1ha)*
- Residential R40
- Residential R30
- Residential R20
- Residential R10
- Residential R5
- Road *(Neighbourhood Connector)*
- Road *(Key Access Street)*
- Subject to refinement
- Road *(Possible Access Road)*
- Subject to further investigation
- Indicative Building Envelope *(1000m²)*
- Integrated Drainage Location
- Subject to refinement
- 1. Conservation Lot
(Restrictions Apply)
- 2. Detailed Area Plan required
- 3. Cooper Street Extension
(Subject to agreement with local council & owner)
- 4. Tramway Road extension
(Subject to agreement with Local Council)



COTERRA ENVIRONMENT		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON
Drawn: L. Rogers	Date: 14 Jan 2013	DRAFT LOCAL STRUCTURE PLAN
Job: HUMMOR02	Revision: A	

Figure 10

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR02-f10.dgn

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-90L-01, 05/12/2012.

**APPENDIX A - Priority Flora Survey for Lots 80 & 81 Hackett Road (GHD,
2007)**

**Humfrey Land
Developments**

**Report for Lots 80 & 81 Hackett
Road, Waggrakine Priority Flora
Survey**

**Addendum to September 2006
Environmental Assessment**

February 2007

Contents

1. Introduction	1
1.1 Background	1
1.2 Scope of Works	1
2. Desktop Review	2
2.1 Vegetation Composition	2
2.2 Priority Flora In the Vicinity	2
2.3 Threatened Ecological Communities In the Vicinity	4
3. Targeted Flora Survey	5
3.1 Methodology	5
3.2 Site Vegetation Condition	5
3.3 Site Flora	6
4. Conclusions	8
5. Limitations of this Report	9
5.1 Survey Limitations	9
5.2 Report Limitations	9
6. References	10

Table Index

Table 1	Regional Assessment of Vegetation Extent	2
Table 2	Threatened and Priority Flora	3
Table 3	Government of Western Australia (2000) Vegetation Condition Scale	6
Table 4	Priority Species Located on Site	6

Figure Index

Figure 1	Location Map
Figure 2	Site Aerial and Proposed Lot Layouts
Figure 3	Priority Flora
Figure 4	Vegetation Condition

Appendices

- A DEC Priority Flora Search Results**
- B Site Photos**
- C Flora Species Recorded on Site**

1. Introduction

1.1 Background

Humfrey Land Developments (HLD) are proposing to develop a rural residential subdivision on Lots 80 and 81 Hackett Road, Waggrakine (the Site). The Site comprises two separate parcels of land, totalling an area of approximately 380 hectares (refer to Figure 1).

HLD previously requested GHD Pty Ltd (GHD) to undertake an environmental appraisal of the site in relation to the proposed development. GHD issued a report to HLD in September 2006 entitled "Lots 80 and 81 Hackett Road: Environmental Assessment", with the following recommendation for further work:

The following additional issues will require further assessment prior to finalising a development concept, and managed where the assessment suggest management is required:

- ▶ *Effluent disposal;*
- ▶ *Rare flora;*
- ▶ *Acid sulfate soils – only if excavation near wetlands is required; and*
- ▶ *Unexploded Ordinance.*

1.2 Scope of Works

In response to the recommendations of the September 2006 Environmental Assessment, HLD requested GHD to undertake a Priority Flora survey on the Site.

The scope of works involved:

- ▶ A desktop review, in particular a search of the DEC Threatened (*Declared Rare*) Flora (TFD) and the *Western Australian Herbarium Specimen (WAHERB)*, as well as the *Declared Rare and Priority Flora (DR&PF)* list. This information is attached at **Appendix A**;
- ▶ Targeted Priority Flora Survey;
- ▶ Herbarium verification of actual and potential Priority Flora; and
- ▶ Reporting.

The September 2006 report provides some comments regarding the likelihood of priority flora existing on the Site, but this addendum provides a more full response. This addendum should now form part of the existing September 2006 Environmental Assessment Report.

2. Desktop Review

2.1 Vegetation Composition

The composition of remnant native vegetation in the project area was interpreted from mapping conducted by Beard (1976). According to this mapping, the project area was originally likely to contain two vegetation communities being: Shrublands; mixed thicket (*Melaleuca* and *Hakea*) and Shrublands on the higher ground; and *Acacia* and *Banksia* scrub on the western portion of the Site.

The relative importance of conserving remnant native vegetation in the project area at a regional scale was determined via the analysis of aerial photos by Shepherd (*pers comm*, 2006), the dataset has been archived as the 2005 vegetation extent. The results of the Vegetation Association assessment for the Geraldton Sandplains IBRA (Interim Biogeographic Regionalisation for Australia) area are summarised in Table 1.

Table 1 Regional Assessment of Vegetation Extent

Vegetation Association	Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining (2005)
675	Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51,854	10,989	21.2
359	Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub.	44,412	8,383	18.9

The Environmental Protection Authority (EPA), has established through Position Statement No. 2, (*Environmental Protection of Native Vegetation in Western Australia*), the "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level. This is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type (EPA, 2000).

In the case of those Vegetation System Associations detailed in Table 1 above, less than 30% of the original regional extent remained intact as at 2005. Clearing of such vegetation may be considered contradictory to the EPA's recommendations stated in Position Statement No. 2. However, much of the Site proposed to be developed has been historically cleared of native vegetation for agricultural purposes, also several areas of remnant bushland (also degraded by past agricultural activities) are proposed to be set aside in Public Open Space (POS), as identified in Figure 2.

2.2 Priority Flora in the Vicinity

A search was undertaken through the Department of Environment and Conservation (DEC) Threatened (*Declared Rare*) Flora Database (TFD) and the *Western Australian Herbarium Specimen* (WAHERB) database for species of rare and priority flora located within the vicinity of the Site. Species found have been listed and described in Table 2.

Table 2 Threatened and Priority Flora

Species	Conservation Category	Database	Description (FloraBase, 2006)
<i>Drummondia ericoides</i>	DRF	TFD	Divaricately branched shrub, 0.3–1 m high. Fl. yellow, white, violet, purple, Sep–Oct. Rocky places.
<i>Verticordia penicillaris</i>	P4	TFD WAHERB	Low spreading shrub, 0.15–0.3 m high, to 1 m wide. Fl. cream, yellow, Sep–Oct. Shallow gritty soils. Granite outcrops.
<i>Eucalyptus bleasellii</i>	DRF	TFD WAHERB	Mallee, 1–4 m high, bark smooth. Fl. white, cream, Aug–Nov. Grey sand, clay. Rocky hillsides, creek flats.
<i>Acacia guiretli</i>	P4	WAHERB	Spreading to straggling or erect & spindly shrub, 0.3–2(–2.5) m high. Fl. yellow, Jun–Sep. Rocky loam, lateritic gravelly soils. Stony hills.
<i>Thryptomene stenophylla</i>	P2	WAHERB	Spreading shrub, 0.3–1.2 m high. Fl. pink, purple, Jun–Aug. Red or yellow sand, loam. Limestone hills, sandplains.
<i>Grevillea triloba</i>	P3	WAHERB	Diffuse or spreading shrub, (0.4–)0.9–1.5(–2.5) m high. Fl. white, pink, Jun–Oct. Sandy loam on sandstone or limestone, lateritic soils.
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3	WAHERB	Open shrub, 0.4–1.3 m high. Fl. pink, white, Sep–Dec. Sandy gravelly soils.
<i>Vittadinia cervicularis</i> var. <i>occidentali</i>	P1	WAHERB	Annual, herb, more than 0.3 m high. Fl. white, purple, blue, Aug–Sep.
<i>Melaleuca huttensis</i>	P1	WAHERB	Upright shrub, to 3 m high, bark gnarled, white to grey. Fl. cream, yellow, Jun–Sep. Light yellow or beige sand. Lower slopes of undulating plains, sandplains.
<i>Eucalyptus dimiruta</i>	P4	WAHERB	Mallee, 1.7–5 m high. Fl. white, cream, Jul–Nov. Sandy clay, white/grey sand, often over laterite. Sandplains, near swampy areas.
<i>Eucalyptus cupree</i>	DRF	WAHERB	Mallee, 2.5–5 m high, bark rough to 1.5 m, box-type. Fl. white, Aug–Nov. Shallow soils over granite.
<i>Thryptomene</i> sp. <i>Moresby Range</i>	P3	WAHERB	Spreading shrub, 0.3–1 m high. Fl. pink, Jul–Sep. Light brown loam, clay loam, sandy clay, sandstone. Hillsides & summits.

Conservation Category Key:

- DRF Declared Rare Flora, taxa which are deemed to be in the wild rare, in danger of extinction, or otherwise in need of special protection and have been declared under the Wildlife Conservation Act 1960 to be "rare flora".
- P1 Taxa known from only one, or a few populations which are under threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P2 Taxa known from only one, or a few populations, at least some of which are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P3 Taxa which are known from several populations, and the taxa are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.

P4 Taxa which are considered to have been adequately surveyed and which, whilst being rare, are not currently threatened by any identifiable factors.

DEC also provided results from a search of their *Declared Rare and Priority Flora (DR&PF)* list. The species in this list are those known to exist in the general Geraldton region and surrounds, and not to this project Site specifically.

The results of these searches are attached at **Appendix A**.

The previous report considered the possibility of these species being found on Site was low due to the degraded nature of the land and continued disturbance through grazing activities, however, the DEC search did indicate that priority species were previously located on Site, refer to Figure 2.

2.3 Threatened Ecological Communities in the Vicinity

A search of the CALM Threatened Ecological Community (TEC) database was undertaken. No known occurrences of threatened ecological communities have been recorded within the Site boundaries.

CALM further advised that there are known occurrences of the priority ecological community referred to as "*Melaleuca megacephala* and *Hakea pycnonera* thickets on the Moresby Range" within 10 kilometres of the Site.

3. Targeted Flora Survey

3.1 Methodology

A site visit was conducted by GHD on 11th August 2006 as part of the original environmental assessment work. A further site visit was conducted on the 21st September 2006 to survey the area for priority flora known to exist in the vicinity, as per the CALM search results. A final inspection was undertaken on the 21st December 2006 to review the Priority Flora populations.

The site was inspected on foot and by vehicle for the CALM listed Priority Flora species. Other common native species were recorded, but a full flora survey of the Site was not undertaken. The survey particularly focused on bushland areas to the west of the Site in or adjacent to proposed development areas. No detailed survey was undertaken of the escarpment, plateau or bushland area to the north, as these locations are proposed to be set aside in Public Open Space (POS).

No quadrat or transect recordings were undertaken.

Any potential Priority Flora species that couldn't be readily identified, were collected and identified at the Perth Herbarium at later date.

3.2 Site Vegetation Condition

The vegetation at the Site was given a condition rating based on the Bush Forever (Government of Western Australia, 2000) vegetation condition ratings scale. This scale recognises a level of intactness of vegetation, which is defined by the following:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping;
- The potential for natural or assisted regeneration.

The ratings in this scale are described in Table 3.

The majority of the Site supported Completely Degraded (Condition 6) agricultural grazing land, as shown in the aerial photograph in Figure 2 and photographs in Appendix B. Some individual, or copses of, remnant trees remain in these areas.

One area of Excellent (Condition 2) and several areas of Very Good (Condition 3) vegetation do exist to the north of Lot 81, in general these areas are proposed to be set aside in POS. Other areas of remnant bushland that are to be set aside in POS are considered to vary from Very Good to Degraded (Condition 3 to 5).

One isolated portion of bush on the western boundary (containing all of the Priority Flora) is also considered to be in Very Good to Good (Condition 3 to 4) condition, this area has been shown as being located within a proposed development lot.

The wetland area on Lot 80 had been recently burnt and so it was not possible to assess the condition of this section, it is assumed that this area was similar to the surrounding unburnt areas.

Vegetation conditions have been presented in Figure 4.



Table 3 Government of Western Australia (2000) Vegetation Condition Scale

Assigned Number	Classification	Description
1	<i>Pristine or nearly so</i>	No obvious signs of disturbance
2	<i>Excellent</i>	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species
3	<i>Very Good</i>	Vegetation structure altered, obvious signs of disturbance
4	<i>Good</i>	Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it
5	<i>Degraded</i>	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6	<i>Completely degraded</i>	The structure of the vegetation is no longer intact and the area is completely or almost without native species

3.3 Site Flora

3.3.1 General

Although a full flora survey was not conducted as part of this assessment a list of common weed and native species on site have been tabulated in Appendix C.

3.3.2 Priority Species

The site was inspected for the Priority Flora species identified by the DEC searches.

No Declared Rare Flora (DRF) was recorded on site.

Three Priority Flora species were identified, being; *Geleznowia verrucosa ssp formosa*, *Grevillea triloba* and *Melaleuca huttensis*. Refer to Table 4 for details.

Table 4 Priority Species Located on Site

Species	Conservation Code (see details at Table 2)	Number of plants seen
<i>Geleznowia verrucosa ssp formosa</i>	P3	1
<i>Grevillea triloba</i>	P3	> 100
<i>Melaleuca huttensis</i>	P1	1

The general location of these species has been shown in Figure 3.

Note, the *Geleznowia verrucosa* ssp *formosa* was not located again in the December 2006 review, therefore no GPS position was recorded, however, the one plant located during the September 2006 survey was known to have occurred in the small area of bush in which the *Melaleuca huttersis* was located (with the general location indicated on Figure 3).

3.3.3 Threatened Ecological Communities

The DEC referred to the possibility of a "*Melaleuca megarcephala* and *Hakea pycnanura* thickets on the Moresby Range" within 10 kilometres of the Site. Neither this TEC, nor these flora species, were identified on site.

3.3.4 Weed Species

The site was largely covered with pastoral weed species. Common weed species are included in the plant species list at Appendix C, identified by an asterix (*) notation.

One species, Paterson's Curse, identified on site is declared under the *Agriculture and Related Resources Protection Act (1976)*. Within the Shire of Greenough this is classified as a P1 declared plant species, which prohibits movement of plants or their seeds within the State and prohibits the movement of contaminated machinery and produce including livestock and fodder.

4. Conclusions

The Site largely supports completely cleared and degraded agricultural land, however, there are small isolated pockets of vegetation in Good to Very Good condition.

The survey undertaken found no Declared Rare Flora (DRF) on site, however, three species of Priority Flora were identified.

DRF is protected under the *Wildlife Conservation Act 1950* and any disturbance to these species requires permission to 'take'. To 'take' under the Act includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora. Additionally, the DEC keeps a list of Priority Flora species, that are not listed under legislation but for which the DEC feels there is cause for concern, or for which not enough information is known. The DEC would expect to be consulted with regards to potential loss of Priority Flora species.

Any clearing on site would require a clearing permit approval under the *Environmental Protection Act 1986*, unless the activity qualifies for an exemption under the Act or the *Environmental Protection (Clearing of Native Vegetation Regulations) 2004*. For example, exemptions are available for some approvals received under the *Town Planning & Development Act 1928*.

5. Limitations of this Report

5.1 Survey Limitations

This report presents the results of a desktop review and a single targeted Priority Flora site inspection carried out on the 21st September 2006.

This survey was carried out during only one season, and in one year. Complete surveys require multiple surveys, at different times of the year, and over a period of a number of years, to enable full survey of all species present.

Some flora species, such as annuals, are only available for collection at certain times of the year, and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to above factors. Therefore, while this flora survey was conducted at a time of year when the majority of the flora species would be able to be identified, there is the possibility that some species of Priority Flora on site have been overlooked.

The report provided does not meet the requirements of the Environmental Protection Authority (2004) *Guidance No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. However, due to the disturbed nature of the area, the opportunistic survey undertaken should be adequate for impact assessment purposes.

5.2 Report Limitations

This report presents the results of a targeted flora investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project described herein and must be reviewed by a competent scientist before being used for any other purpose. GHD Pty Ltd accepts no responsibility for other use of the data.

Where reports, searches, any third party information and similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

For these investigations GHD has conducted desktop data searches and field surveys. The conclusions of this report were based on the information gathered during these investigations and thus reflect the environment of the Site at the time of survey. GHD accepts no responsibility for any variation in the flora present at the Site due to natural and seasonal variability.

6. References

Agriculture and Related Resources Protection Act (1976).

Beard, J.S. (1976) *Vegetation Survey of Western Australia: The Vegetation of the Geraldton Area, Western Australia.* Vegmap Publications, Perth.

Environmental Protection Authority (2000) *Environmental Protection of Native Vegetation in Western Australia. clearing of native vegetation, with particular reference to the agricultural area.* Position Statement No. 2. Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Act 1986

Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

GHD Pty Ltd (2006) *80 & 81 Hackett Road, Waggrakine: Environmental Assessment.*

Government of Western Australia (2002) *Bush Forever Volume 2 – Directory of Bush Forever Sites.* Western Australian Planning Commission, Western Australia.

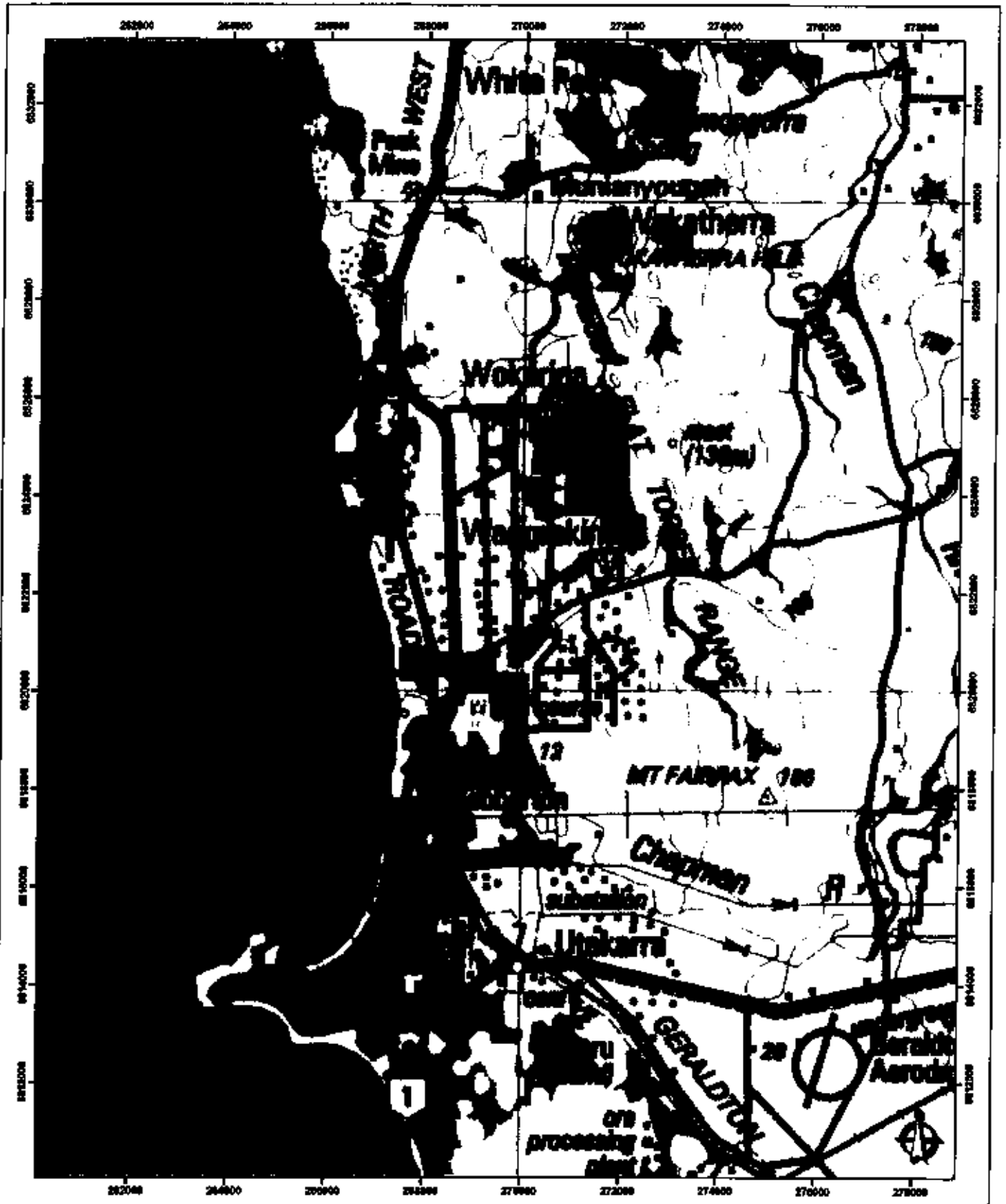
Shepherd, D.P, Beeston, G.R and Hopkins, A.J.M (2002) *Native Vegetation in Western Australia: Extent, Type and Status.* Natural Resource Management Technical Report No. 249: Department of Agriculture.

Shepherd, D.P. (2006) *Personal Communication.* Information updated from above reference, but not as yet developed into a final report.

Town Planning & Development Act 1928

Wildlife Conservation Act (1950).

Figures



LEGEND

 Lot 80 & 81 Hekett Rd Site Boundary

SCALE
 750 0 750 1,500 2,250m
 1:75,000 at A3



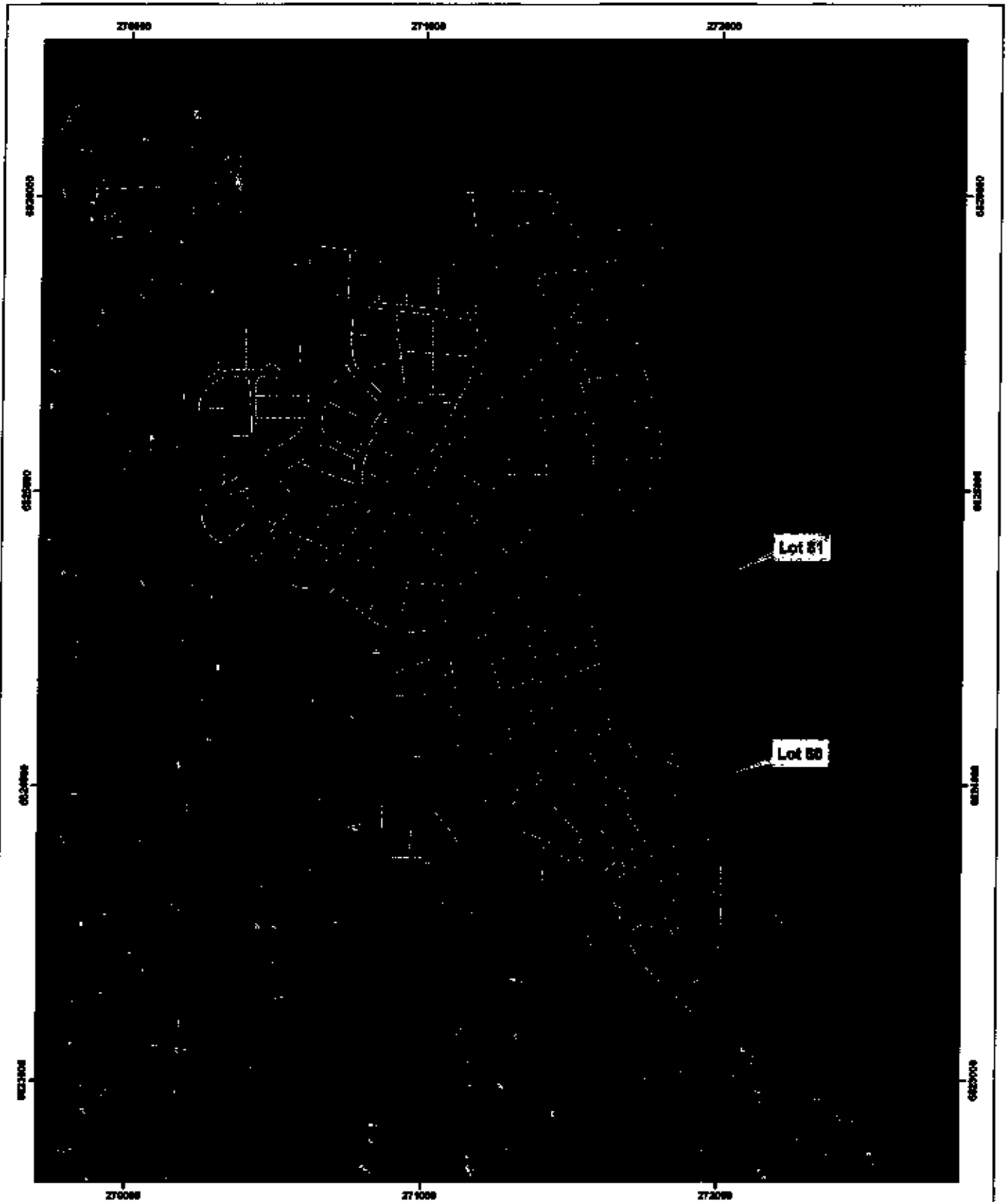
COPYRIGHT
 THE GOVERNMENT OF WESTERN AUSTRALIA
 THE INFORMATION ON THIS MAP IS PROVIDED AS IS WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE GOVERNMENT OF WESTERN AUSTRALIA BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, ARISING FROM, OUT OF OR IN CONNECTION WITH THE USE OF THE INFORMATION ON THIS MAP.

CREATED BY ML	CHECKED	APP'D BY
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
VERTICAL DATUM: NA		METADATA: ISO19115-2
DATE 04.08.2009	FILE LOCATION h:\011\0227\0000000001\0227-00.mxd	
REVISION 0	CREATED BY 011022-00	



Environmental Assessment
 Hekett Road, Waggrakine
 Figure 1 - Site Locality




MAP UNITS PROVIDED IN MGA ZONE 50
 NOTE THAT POSITIONAL ERRORS CAN BE ± 5M IN SOME AREAS
 THIS BOUNDARY SHOULD BE CHECKED ON THE GROUND



Lot 81

Lot 80

LEGEND

-  Existing Cadastre
-  Proposed Subdivision Cadastre
-  Lot 80 & 81 Site Boundary

SCALE
 0 125 250 375m
 1:12,800 at A3



COPYRIGHT

UNCLASSIFIED DATA UNDER THE PROVISIONS OF THE
 INFORMATION ACCESS ACT 1982 (CANTONMENT) AND/OR
 THE OFFICIAL INFORMATION ACT 1982 (CANTONMENT)
 INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
 DATE 15-07-2010 BY 10000000000000000000

CREATED BY WD	CHECKED	APPROVED
------------------	---------	----------

COORDINATE DATUM: GDA 94
 HEIGHT DATUM: MSL
 PROJECTION: UTM ZONE 50
 METADATA RECORDED: 1998

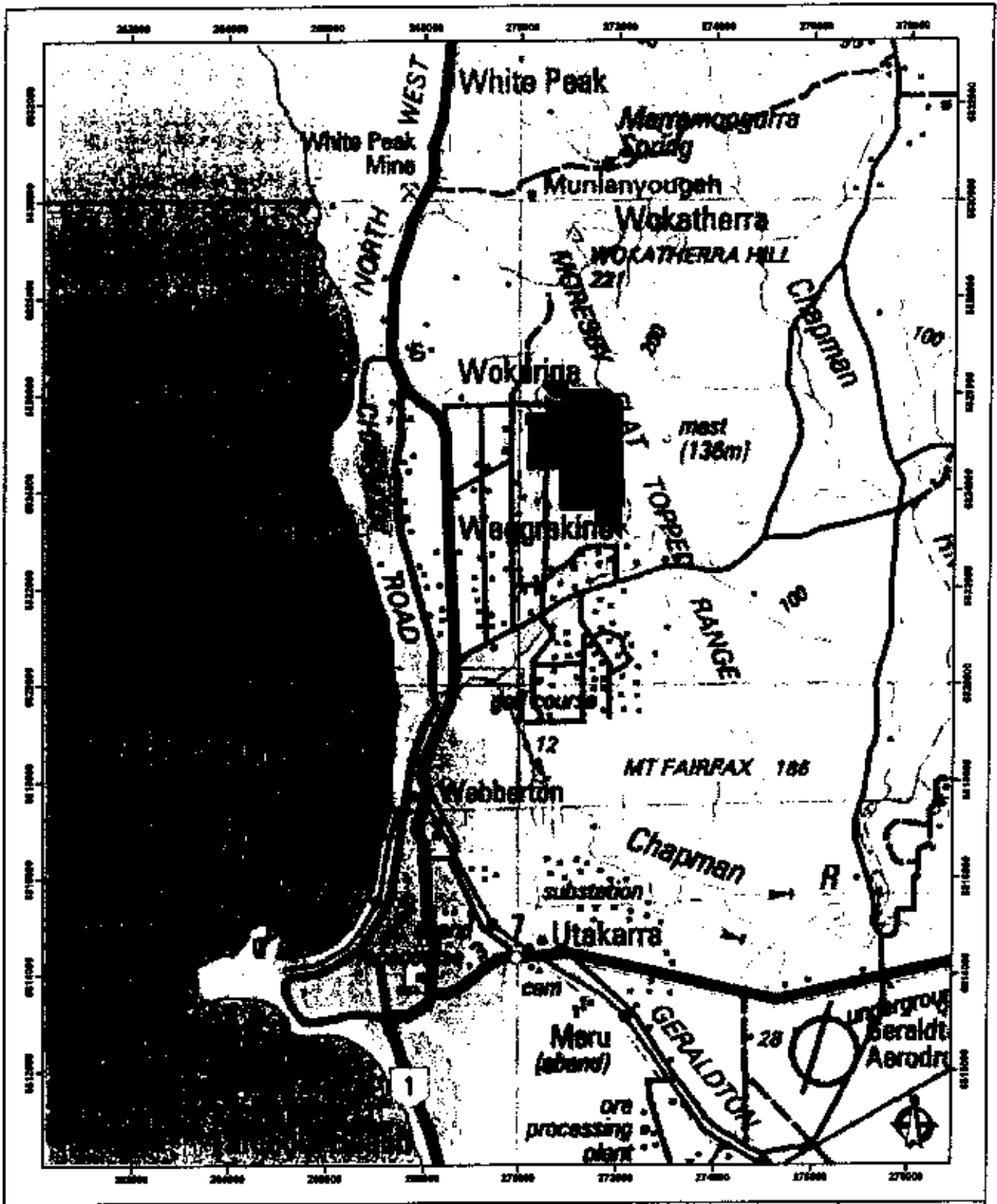
DATE 12.02.07	FILE LOCATION G:\W\120207\120207\F12020-02_Rev1.dwg
REVISION 1	DRAWING NO 04W023-02




Environmental Assessment
 Heald Road, Wagga Wagga

Figure 2 - Proposed Development

NOTE THAT POSITIONAL ERRORS CAN BE ± 0.4 M AT 90% CL
 AIRPHOTO PHOTOGRAPHY ACQUIRED FROM DJL - 2003 ORIGINATOR'S RECORD REPRODUCED BY PERMISSION
 OF THE DEPT. OF LAND INFORMATION SYSTEMS, WESTERN AUSTRALIA, COPYRIGHT LICENSE 2004



LEGEND

 Lot 80 & 81 Hackett Rd
Site Boundary

MAP DATA PROVIDED BY BUA LTD/NO 20
NOTE THAT PORTIONALS SHOWN CAN BE ± 5M IN SOME AREAS
2004 BURNING SOURCES GEOGRAPHICS AUSTRALIA



COPYRIGHT
MATERIALS AND METHODS DEVELOPED BY THE
THE UNIVERSITY OF WESTERN AUSTRALIA
AND THE GEOGRAPHICAL INSTITUTION OF
WESTERN AUSTRALIA FOR THE COMPANY

DESIGNED BY	DATE	APPROVED
ML		

PRODUCTION AND SOURCE OF
REPRODUCTION: 100%

DATE: 04/10/2005
FILE LOCATION: \\BURNING\GIS\2004-05\10234-02.mxd
DRAWING NO: 1010005-00

Environmental Assessment
Hackett Road, Wokatherra

Figure 1 - Site Locality



LEGEND

- Existing Cadastre
- - - Proposed Subdivision Cadastre
- ▭ Lot 80 & 51 Site Boundary



1:12,500 at A3



MID-WEST W.A.

COPYRIGHT

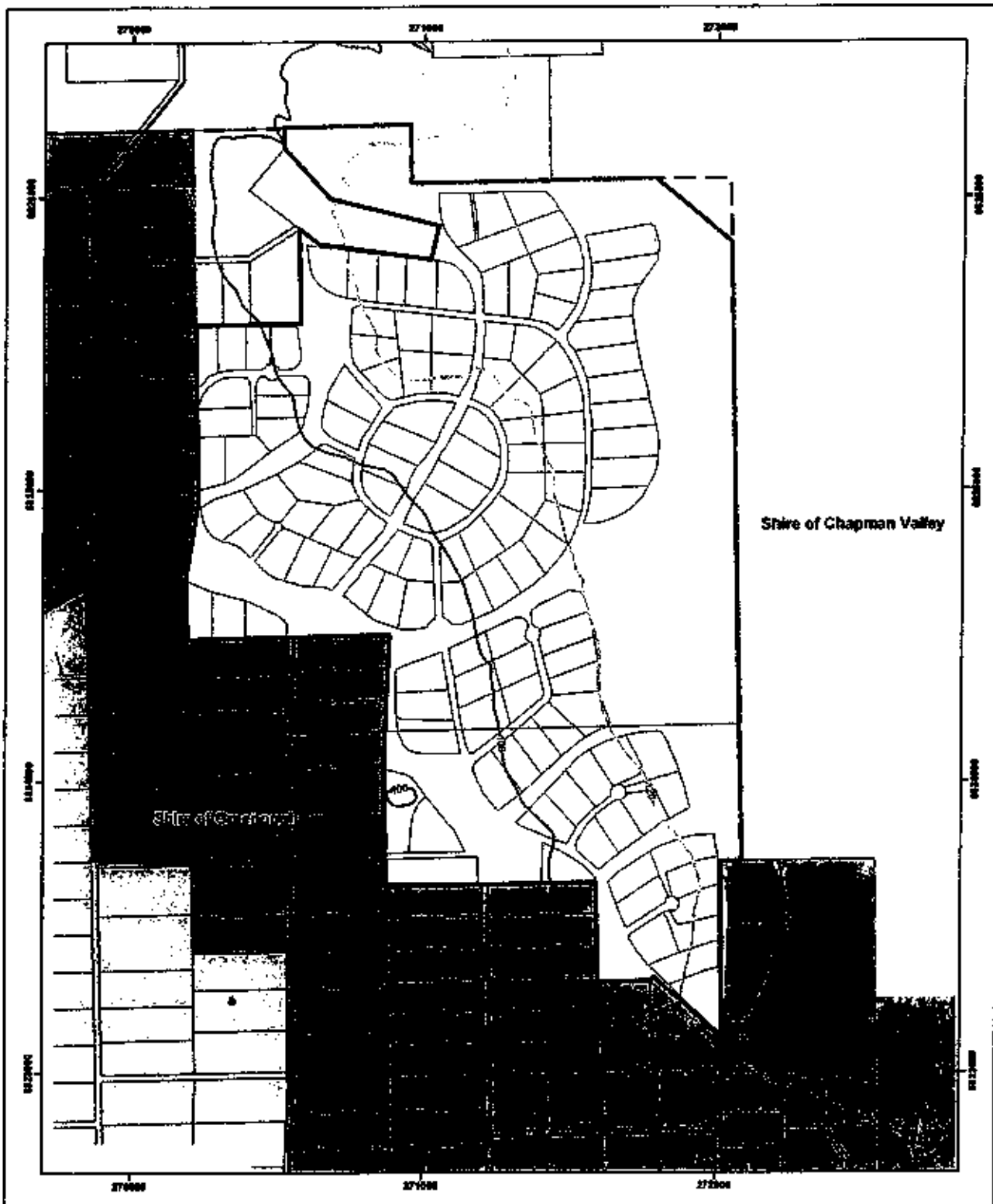
Information is provided under the provisions of the Copyright Act 1969 and the Copyright Act 1984. The user of this information is advised that the user is responsible for the correct interpretation and use of the information.

CREATED BY ML	DESIGNED ML	APPROVED [Signature]
REVISIONS DATE: 20/06/2000 BY: [Signature]		PROPOSED FROM: MESA ZONE 02 PROPOSAL NO: [Number]
DATE: 20/06/2000		FILE NUMBER: [Number]
REVISION: 2		APPROVED BY: [Signature]

Environmental Assessment
Hackett Road, Wagga Wagga

Figure 2 - Proposed Development

SOME STATE GOVERNMENTS, INCLUDING NSW, ACT, VIC AND WA, HAVE A LEGAL OBLIGATION TO PROVIDE ACCESS TO INFORMATION. INFORMATION IS PROVIDED UNDER THE PROVISIONS OF THE INFORMATION ACCESS ACT 2009. INFORMATION IS PROVIDED UNDER THE PROVISIONS OF THE INFORMATION ACCESS ACT 2009. INFORMATION IS PROVIDED UNDER THE PROVISIONS OF THE INFORMATION ACCESS ACT 2009.



LEGEND

- Existing Cadastre
- Proposed Subdivision Cadastre
- 100m Contour
- 120m Contour
- ▭ Lot 80 & 81 Site Boundary
- ▭ Local Government Boundary

Northern Geraldton District Structure Plan Area

- ▭ R17
- ▭ R10 B
- ▭ R10 A

NOTE THAT INFORMATION CONTAINED HEREIN IS UNCLASSIFIED AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE DEPT. OF LAND INFORMATION/ARTS, HERBERT AUSTRALIA. COPYRIGHT LICENSE 30004

SCALE
0 125 250 375m

1:12,500 at A3

LOCALITY MAP



MID-WEST WA

COPYRIGHT

THIS DOCUMENT IS UNCLASSIFIED AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE DEPT. OF LAND INFORMATION/ARTS, HERBERT AUSTRALIA. COPYRIGHT LICENSE 30004

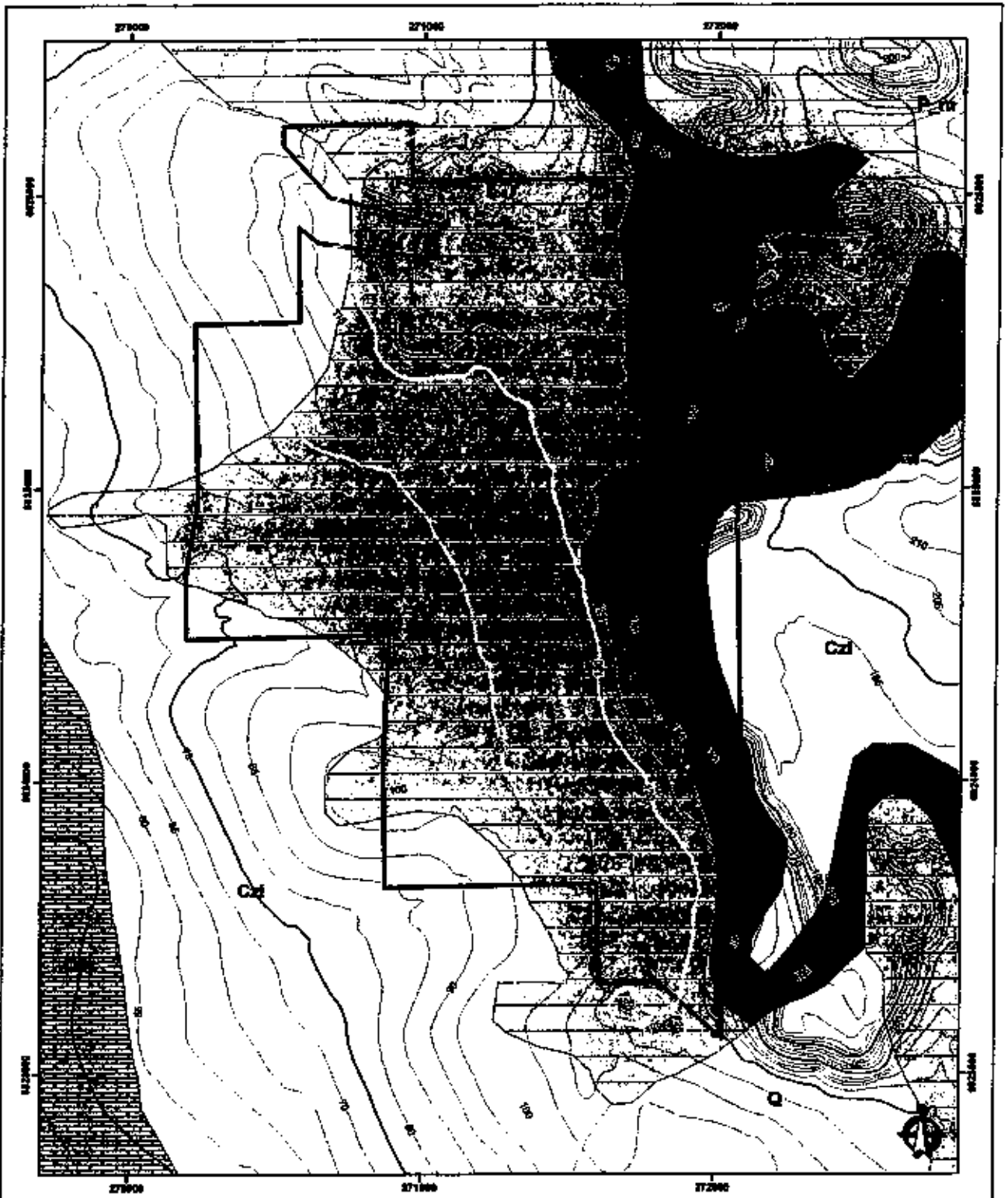
CREATED BY: ML CHECKED: APPROVED:

REVISIONS: 001: GDA 84 PROJECT NO: 484-2016 E2
002: DA 2016 PROJECT NO: 484-2016 E2

DATE: 04/08/2016 FILE LOCATION: \\SRV1\proj\484-2016\484-2016-E2_001.dwg
REVISION: 0 DRAWING NO: 484-2016-E2_001.dwg

Environmental Assessment
Newport Road, Waggrakine

Figure 3 - Planning Scheme and Constraints



LEGEND

- Lot 80 & 81 Site Boundary
- 5m Contour Intervals
- 25m Index Contours
- 100m Contour
- 120m Contour

GEOLOGY

- Aqueous, calcareous and micaceous silts
- Coastal Limestone
- Lenticle with overlying quartz sand
- Yampelee Formation: Vailed sandstone
- Chepton Bay Group: Kojamaa Sandstone
- Chepton Bay Group: Mooryosooka Sandstone
- Granite - Includes cordierite gneiss

MAP UNITS PROJECTED IN NAD 83 ZONE 67
NOTE THAT PORTION OF UNITS CAN BE 1-2M IN SOME AREAS

SCALE

125 0 125 250 375m

1:12,500 @ A3

LOCALITY MAP

ARO-WEST W/A

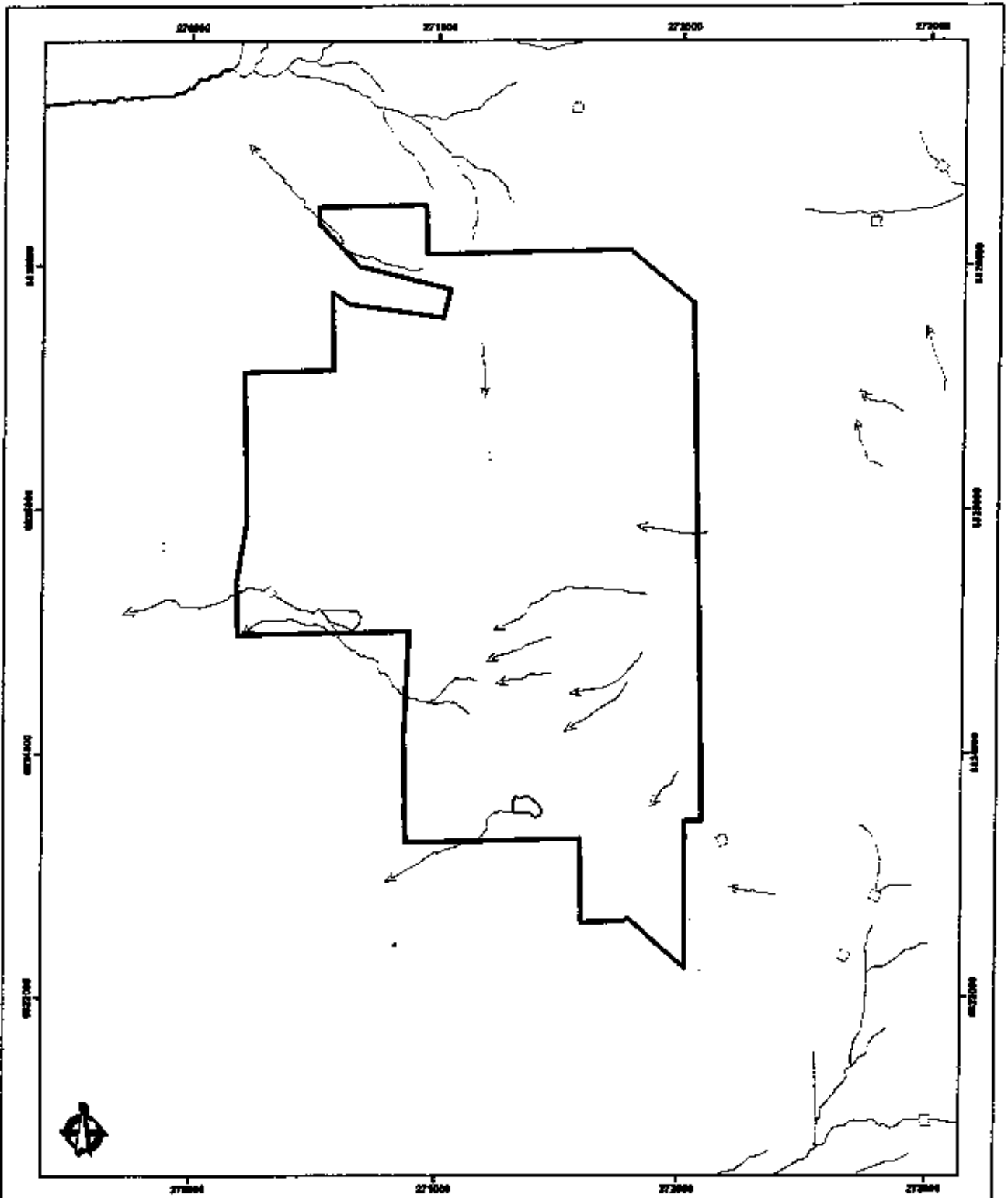
COPYRIGHT

TRADEMARK AND COPYRIGHT PROPERTY OF ARO PTT LTD
REPRODUCED BY ALL THE ABOVE MEMBERS
FOR SERVICE OF THE CUSTOMERS AND TO BE
USED BY THE CUSTOMERS FOR THE PURPOSES
OF THE ORIGINAL DOCUMENT AND THE DRAWINGS
ONLY.

CREATED BY BL	CHECKED	APPROVED
HORIZONTAL DATUM: GDA 84		VERTICAL DATUM: MGA 84
HEIGHT DATUM: MGA		PROJECTION: UTM
DATE 14/01/2008	FILE LOCATION C:\AROWEST\GIS\110205-04_gis_report.mxd	
PROJECT 0	SCALE 1:12500	

Environmental Assessment
Nackak Road, Waggepink

Figure 4 - Geology and Topography



LEGEND

- Lot 80 & 81 Site Boundary
- Linear Hydrography (DEC 2006)**
- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to inundation
- Earth Dam

- Flow Direction Arrow
- Tank
- Well
- Well With Windmill

SCALE
 1:75 250 M:AS
 0 100 200 400m



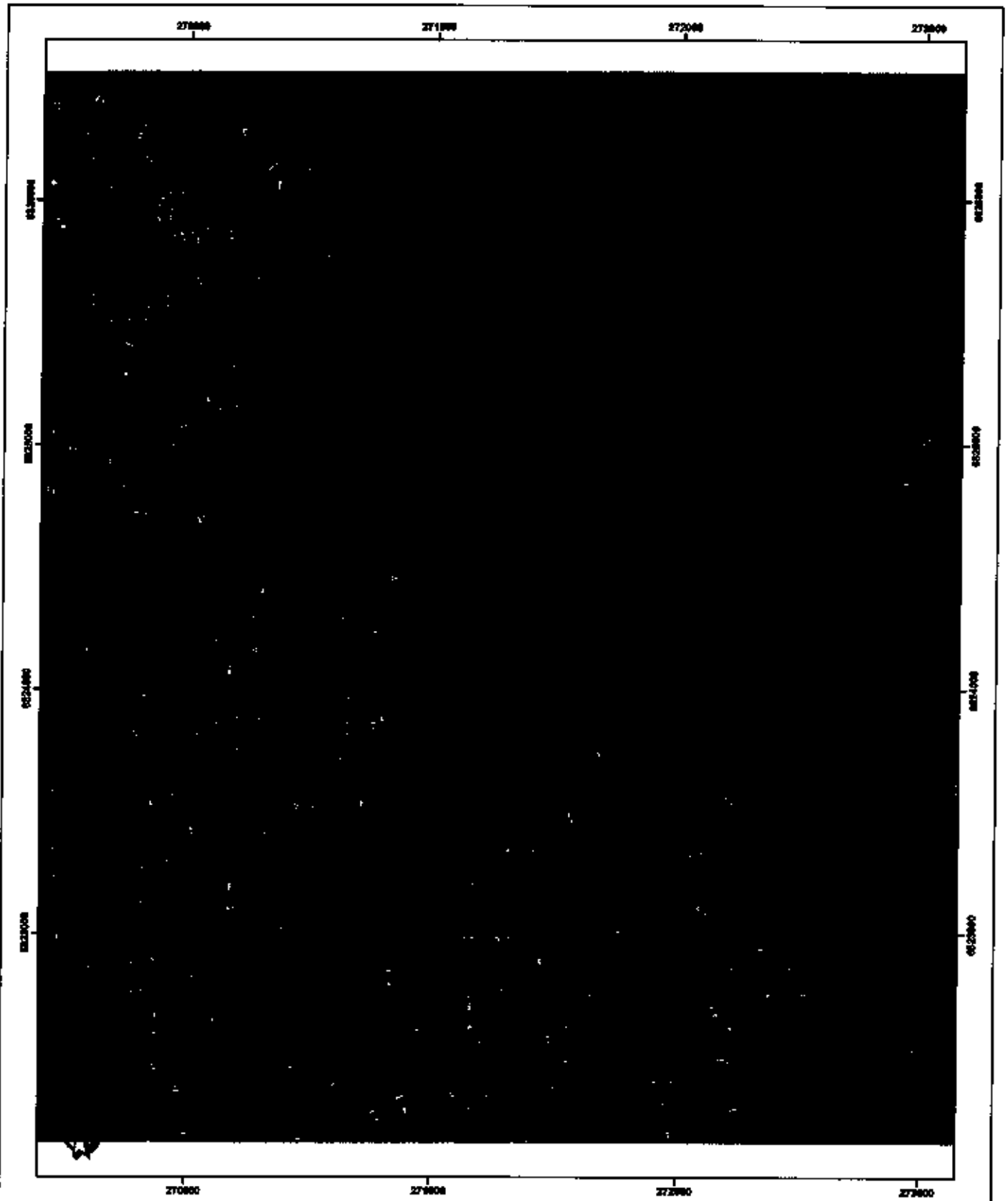
COPYRIGHT
 THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF THE GOVERNMENT OF WEST AUSTRALIA AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

DESIGNED BY ML	DRAWN BY	APPROVED
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
VERTICAL DATUM: MGA		MEASUREMENT SYSTEM: 1984
DATE 04.06.2008	FILE LOCATION S:\M\1620\hydro\1620-05_hydro.mxd	
REVISION 0	DISCRIPTION 1620-05	

Environmental Assessment
 Hockatt Road, Waggrakine

Figure 6 - Hydrography

MAP DATA PROVIDED BY MRN 2008-02. NOTE THAT POSITIONAL ACCURACY CAN BE +/- 5m IN SOME AREAS.



LEGEND

Lot 80 & 81 Site Boundary
 Declared Rare and Priority Flora
 (R) Declared Rare Flora - Extant Taxa
 Priority 1 - Poorly Known Taxa
 Priority 2 - Poorly Known Taxa
 Priority 3 - Poorly Known Taxa
 Priority 4 - Rare Taxa

Priority Species
Eucalyptus adspersa
Melaleuca holtzei
Galaxiornis strepitosa ssp formosa

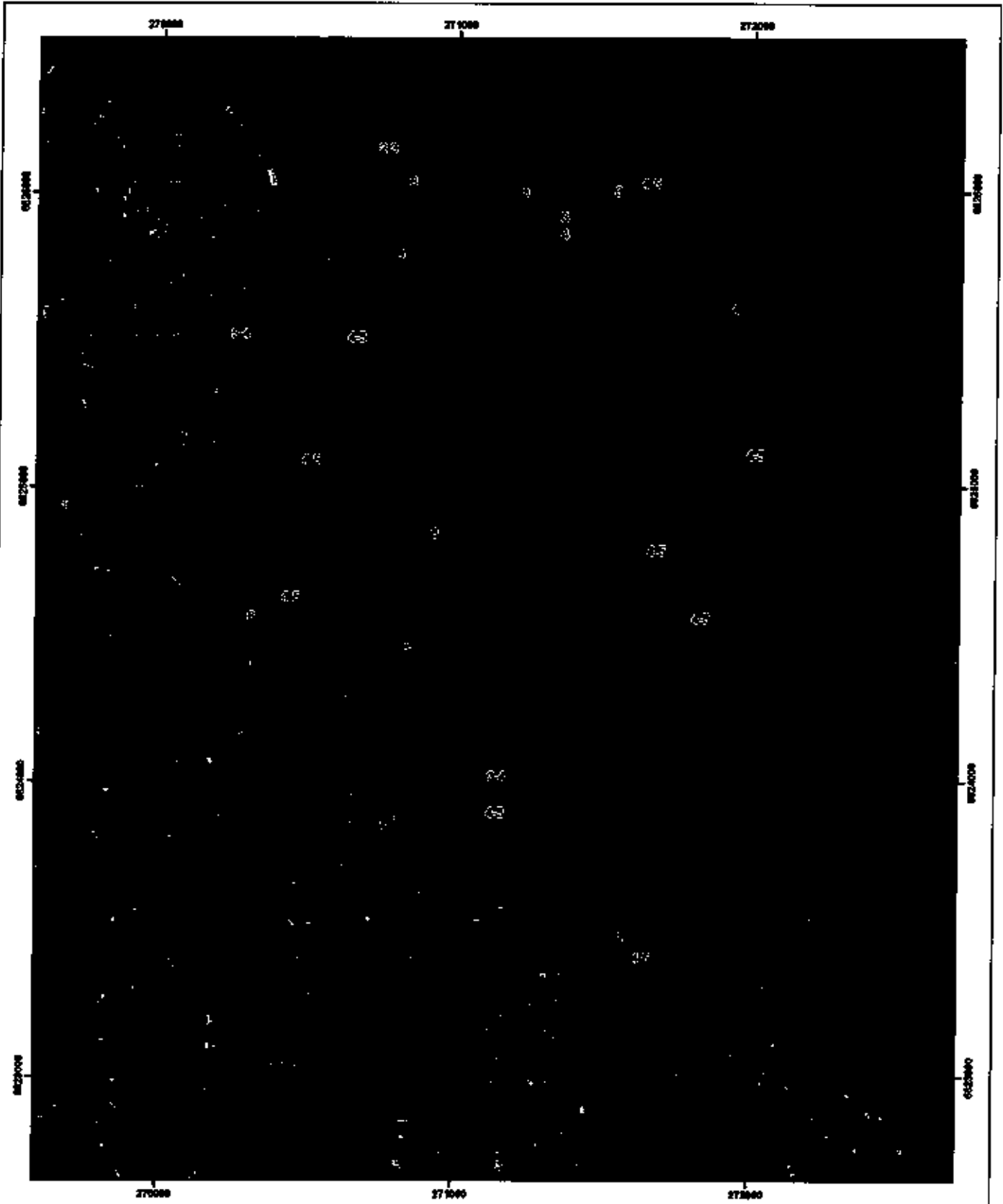
MAP UNITS PROJECTED IN MGA ZONE 80 NOTE THAT POSITIONAL ERRORS CAN BE ± 5M IN SOME AREAS

SCALE
 100 0 100 200 400m
 1:10,000 at A3
LOCALITY MAP



 MID-WEST W.A.
COPYRIGHT
THIS DOCUMENT IS AN UNCLASSIFIED PROPERTY OF THE GOVERNMENT OF WEST AUSTRALIA
 THE GOVERNMENT OF WEST AUSTRALIA ACCEPTS NO LIABILITY FOR ANY ERRORS OR OMISSIONS
 WITH THE EXCEPT OF INFORMATION FROM THE GOVERNMENT

CREATED BY MT	CHECKED	APPROVED
HORIZONTAL DATUM: SDA 84		PROJECTION: MGA ZONE 80
HEIGHT DATUM: NA		DATA SOURCE: 1995
DATE 20/1/07	FILE LOCATION G:\1\1023\glaciated\1023-01.jpg Revised	
REVISION 0	DRAWING NO 011023-01	

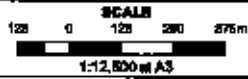
Environmental Assessment
 Hackett Road, Wagga Wagga
Figure 3 - Priority Flora



LEGEND

-  Lot 80 & 81 Site Boundary
-  Burnt Area

- Vegetation Condition**
1. Pristine or nearly so
 2. Excellent
 3. Very Good
 4. Good
 5. Degraded
 6. Completely degraded



COPYRIGHT

THIS DOCUMENT IS THE PROPERTY OF GHD. IT IS TO BE USED ONLY FOR THE PROJECT AND NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF GHD.

REPORTED BY	CHIEF	APPROVED
NO		

HORIZONTAL DATUM: GDA 84
 HEIGHT DATUM: MSL
 PROJECTION: MGA ZONE 50
 METADATA RECORDS: None

DATE	FILE LOCATION
18/02/2007	D:\GIS\Projects\2007\20070218_Veg_Condition
Version	ISSUE NO
1	01/2007-08



Environmental Assessment
 Mackay Road, Waggrakine

Figure 4 - Vegetation Condition

MAP UNITS PROJECTED IN MGA ZONE 50. NOTE THAT POSITIONAL ERRORS CAN BE > 1M IN SOME AREAS.

Appendix A

DEC Priority Flora Search Results



Department of Environment and Conservation

Your reference:
Our reference: 2006-003551
Enquiries: Ben Lullfitz

Phone: 9334 0123
Fax: 9334 0278
Email: Ben.Lullfitz@dec.wa.gov.au

GHD Pty Ltd
76 Forrest Street
GERALDTON WA 6530

Attention: Cathee Miller

Dear Ms Miller

REQUEST FOR RARE FLORA INFORMATION

I refer to your request of 3 August 2006 for information on rare flora in the Geraldton and Morawa areas. The search co-ordinates used were (Geraldton) 28° 39' - 28° 43' S and 114° 37' - 114° 41' E and (Morawa) 29° 07' - 29° 15' S and 115° 57' - 116° 05' E.

A search was undertaken for this area of (1) the Department's *Threatened (Declared Rare) Flora* database (for results, if any, see "Threatened Flora Data" - coordinates are GDA94), (2) the *Western Australian Herbarium Specimen* database for priority species opportunistically collected in the area of interest (for results, if any, see "WAHERB" - coordinates are GDA94 - see condition number 9 in the attached 'Conditions in Respect of Supply' and (3), the Department's *Declared Rare and Priority Flora List* [this list is searched using 'place names'. This list which may also be used as a species target list, contains species that are declared rare (Conservation Code R or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) - for results, if any, see "Declared Rare and Priority Flora List"]. The results are attached electronically to this email.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the seventh point, which refers to the requirement to undertake field investigations for the accurate determination of rare flora occurrence at a site. *The information supplied should be regarded as an indication only of the rare flora that may be present and may be used as a target list in any surveys undertaken.*

The information provided does not preclude you from obtaining and complying with, where necessary, land clearing approvals from other agencies.

An invoice for \$350 (plus GST) to supply this information will be forwarded.

It would be appreciated if any populations of rare flora encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss rare flora management, please contact my Principal Botanist, Dr Ken Atkins, on (08) 9334 0425.

Yours faithfully

B.R. Lullfitz

.....
for Keiran McNamara
DIRECTOR GENERAL
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

4 August, 2006

Please note: Co-ordinates supplied for all data search requests must be provided in latitude/longitude format, 'eastings and northings' are no longer suitable. Thank you.

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

RARE FLORA INFORMATION

CONDITIONS IN RESPECT OF SUPPLY OF INFORMATION

1. All requests for data to be made in writing to the Director General, Department of Environment and Conservation, Attention: Threatened Flora Database Officer, Species and Communities Branch.
2. The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided, without the prior written consent of the Director General, Department of Environment and Conservation.
3. Specific locality information for Declared Rare Flora is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for DRF may not be used in public reports without the written permission of the Executive Director, Department of Environment and Conservation. Publicly available reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Department is to be contacted for guidance on the presentation of rare flora information.
4. Note that the Department of Environment and Conservation respects the privacy of private landowners who may have rare flora on their property. Rare flora locations identified in the data as being on private property should be treated in confidence, and contact with property owners made through the Department of Environment and Conservation.
5. Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data provided, they may be present. The Department of Environment and Conservation accepts no responsibility for this.
6. Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.
7. It should be noted that the supplied data do not necessarily represent a comprehensive listing of the rare flora of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area. The receiving organisation should employ a botanist, if required, to undertake a survey of the area under consideration.
8. Acknowledgment of the Department of Environment and Conservation as source of the data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Environment and Conservation, Attention: The Manager, Species and Communities Branch.
9. The development of the PERTH Herbarium database was not originally intended for electronic mapping (eg. GIS ArcView). The latitude and longitude coordinates for each entry are not verified prior to being databased. It is only in recent times that collections have been submitted to PERTH with GPS recorded in latitude and longitude coordinates. Therefore, be aware when using this data in ArcView that some records may not plot to the locality description given with each collection.

THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DECLARED RARE AND PRIORITY FLORA LIST

for Western Australia

CONSERVATION CODES

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

ABBREVIATIONS USED IN THREATENED FLORA DATABASE PRINTOUTS

VESTING		EXL	Exploration Lease
AGR	Chief Exec Dept of Agriculture	EXP	Experimental Farm
ALT	Aboriginal Land Trust	FIR	Firing Range
BAP	Baptist Union of WA Inc	FOR	State Forest
BSA	Boy Scouts Association	GHA	Grain Handling
CC	Conservation Commission - NPNCA - LFC	GOL	Golf
CGT	Crown Grant in Trust	GRA	Gravel Pit
COM	Commonwealth of Australia	GRE	Green Belt
CRO	Crown Freehold-Govt Ownership	GVT	Government Requirements
DOL	Dept of Land Administration	HAR	Harbour Purposes
DFU	Ministry for Planning	HEP	Heritage Purposes
EXD	Exec Direc CALM	HER	Heritage trail
FRE	Freehold	HOS	Hospital
HOW	Homeswest	KEN	Kennels
ILD	Industrial Lands Develop. Auth	MIN	Mining lease
JOI	Joint Vesting-NPNCA & Shire	MUN	Municipal Purposes
LAC	LandCorp	NPK	National Park
LFC	Lands and Forests Commission	NRE	Nature Reserve
MAG	Minister for Agriculture	OTH	Other
MED	Ministry of Education	PAC	Public access
MHE	Minister for Health	PAR	Parkland (& Recreation)
MIN	Minister for Mines	PAS	Pastoral lease
MPL	Ministry for Planning	PFL	Protection of Flora
MPR	Minister for Prisons	PIC	Picnic ground
MRD	Main Roads WA	PLA	Plantation
MTR	Minister for Transport	POS	Public Open Space
MWA	Minister for Water Resources	FPA	Public parkland
MWO	Minister for Works	PRS	Prison site
NAT	Natural Trust of Australia WA	PUT	Public Utility
NON	Not Vested	QUA	Quarry
NPN	NPNCA	RAD	Radio Station
OTH	Other	RAC	Racecourse
FRI	Private	REC	Recreation
RAI	Westrail	REH	Rehabilitation
SEC	Western Power	RNP	Re-establish Native Plants
SHI	Shire	RRE	Railway Reserve
SPC	State Planning Commission	RUB	Rubbish
TEL	Telstra	SAN	Sand
TGR	Timber Govt Requirement	SCH	School-site
TOW	TOWN	SET	Settlers requirements
UNK	Unknown	SHI	Shire Requirements
WAT	Water Corporation	SHO	Showgrounds
WEL	Minister Community Welfare	SNN	Sanitary
WRC	Water & Rivers Commission	STO	Stopping place
XPL	Ex-Pastoral Lease	TIM	Timber
		TOU	Tourism
		TOW	Town-site
		TRA	Training Ground
		TRI	Trig station
		TVT	Television transmitting
		UNK	Unknown
		UTI	Utilities
		VCL	Vacant Crown Land
		VER	Road Verge
		VPF	Vermin Proof Fence
		WAT	Water
		WCO	Water & Conservation of F & F
		WOO	Firewood
PURPOSES			
ABR	Aboriginal Reserve		
AER	Aerodrome		
CAM	Camping		
CAR	Caravan park		
CEM	Cemetery		
CFA	Conservation of Fauna		
CFF	Conservation Of Flora & Fauna		
CFL	Conservation of Flora		
CHU	Church		
CPK	Car Park		
COM	Common		
CON	Conservation Park		
DEF	Defence		
DRA	Drain		
EDE	Educational Endowment		
EDU	Educational purposes UWA		
ENE	Enjoyment of Natural Environ.		
EXC	Excepted from sale		

* Please note that LFC now comes under the Conservation Commission.

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
DECLARED RARE AND PRIORITY FLORA LIST
30 June 2006

SPECIES / TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER PERIOD
<i>Acacia guinetii</i>	4	MW	Geraldton-Northampton	Jun-Aug
<i>Acacia latipes</i> subsp. <i>licina</i>	3	MW	Erangy Springs, Geraldton, Three Springs, Northampton, Hutt River, Eneabba	Jun-Jul
<i>Acacia leptospermoides</i> subsp. <i>psammophila</i>	3	MW	Geraldton, Yuna, Indarra, Eradu	
<i>Acacia megacephala</i>	2	MW	E of Geraldton, Kojarena, Burma Road	Jun-Sep
<i>Baeckea</i> sp. <i>Walkaway</i> (AS George 11249)	3	MW	Nanson, Ambania, Walkaway, Burma Road Reserve, Mt Fanny, Mt Homer	Jan-Apr
<i>Caladenia hoffmanii</i>	R	MW	Geraldton-Kalbarri	Aug-Oct
<i>Chorizema humile</i>	R	MW	Strawberry, Camamah, Geraldton, Kojarena, Coorow	Jul-Sep
<i>Cryptandra scoparia</i> var. <i>microcephala</i>	2	MW	Kalbarri N.P., Geraldton	May-Aug
<i>Dicrastylis incana</i>	2	MW	E of Geraldton, Yuna, Eradu	Sep, Nov
<i>Drummondita ericoides</i>	R	MW	N of Geraldton	Sep-Oct
<i>Enekbatus bounites</i> ms	2	MW	Howatharra Hill	July
<i>Eremophila brevifolia</i>	2	MW, WB	Geraldton, Mt Caroline, Northampton	Aug-Sep
<i>Eucalyptus blaxellii</i>	R	MW	NE of Geraldton	Aug-Nov
<i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>	4	MW	Nanson, Mt Michael, Eradu, Mt Homer, Morseby Range	-
<i>Gastrolobium propinquum</i>	1	MW	Northampton, Geraldton	Jun-Nov
<i>Geleznowia verrucosa</i> subsp. <i>formosa</i> ms	3	MW, WB	Kalbarri, Hill River, Geraldton, Eneabba	Jun-Sep
<i>Grevillea bracteosa</i>	R	MW, SW	Geraldton, Howatharra, Mullewa, Milling, Bindoon	Aug-Oct
<i>Grevillea candicans</i>	3	MW, WB	Dalwallinu, Mingenew, Geraldton, Galena, Yuna, Mullewa	Jul-Oct
<i>Grevillea hirtella</i>	3	MW	Walkaway, Burma Road, Geraldton, Greenough	-
<i>Grevillea triloba</i>	3	MW	Geraldton, Northampton	Jul-Aug
<i>Harperia ferruginipes</i>	1	MW	Geraldton/Mullewa	Apr-May
<i>Homalocalyx chapmanii</i>	1	MW	Arrowsmith River, Geraldton, One Tree Hill, Three Springs	
<i>Homalocalyx inerrabundus</i>	2	MW	Geraldton, Bindoo Hill, East Yuna, Mount Magnet	Sep, Oct
<i>Lepidobolus basiflorus</i>	1	MW	Geraldton-Mullewa	Apr-May
<i>Leucopogon oblongus</i> ms	2	MW	Northampton, Howatharra	Jul
<i>Malleostemon</i> sp. <i>Moonyoonooka</i> (R.J Cranfield 2847)	2	MW	Kalbarri, Geraldton	Aug, Sep
<i>Schoenia filifolia</i> subsp. <i>subulifolia</i>	R	MW	Champion Bay, Geraldton	
<i>Scholtzia</i> sp. <i>Valentine Road</i> (S Patrick 2142)	1	MW	Geraldton-Mullewa	Nov
<i>Stenanthemum gracilipes</i>	1	MW	Geraldton, Nabawa	Aug-Sep
<i>Thryptomene</i> sp. <i>Moresby Range</i> (AS George 14873)	3	MW	Moresby Range, Chapman Valley, Howatharra	Jul-Sep
<i>Thryptomene</i> sp. <i>Yuna Reserve</i> (AC Burns 100)	2	MW	East Yuna Reserve, East Chapman, Bella Vista NR	Aug-Sep
<i>Thryptomene stenophylla</i>	2	MW	Kalbarri, Geraldton	-
<i>Verticordia chrysostachys</i> var. <i>pallida</i>	3	MW	Geraldton, Northampton	Dec
<i>Vittadinia cervicalis</i> var. <i>occidentalis</i>	1	MW	Geraldton, Northampton	-
<i>Wumbea tubulosa</i>	R	MW	Geraldton-Mingenew-Three Springs	Jun-Jul

WA HERBARIUM DATABASE - 4 August 2006

SHEET_NO.	GENUS	SPECIES	RANK	INFRASP	CONS.CODE
PERTH 196940	Acacia	guinetii			P4
PERTH 1135155	Verticordia	penicillaris			P4
PERTH 196428	Acacia	guinetii			P4
PERTH 196371	Acacia	guinetii			P4
PERTH 05395909	Grevillea	triloba			P3
PERTH 00755729	Acacia	guinetii			P4
PERTH 00759430	Acacia	guinetii			P4
PERTH 196396	Acacia	guinetii			P4
PERTH 1048945	Eucalyptus	blaxellii			R
PERTH 02032279	Verticordia	penicillaris			P4
PERTH 197335	Acacia	guinetii			P4
PERTH 197394	Acacia	guinetii			P4
PERTH 196363	Acacia	guinetii			P4
PERTH 196401	Acacia	guinetii			P4
PERTH 196436	Acacia	guinetii			P4
PERTH 196444	Acacia	guinetii			P4
PERTH 05396344	Grevillea	triloba			P3
PERTH 04159918	Grevillea	triloba			P3
PERTH 01648659	Grevillea	triloba			P3
PERTH 05392195	Thryptomene	stenophylla			P2
PERTH 1050508	Eucalyptus	blaxellii			R
PERTH 1048937	Eucalyptus	blaxellii			R
PERTH 196932	Acacia	guinetii			P4
PERTH 197408	Acacia	guinetii			P4
PERTH 01404539	Verticordia	densiflora	var.	roseostella	P3
PERTH 522309	Vitfadina	cervicularis	var.	occidentalis	P1
PERTH 00759449	Acacia	guinetii			P4
PERTH 05481074	Melaleuca	huttensis			P1
PERTH 04257413	Grevillea	triloba			P3
PERTH 05498228	Grevillea	triloba			P3
PERTH 05946433	Melaleuca	huttensis			P1
PERTH 06297161	Eucalyptus	blaxellii			R
PERTH 06297145	Eucalyptus	blaxellii			R

PERTH 1096846	Eucalyptus	diminuta	P4
PERTH 1039646	Eucalyptus	diminuta	P4
PERTH 1022814	Eucalyptus	cuprea	R
PERTH 05758408	Eucalyptus	blaxellii	R
PERTH 06095880	Eucalyptus	blaxellii	R
PERTH 06095879	Eucalyptus	blaxellii	R
PERTH 02191385	Thyptomene	sp. Moresby Range (A.S. George 1487	P3
PERTH 07901049	Melaleuca	huttensis	P1

THREATENED FLORA DATABASE - 4 August 2006

GENUS	SPECIES	CONS. CODE
Drummondia	ericoides	R
Verticordia	pericillaris	4
Eucalyptus	blaxellii	R

Appendix B
Site Photos

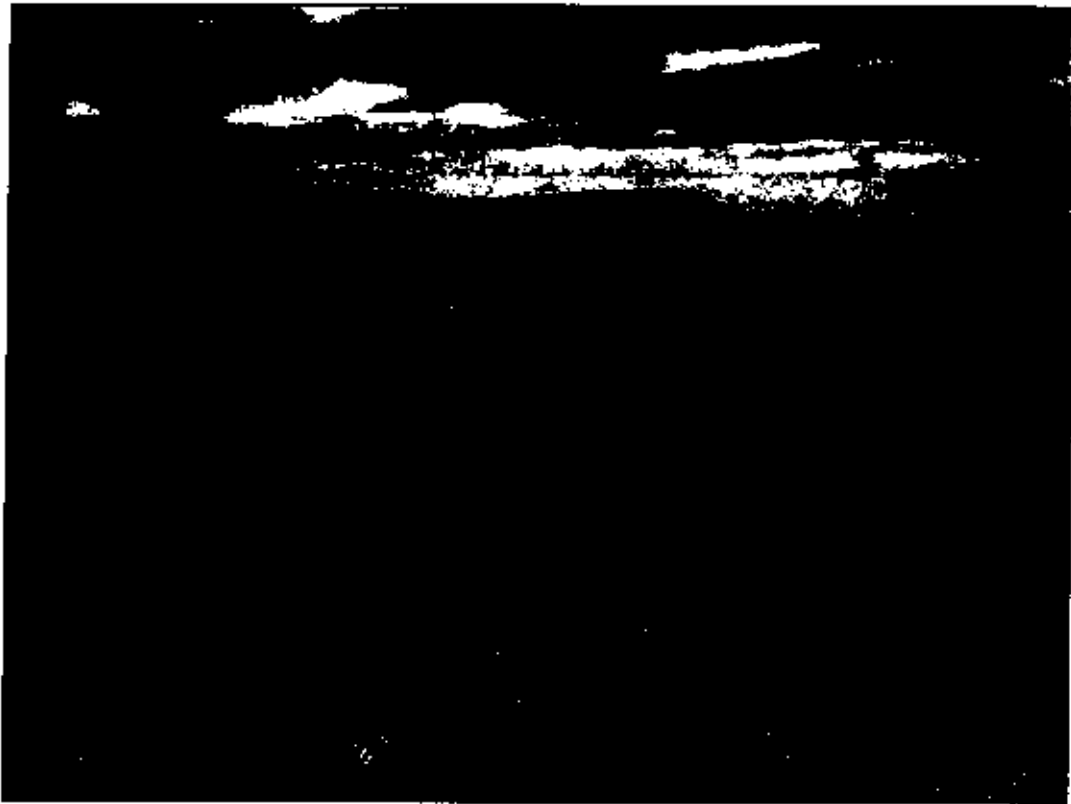


Plate 1 – Cleared Pasture Land



Plate 2 – View from escarpment onto Lot 81

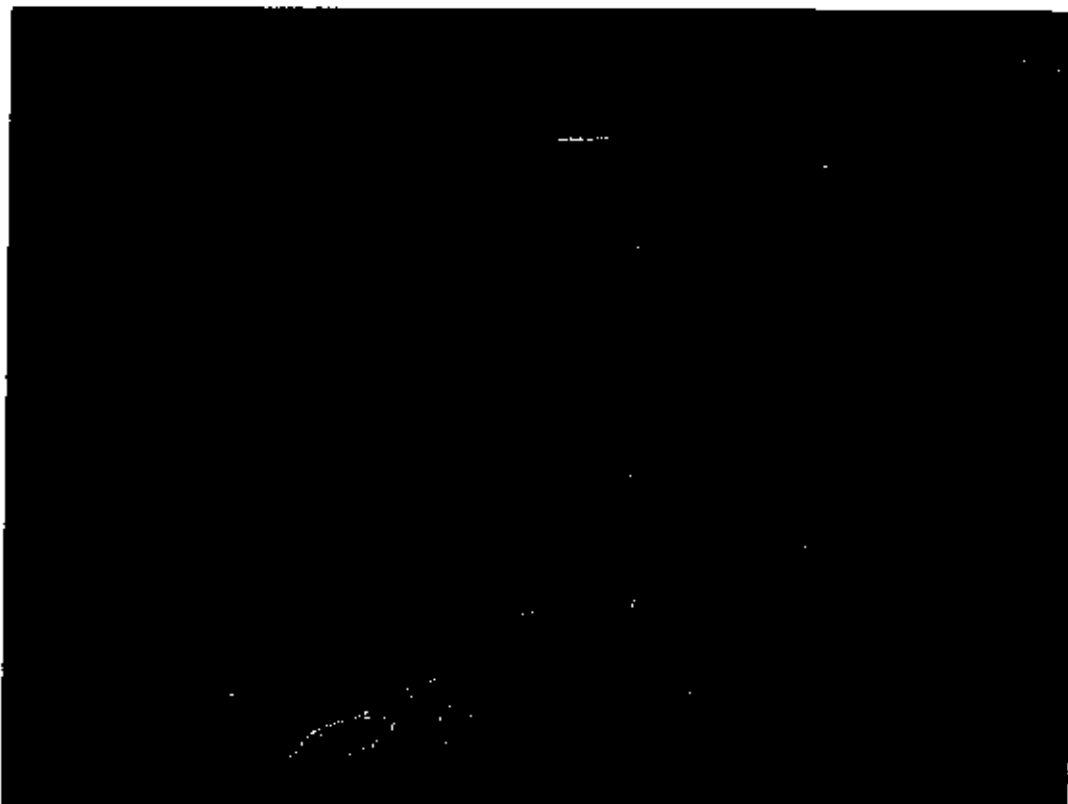


Plate 3 – vegetated areas to the north of Lot 81 in mid to background of photo

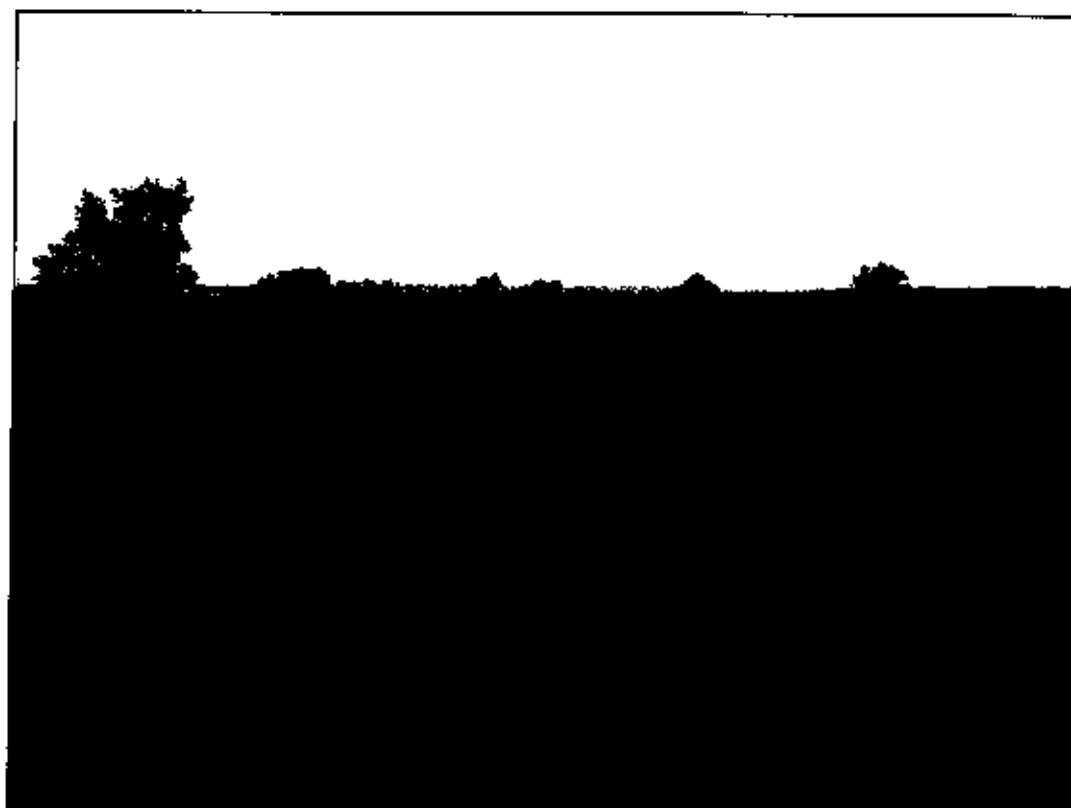


Plate 4 – northern fence line on Lot 81 hosting *Grevillea triloba* population



Plate 5 – Burnt Wetland Area on Lot 80

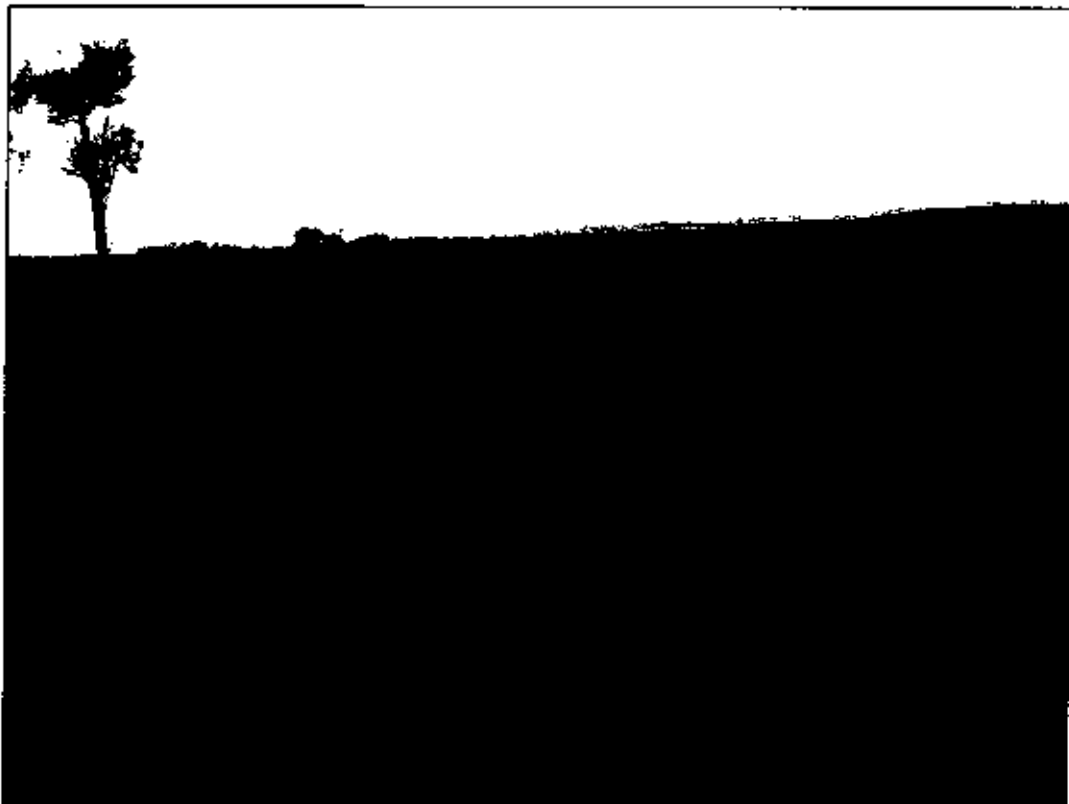


Plate 5 – Gravel Outcrop on Lot 80

Appendix C

Flora Species Recorded on Site

Family	Species	Common Name
	<i>Ptilotus polystachyus</i>	Prince of Wales Feather
AMARANTHACEAE	<i>Ptilotus obovatus</i> var <i>obovatus</i>	Cotton Bush
ANACARDIACEAE	* <i>Schinus terebinthifolia</i>	Japanese Pepper
	<i>Cassia micrantha</i>	Pale Grass Lily
	<i>Corynotheca micrantha</i>	Sand Lily
ANTHERICACEAE	<i>Tricoryne elatior</i>	Yellow Autumn Lily
APIACEAE	<i>Trachymene cyanopetala</i>	
	* <i>Arthrotheca calendula</i>	Cape Weed
	<i>Brachyscome ciliaris</i>	
	* <i>Hypochaeris</i> sp	Flat Weed
	<i>Lawrencella rosea</i>	
	* <i>Monoculus monstrosus</i>	
	<i>Podolepis lessonii</i>	
	<i>Rhodanthe manglesi</i>	
	<i>Rhodanthe spicata</i>	
	* <i>Sonchus oleraceus</i>	Sowthistle
	* <i>Urospermum picroides</i>	False Hawkbit
ASTERACEAE	* <i>Ursinia anthemoides</i>	Ursinia
BORAGINACEAE	* <i>Echium plantagineum</i> (DP)	Paterson's Curse
BRASSICACEAE	* <i>Brassica tournefortii</i>	Wild Turnip
	* <i>Raphanus raphanistrum</i>	Wild Radish
	* <i>Rapistrum rugosum</i>	Turnip Weed
BORYACEAE	<i>Borya sphaerocephala</i>	Pincushions
CARYOPHYLLACEAE	* <i>Petrohragia dubia</i>	
CASUARINACEAE	<i>Allocasuarina campestris</i>	
CHENOPODIACEAE	<i>Chenopodium gaudichaudianum</i>	Cottony Saltbush

	<i>Enchyleena tomentosa</i> var <i>tomentosa</i>	Ruby Saltbush
	<i>Rhagodia preissii</i> subsp <i>obovata</i>	
CONVOLVULACEAE	<i>Convolvulus remotus</i>	
CRASSULACEAE	<i>Crassula colorata</i>	
CUCURBITACEAE	* <i>Citrullus lanatus</i>	Paddy Melon
CUNONIACEAE	<i>Aphanopetalum dermatideum</i>	
	<i>Lepidosperma leptostachyum</i>	
	<i>Lepidosperma tenue</i>	
CYPERACEAE	<i>Mesomelaena pseudostygia</i>	Semaphore Sedge
DASYPOGONACEAE	<i>Acanthocarpus preissii</i>	
	<i>Hibbertia hypericoides</i>	Yellow Buttercups
DILLENIACEAE	<i>Hibbertia potentilliflora</i>	
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>	
GOODENIACEAE	<i>Dampiera incana</i> var <i>incana</i>	
GYROSTEMONACEAE	? <i>Gyrostemon racemiger</i>	
	<i>Conostylis aculeata</i>	Prickly Conostylis
HAEMODORACEAE	<i>Conostylis candicans</i>	Grey Cottonhead
JUNCACEAE	<i>Juncus kraussii</i>	Sea Rush
LAURACEAE	<i>Cassytha</i> sp.	Dodder Laurel
LORANTHACEAE	<i>Nuytsia floribunda</i>	WA Christmas Bush
MALVACEAE	<i>Hibiscus ?sturtii</i>	
	<i>Acacia microbotrya</i>	Manna Wattle
	<i>Acacia oxyclada</i>	
	<i>Acacia rostellifera</i>	Summer-scented Wattle
	<i>Acacia saligna</i>	Orange Wattle
MIMOSACEAE	<i>Acacia tetragonophylla</i>	Kurara
MYOPORACEAE	<i>Myoporum montanum</i>	

	<i>Eucalyptus camaldulensis</i> var <i>obtusa</i>	Northern River Red Gum
	<i>Eucalyptus loxophleba</i>	
	<i>Eucalyptus subangulata</i> ssp <i>subangulata</i>	
	<i>Melaleuca huttensis</i> (P1)	
	<i>Melaleuca raphiophylla</i>	Swamp Paperbark
	<i>Melaleuca uncinata</i>	Broom Bush
MYRTACEAE	<i>Verticordia chrysantha</i>	
	<i>Daviesia divaricata</i>	
	<i>Daviesia divaricata</i> ssp <i>lanulosa</i>	
	<i>Gastrolobium trifangulare</i>	
	<i>Jacksonia calcicola</i>	
	<i>Leptosema aphyllum</i>	
	* <i>Lupinus cosentinii</i>	Blue Lupins
	* <i>Mellilotus indica</i>	Common Melilot
	* <i>Trifolium fragiferum</i>	Strawberry clover
PAPILIONACEAE	* <i>Trifolium hirtum</i>	Rose clover
PHORMIACEAE	<i>Dianella revoluta</i> var <i>divaricata</i>	Blueberry Lily
PITTOSPORACEAE	<i>Pittosporum ligustifolium</i>	
POACEAE	<i>Austrostipa elegantissima</i>	Elegant Spear Grass
	* <i>Avena barbata</i>	Bearded Oat Grass
	* <i>Avena fatua</i>	Wild Oats
	* <i>Briza maxima</i>	Blow Fly Grass
	* <i>Bromus diandrus</i>	Great Brome
	* <i>Ehrharta calycina</i>	Perennial Veldt Grass
	* <i>Hordeum leporinum</i>	Barley Grass
	<i>Neurachne alopecuroides</i>	Foxtail Mulga Grass
	* <i>Pennisetum clandestinum</i>	Kikuyu

	<i>* Pennisetum setaceum</i>	Fountain grass
POLYGONACEAE	<i>* Emex australis</i>	Doublegee
	<i>Muehlenbeckia adpressa</i>	Climbing Lignum
PORTULACACEAE	<i>Calandrinia liniflora</i>	
PRIMULACEAE	<i>* Anagallis arvensis</i>	Pimpernel
	<i>Banksia prionotes</i>	
	<i>Dryandra fraseri</i> var <i>fraseri</i>	
	<i>Dryandra sessilis</i> ssp <i>flabellifolium</i>	Parrot Bush
	<i>Grevillea candelabroides</i>	
	<i>Grevillea pinaster</i>	
	<i>Grevillea triloba</i> (P3)	
	<i>Hakea lissocarpa</i>	Honeybush
	<i>Hakea prossii</i>	Needle Tree
	<i>Hakea recurva</i> ssp <i>recurva</i>	
PROTEACEAE	<i>Petrophile confers</i>	
RUTACEAE	<i>Galeznovia verrucosa</i> ssp <i>formosa</i> (P3)	
SAPINDACEAE	<i>Dodonaea inaequifolia</i>	
	<i>* Lycium ferocissimum</i>	African Boxthorn
	<i>* Solanum nigrum</i>	Blackberry Nightshade
SOLANACEAE	<i>Solanum oldfieldii</i>	
	<i>Gulchenotia micrantha</i>	
STERCULIACEAE	<i>Thomasia hermennifolia</i>	
STYLIDIACEAE	<i>Stylidium septentrionale</i>	
THYMELAEACEAE	<i>Pimelea microcephala</i> ssp <i>microcephala</i>	Shrubby Riceflower
VITACEAE	<i>Clematicissus angustissima</i>	

KEY:

* introduced plant species

DP = declared plant, see Section 3.3.4

P1, P3 = Priority Flora species, see Section 2.3 for further details

GHD Pty Ltd ABN 39 008 488 373

76 Forrest Street Geraldton WA 6530

PO BOX 164 Geraldton WA 6531

T: (08) 9964 3677 F: (08) 9921 7997 E: geraldtonmail@ghd.com.au

© GHD Pty Ltd 2007

This document is and shall remain the property of GHD Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
	C Miller	A Napier		M Coombes		

APPENDIX B - Level 1 Flora and Vegetation Survey (Coterra, 2011)

COTERRA
ENVIRONMENT

Level 1 Flora and Vegetation Survey

Lots 80 & 81 Hackett Road, Waggrakine

Rev 0, May 2011

This report was prepared by;

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): A. Benkovic
Report Version: Rev 0
Date: May, 2010

This report was prepared for;

Humfrey Land Developments
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Key Elements	
Flora	<p>A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants.</p> <p>No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian <i>Wildlife Conservation Act 1950</i> or governed by the <i>Environment Protection and Biodiversity Conservation Act 1999</i> were located within the study area.</p> <p>Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>.</p> <p>No other flora species of other conservation significance as stated in <i>Guidance Statement 51</i> (EPA, 2004) were recorded within the study area.</p>
Vegetation	<p>An expert botanist defined and mapped 12 vegetation units across the study area.</p> <p>The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition. The north western extent of the study area contains remnant heath vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition.</p>
Regional Representation Vegetation	<p>The study area is represented by two Beard vegetation associations: 359 - (Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub) and 675 - (Shrublands; <i>Melaleuca</i> and <i>Hakea</i> mixed thicket). Both of these vegetation associations are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010).</p> <p>Within the study area there are 3 plant communities, as mapped by the Geraldton Regional Flora and Vegetation Survey (WAPC, 2010). These plant communities are: 10 Near Coastal: <i>Acacia rostellifera</i> shrubland, 15 Thicket: <i>Melaleuca</i> spp. /mixed spp. and 13 Sandplain: <i>Banksia prionotes</i>/<i>Acacia rostellifera</i>.</p>
Regionally Significant Vegetation	<p>According to <i>Guidance Statement 33</i> (EPA, 2008) and <i>Position Statement 2</i> (EPA, 2000) the study area is considered Regionally Significant because:</p> <ol style="list-style-type: none"> 1. The vegetation associations within the study area have <30% of their present extents remaining within in WA. 2. The study area contains native vegetation remnants in good or better condition. 3. Two Priority Flora species were recorded; Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>. 4. Within the study area boundary lies, in part, the Moresby Range.

TABLE OF CONTENTS	Page
1.0 BACKGROUND.....	6
1.1 Objectives	6
1.2 Previous Investigations	6
2.0 EXISTING INFORMATION	8
2.1 Threatened Flora and Priority Flora	8
2.1.1 State Legislation.....	8
2.1.2 Federal Legislation	10
2.1.3 Other Species of Conservation Significance.....	10
2.2 Vegetation.....	10
2.2.1 Interim Biogeographical Regionalisation of Australia	10
2.2.2 Beard Vegetation Associations	11
2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).....	11
2.3 Conservation Significant Vegetation	12
2.3.1 Threatened Ecological Communities	12
2.3.2 Threshold Levels for Biodiversity Conservation.....	12
2.3.3 Areas of High Conservation Value.....	13
2.3.4 Significant Natural Areas.....	13
3.0 METHODS	14
3.1 Field Survey	14
3.1.1 Vegetation Sampling.....	14
3.2 Vegetation Condition	15
4.0 RESULTS AND DISCUSSION	16
4.1 Flora.....	16
4.1.1 Flora of Conservation Significance	16
4.1.2 Introduced Flora (Weeds).....	18
4.2 Vegetation.....	18
4.2.1 Vegetation Units	18
4.2.2 Vegetation Condition.....	19
4.3 Conservation Significant Vegetation	20

4.3.1	Biodiversity Threshold Levels.....	20
4.3.2	GRFVS Plant Community Representation.....	20
4.3.3	Regionally Significant Natural Areas and Areas of High Conservation Value.....	21
5.0	CONCLUSIONS & RECOMMENDATIONS	23
6.0	LIMITATIONS.....	24
7.0	REFERENCES	25

TABLES (Compiled within the report)

	Page
Table 1: Priority Flora Recorded in 2006 by GHD.....	7
Table 2: Significant Flora Species	9
Table 3: Regional Vegetation Association within Western Australia.....	11
Table 4: Regional Vegetation Association within the GRFVS Area	11
Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010).....	12
Table 6: Vegetation Structure Classes.....	15
Table 7: Vegetation Condition Scale.....	15
Table 8: Criteria for Environmental Weeds Strategy Rating.....	18
Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton	18

PLATES (Compiled within the report)

Plate 1: Mean Monthly Temperatures and Rainfall for Geraldton Airport (1941-2010) (BOM, 2011).....	Error! Bookmark not defined.
Plate 2: P1 <i>Melaleuca huttensis</i>	17
Plate 3: P3 <i>Grevillea triloba</i>	17

FIGURES (Compiled at the end of the report)

- Figure 1: Beard Vegetation Association
- Figure 2: Vegetation Units
- Figure 3: Vegetation Condition

APPENDICES

- Appendix A: Species List
- Appendix B: Vegetation Unit Photos

1.0 BACKGROUND

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the study area') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. In order to facilitate development of the site in accordance with this Concept Plan, the site is proposed be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5.

In accordance with Section 48A of the Environmental Protection (EP) Act (1986), any proposed change to a town planning scheme must be referred to the Environmental Protection Authority (EPA) for consideration.

In order to provide the EPA with the information necessary to properly assess this rezoning application, Coterra Environment have undertaken this Level 1 Flora and Vegetation survey to supplement the Environmental Assessment Report which will form part of the overall amendment application.

1.1 Objectives

This report presents the findings of the Level 1 Flora and Vegetation Survey for Lots 80 & 81 Hackett Road. The survey was carried out in accordance with the EPA's Guidance Statement 51 – *Terrestrial Flora and Vegetation Surveys for Environmental Impact assessment in Western Australia* requirements for a Level 1 Flora and Vegetation Survey (EPA, 2004) and involved the following components:

- Desktop review of the Department of Environment and Conservation (DEC) database search to identify any significant flora species that could potentially exist on site.
- A site visit to detail the vegetation and flora present on site. This involved undertaking selective low level sampling of native vegetation to produce maps of vegetation units and condition across the site.
- A targeted search for any Threatened Flora (TF) or Priority species known from the Geraldton area (as identified in the DEC database search).
- Analysis of the floristic composition of the vegetation for any species of conservation significance. This includes TF, Priority species and any species of other conservation value (EPA, 2004).
- Assessment of the condition and conservation significance of the vegetation using criteria outlined in *Position Statement 2* (EPA, 2000) and *Guidance Statement 33* (EPA, 2008).
- Preparation of a report and relevant maps.

1.2 Previous Investigations

A Priority Flora survey of the study area was conducted previously in 2006 by GHD (GHD, 2007). This survey only concentrated on locating DEC listed Priority Flora and therefore did not meet the requirements of a full flora survey. In addition the study did

not include the escarpment, plateau or bushland area in the north, as these portions of the site were proposed to be set aside as open spaces.

In this GHD survey, three Priority Flora species were recorded within the study area. These species and the number of plants recorded are listed in Table 1.

Table 1: Priority Flora Recorded in 2006 by GHD

Species	Conservation Code	Number of Plants Recorded
<i>Geleznovia verrucosa</i> subsp. <i>formosa</i> #	P3	1
<i>Grevillea triloba</i>	P3	>100
<i>Melaleuca huttensis</i>	P1	1

This taxon name is no longer current; it is a taxonomic synonym of *Geleznovia verrucosa*, which is not a Priority Flora species

The priority flora report completed by GHD (2007) is attached to the EAR, prepared as part of the overall scheme amendment submission.

2.0 EXISTING INFORMATION

2.1 Threatened Flora and Priority Flora

2.1.1 State Legislation

Threatened Flora (TF) are flora that have been adequately surveyed and are considered to be in danger of extinction, rare or otherwise in need of special protection within Western Australia. TF are protected under the *Wildlife Conservation Act 1950* (as amended).

Additionally in Western Australia there are five categories of Priority Flora, which are not specifically covered under current legislation, but their conservation status warrants some protection and/or further investigation. Three categories of Priority Flora are allocated to species that are poorly known (Priority 1 to 3). These require more information to be assessed for inclusion as TF. The categories are arranged to give an indication of the priority for undertaking further surveys based on the number of known sites, and the degree of threat to those populations. A fourth category of priority (Priority 4) is included for those species that have been adequately surveyed and are considered to be rare but not currently threatened. Priority 5 species are those that are also not threatened but are subject to a specific conservation program

The Department of Environment and Conservation's (DEC) databases for Threatened Flora, the Western Australian Herbarium (WAH) Specimen and Threatened Flora were searched for known records within the vicinity of the study area. There were twelve conservation significant species recorded, three of which are TF. The list of significant flora is provided in **Table 2** below.

Table 2: Significant Flora Species

Species	Conservation Code ¹
<i>Drummondita ericoides</i>	T - EN
<i>Eucalyptus cuprea</i>	T - EN
<i>Melaleuca huttensis</i>	P1
<i>Vittadinia cervicularis</i> var. <i>occidentalis</i>	P1
<i>Thryptomene</i> sp. Moresby Range	P3
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3
<i>Grevillea triloba</i>	P3
<i>Thryptomene stenophylla</i>	P2
<i>Acacia guinetii</i>	P4
<i>Eucalyptus blaxellii</i>	P4
<i>Verticordia penicillaris</i>	P4

¹ T: Threatened Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. Threatened Flora are further ranked by the Department according to their level of threat using IUCN Red List criteria:

CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
 EN: Endangered – considered to be facing a very high risk of extinction in the wild
 VU: Vulnerable – considered to be facing a high risk of extinction in the wild.

P1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

P4: Priority Four – Rare, Near Threatened and other species in need of monitoring

Rare Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection

Near Threatened Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent

Other Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

P5: Priority Five – Conservation Dependant Species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

2.1.2 Federal Legislation

Some flora species have additional protection under the *Environment Protection and Biodiversity Conservation Act (EPBC) 1999*. In Western Australia, this predominantly consists of Threatened Flora. Penalties apply for any damage to individuals, populations or habitats of species protected.

2.1.3 Other Species of Conservation Significance

Environmental Protection Authority (EPA) *Guidance Statement 51* (EPA, 2004) lists species other than Threatened Flora and Priority Flora as of conservation significance where a species has:

- A keystone role.
- Relictual status.
- Anomalous features indicating a potential new discovery.
- A representation of a species range (range extensions, extremes or an outlier population).
- Status as a restricted subspecies, variety, or naturally occurring hybrid.
- Poor reservation.
- Status as a local endemic or has a restricted distribution.

This document states that conservation significance includes these criteria, but is not limited to them. It may include flora that are poorly represented in WAH and short range endemic flora (those with a known range less than 200km).

2.2 Vegetation

2.2.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway & Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2, 242, 033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

2.2.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are;

- 675 -Shrublands; mixed thicket (*Melaleuca* and *Hakea*), and;
- 359 -Shrublands; *Acacia* and *Banksia* scrub.

The extent of these two vegetation associations within the study area is illustrated in **Figure 1**.

The vegetation extents within Western Australia of these two 'associations' are presented in **Table 3** (WAPC, 2010).

Table 3: Regional Vegetation Association within Western Australia

Vegetation Association	Pre-Europe Extent (WA)	Current Extent (WA)	% Remaining in WA
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51 850	10 992	21.2
359 Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub	44 493	8 366	18.8

The vegetation extents within the Geraldton Regional Flora and Vegetation Survey area (see section 2.4.3) of these two associations' are presented in **Table 4** (WAPC, 2010).

Table 4: Regional Vegetation Association within the GRFVS Area

Vegetation Association	Pre-Europe Extent (GRFVS)	Current Extent (GRFVS)	% Remaining in GRFVS area
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	3 148	240	7.62
359 Shublands; <i>Acacia</i> and <i>Banksia</i> scrub	17 805	3 077	17.28

2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010)

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed to describe and map the flora and vegetation within the Geraldton area. The report generated from the outcomes of this survey aims to provide information, from a regional context, to aid local scale studies in the assessment of proposals that may affect the native vegetation within the Geraldton region (WAPC, 2010). This survey

has been endorsed by the EPA (2010) as a key source to help minimise the environmental impact of future development in the Geraldton region.

Most of the remnants in the study area are within the GRFVS boundaries. However, no GRFVS quadrats were established within the study area for the GRFVS report. Therefore the plant communities within the study area that have been mapped by the GRFVS were done so at a 90% confidence level (WAPC, 2010).

The GRFVS mapped plant communities for the study area are listed in **Table 5**. The majority of the study area, which consists of cleared pastureland, and in part the Moresby Ranges, falls outside the GRFVS boundary.

Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010)

Beard Vegetation Association	Plant Community	Extent of GRFVS Plant Communities %
359	10 Near Coastal: <i>Acacia rostellifera</i> shrubland	36.63
675	15 Thicket: <i>Melaleuca</i> spp. /mixed spp.	7.61
359	13 Sandplain: <i>Banksia prionotes</i> / <i>Acacia rostellifera</i>	12.23

2.3 Conservation Significant Vegetation

2.3.1 Threatened Ecological Communities

DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database was searched for known occurrences within the vicinity of the study area.

This search relates to TECs listed under the *Wildlife Conservation Act 1950* (as amended). Some TECs have further protection under the *Environmental Protection Biodiversity Conservation (EPBC) Act 1999*. TEC and PEC listings are administered through the DEC Threatened Communities Branch.

No previously known TECs or PECs were identified as occurring within the search area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca megacephala* and *Hakea pycnoneura* thickets on the Moresby Range.

2.3.2 Threshold Levels for Biodiversity Conservation

To highlight the need for biodiversity protection within the agricultural areas of the Wheatbelt/ Geraldton region – due to high clearing practices - the EPA published *Position Statement 2* (EPA, 2000). According to *Position Statement 2*, for the EPA to support clearing within the Wheatbelt/ Geraldton region, alternative mechanisms need to be put in place that address biodiversity protection.

As a result EPA (2000 & 2008) has adopted two criteria that are to be taken into consideration when assessing a clearing application, these are:

- i. *The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type*
- ii. *A level of 10% of the original extent is regarded as being a level representing “endangered”*

Vegetation below the 30% “threshold level” is deemed to be significant (EPA, 2008).

2.3.3 Areas of High Conservation Value

In addition to the above criteria, *Guidance Statement 33* (EPA, 2008) lists areas of high conservation value that require protection in WA, these are:

- State and regional conservation areas
- Areas where clearing would conflict with the native vegetation clearing principles in schedule 5 of the *Environmental Protection Act 1986*
- Threatened Ecological Communities
- Significant flora and fauna
- Wetlands and buffers
- Rivers and foreshores
- Important landscapes and landforms
- Natural areas of heritage significance
- Other natural areas, such as ecological linkages

2.3.4 Significant Natural Areas

To assist proponents in the identification of significant natural areas, *Guidance Statement 33* (EPA, 2008) outlines methodology used by government agencies within the Perth Metropolitan Region (Del Marco *et al.* 2004). This methodology adopts the following criteria:

- Representation of ecological communities
- Diversity
- Rarity
- Maintaining ecological processes or natural systems
- Scientific or evolutionary importance
- Protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

3.0 METHODS

3.1 Field Survey

An expert botanist conducted a Level 1 Flora Survey of the Moresby Heights study area (Figure 1) in April 2011. The survey methodology was based on a Level 1 Flora Survey as outlined in *Guidance Statement 51* (EPA, 2004).

A Level 1 Survey comprises of:

Background Research or Desktop Study

- i. Gather together background information on the target area.

Reconnaissance Survey

- i. Verify accuracy of the Desktop Study.
- ii. Delineate and characterise the flora and range of vegetation units present in the target area.
- iii. Identify potential impacts

This involves selective, low intensity sampling of flora and vegetation to produce maps of vegetation units and vegetation condition at an appropriate scale. Searches for significant flora (**Table 2**) were also performed within the study area.

A species list was compiled using the latest nomenclature and taxonomic references (*Florabase*, 2011 and Smith, 2010).

3.1.1 Vegetation Sampling

Mapping of each vegetation unit was completed using aerial photographs and on site surveying. Each vegetation unit was defined by the dominant plant species (>2% cover) throughout its extent, using the vegetation structure classes of the WAPC (2000) (**Table 6**).

Table 6: Vegetation Structure Classes

Life Form/ Height Class	Canopy Cover (percentage)			
	100% - 70%	70% - 30%	30% - 10%	10% - 2%
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees <10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Scrub Mallee
Shrubs >2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs <1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

(WAPC, 2000)

3.2 Vegetation Condition

The site was traversed by foot and vehicle to assess the vegetation condition. The Vegetation Condition Scale (Keighery, 1994) recommended in *Bush Forever* (WAPC, 2000) (Table 7) was used to classify the vegetation condition of the study area.

Table 7: Vegetation Condition Scale

Condition	Definition
Pristine	No obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species; weeds are non-aggressive species.
Very Good	Vegetation structure altered; obvious signs of disturbance.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance; basic vegetation structure or ability to regenerate is retained.
Degraded	Basic vegetation structure severely impacted by disturbance; scope for regeneration but not to a state approaching good (sic) condition without intensive management.
Completely Degraded	Vegetation structure not intact; the area completely or almost completely without native species ('parkland cleared').

(WAPC, 2000)

4.0 RESULTS AND DISCUSSION

4.1 Flora

A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants. A list of species recorded within the study area is presented in **Appendix A**.

There were a number of taxa that could not be positively identified due to inadequate fruiting or flowering material available at the time of the survey. These are labeled throughout this document with a '?'.

4.1.1 Flora of Conservation Significance

No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian *Wildlife Conservation Act 1950* or governed by the *Environment Protection and Biodiversity Conservation Act 1999* were located within the study area.

Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) *Melaleuca huttensis* (**Plate 1**) and Priority 3 (P3) *Grevillea triloba* (**Plate 2**). One individual *Melaleuca huttensis* was recorded within vegetation unit ArAt (**Section 4.2.1**) (**Figure 2**). *Grevillea triloba* was recorded in large numbers (>100) within vegetation units ArAt and EInF (**Section 4.2.1**) (**Figure 2**).

Both Priority Flora species located in this survey (current report) were also recorded in the previous survey of the study area by GHD (2007). GHD also recorded *Geleznovia verrucosa* subsp. *formosa*, which was a P3 species at the time of that survey. This species has since been identified as a taxonomic synonym of *Geleznovia verrucosa* and is no longer a Priority Flora species.



Plate 1: P1 *Melaleuca huttensis*



Plate 2: P3 *Grevillea triloba*

No other flora species of other conservation significance as stated in *Guidance Statement 51* (EPA, 2004) were recorded within the study area.

4.1.2 Introduced Flora (Weeds)

Thirteen introduced flora (weeds and landscaping plants) were recorded from the survey site, representing 16% of the total flora recorded.

The Environmental Weeds Strategy for WA (EWSWA) (CALM, 1999) rated all the weeds known for Western Australia at the time of publication, according to invasiveness, distribution and environmental impact (**Table 8**). Weeds were classified into four categories; High, Moderate, Mild and Low. High rated species are those that all three criteria apply to (**Table 8**) and Moderate to which two criteria apply. The High and Moderate category weeds recorded in the survey area that should be prioritised for control or eradication are listed in **Table 9**.

Table 8: Criteria for Environmental Weeds Strategy Rating

Criteria	Description
Invasiveness	Ability to invade bushland in good to excellent condition or ability to invade waterways.
Distribution	Wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world.
Environmental Impacts	Ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton

Weed	Rating	Weed	Rating
* <i>Brassica tournefortii</i>	High	* <i>Lycium ferocissimum</i>	High
* <i>Bromus diandrus</i>	High	* <i>Avena barbata</i>	Moderate
* <i>Ehrharta calycina</i>	High	* <i>Briza maxima</i>	Moderate
* <i>Lupinus cosentinii</i>	High	* <i>Ursinia anthemoides</i>	Moderate

4.2 Vegetation

4.2.1 Vegetation Units

An expert botanist defined and mapped 12 vegetation units across the study area, as shown in **Figure 3**. Photographs of some vegetation units and the general study area can be found in **Appendix B**. Descriptions of the vegetation units for the study area are as follows:

1. **EPw** - *Eucalyptus loxophleba*, *E. camaldulensis*, **E.utilis* and *E. sp?* Low Open Woodland over pasture weeds

2. **AAH** - *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladus asper*, **Avena barbata* and Poaceae sp.? Open Herbland/Grassland.
3. **AtMc** - *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland
4. **MrAr** - *Melaleuca raphiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostellifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and Poaceae sp.? Grassland.
5. **EIAr** - Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland
6. **AsAr** - Scattered *Acacia scirpifolia* and *A. rostellifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds
7. **ArAt** - *Acacia rostellifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmocladus asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
8. **EINF** - Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, *?Austrostipa* sp. and *Desmocladus asper* Herbland/ Grassland.
9. **ArAc** - Scattered *Acacia rostellifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland
10. **Hp** - *Hakea preissii* Tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face
11. **Di** - *Dodonaea inaequifolia* Closed Tall Scrub over Poaceae sp.
12. **CP** - Scattered *Eucalyptus loxophleba*, *Acacia rostellifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland

4.2.2 Vegetation Condition

The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition (Figure 3). The north western extent of the study area contains remnant heath

vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition. Within close proximity to this are small patches of 'Very Good' and 'Very Good' - 'Good' vegetation. The remainder of the study area has been affected - to varying degrees from grazing, clearing and weeds. Small patches of remnant vegetation exist within the cleared pasturelands, however weeds dominate most of these areas.

4.3 Conservation Significant Vegetation

4.3.1 Biodiversity Threshold Levels

Beard Vegetation Association Extent for WA and the GRFVS Area

Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010) (Table 3). In WA these two vegetation types have been cleared below the threshold at which species loss appears to accelerate exponentially at the ecosystem level (EPA, 2000 & 2008).

Within the GRFVS area Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have 17.28% and 7.62% respectively remaining (Table 4). Even though the 'threshold extents apply to vegetation associations at state level, it is still important to consider the representation of these two vegetation associations within the GRFVS area in terms of local biodiversity.

It should be noted that these statistics do not take into account remnant size or vegetation condition of the areas represented by these vegetation associations. The majority of the study area has been historically cleared, and small remnants of vegetation within cleared pastureland are generally what is remaining. These remnants are continuing to degrade due to grazing and weed invasion, with the exception of the remnant vegetation represented by vegetation unit E1Nf in the north western corner of the site, rated as being in 'Excellent' condition (Figures 2 & 3).

4.3.2 GRFVS Plant Community Representation

To effectively assess the regional representation of vegetation within the study area and compare it to the dataset of the GRFVS, a 10m x 10m plot based survey followed by a quantitative statistical analysis would need to be done; this would involve a detailed Level 2 Flora and Vegetation survey in accordance with the EPA's Guidance Statement 51 (EPA, 2004). As outlined above in section 2.2.3, no GRFVS plots were established within the study area. The plant communities outlined below for the study area were mapped by the GRFVS at a confidence level of 90% (WAPC, 2010).

Plant Community 10 Near Coastal: *Acacia rostellifera* shrubland

This plant community is represented by vegetation units AAH, E1Ar and AtMc within the study area. The vegetation condition for these units ranged from 'Good' to 'Degraded' (Figure 3). Plant community 10 is thought to have previously included *Banksia prionotes*, but due to disturbance from clearing, grazing, fire and weed invasion it has been reduced to a community dominated by *Acacia rostellifera*.

This community occupies 36.63% of the native vegetation of the GRFVS area (Table 5), and is the most widespread of the plant communities

Plant Community 15 Thicket: *Melaleuca* spp / mixed spp.

This plant community is represented by vegetation units AAH, ElAr, MrAr, and EInF. The vegetation condition for these units ranged from 'Excellent' to 'Degraded' (Figure 3). This community is dominated by *Melaleuca* spp. and is most accurately portrayed in the study area by vegetation unit EInF.

Significant numbers of Threatened and Priority Flora species were recorded in this plant community by the GRFVS. Five out of eight plant community 15 quadrats surveyed by GRFVS contained flora species of conservation significance. This survey (current report) recorded Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 7.61% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area.

Plant Community 13 Sandplain: *Banksia prionotes/ Acacia rostellifera*

This plant community is only represented within the study area by vegetation unit ArAt; the condition of this unit was assessed as 'Good'. Species characteristic of this community include *Grevillea candelabroides*, *Melaleuca depressa*, *Hibbertia* spp., *Conostylis* spp., sedges and rushes. This survey (current report) recorded Priority Flora 1 (P1) *Melaleuca huttensis* and Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 12.23% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area. The GRFVS (WAPC, 2010) has stated that this community within Beard Association 359 has conservation significance because of the reduced numbers of *Banksia prionotes* due factors such as; fire, *Phytophthora* and grazing. As a result, large areas of this community no longer have this characteristic species present.

4.3.3 Regionally Significant Natural Areas and Areas of High Conservation Value

According to the EPA's *Position Statement 2* (2000) and *Guidance Statement 33* (2008) the study area is a Regionally and Locally Significant Natural Area for the following reasons:

Representation of ecological communities – Beard vegetation association 359 – (Shrublands; *Acacia* and *Banksia* scrub) and 675 – (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have < 30% of their pre-European extents remaining in WA

Diversity – The study area contains natural areas in good or better condition; namely vegetation unit EInF (Figures 2 & 3).

Significant Flora/ Rarity – Two Priority Flora species were recorded with the study area. These species were Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba*. One individual *Melaleuca huttensis* was recorded, whilst *Grevillea triloba* was recorded in densities of 5% and 20% (Figure 3).

Important landscapes and landforms/ Maintaining ecological processes or natural systems and Ecological Linkages - The Moresby Range follows the boundary of the eastern extent of the study area. The Moresby range is an important landscape that is part of a natural system and provides an ecological linkage throughout its extent.

The Moresby Range escarpment within the study area was not covered by the GRFVS (WAPC, 2010), so no plant community was assigned. However, plant assemblages of the Moresby Range system are considered to be synonymous with Beard vegetation association 675 (WAPC, 2010).

5.0 CONCLUSIONS & RECOMMENDATIONS

According to *Guidance Statement 33* (EPA, 2008) and *Position Statement 2* (EPA, 2000) the study area is considered Regionally Significant because:

5. The vegetation associations within the study area have <30% of their present extents remaining within in WA (**Table 3**)
6. The study area contains native vegetation remnants in good or better condition
7. Two Priority Flora species were recorded; Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba* (**Figure 3**)
8. Within the study area boundary lies, in part, the Moresby Range

To assess the proposed development of the study area, in reference to points 1 and 4, some details should be noted:

- The majority of the study area has been historically cleared and is in Completely Degraded condition (**Figure 3**)
- The Moresby Range escarpment of the study area will not be affected by the proposed development, as this area is to be set-aside as an open space.

With regards points 2 and 3 - vegetation in good or better condition, and Priority Flora – the following should be addressed:

- Within vegetation unit ArAt, P1 *Melaleuca huttensis* and P3 *Grevillea triloba* were recorded. This remnant was in Good condition but is small in size (<1ha). It is currently not fenced off from livestock, so without proper management the area will become further degraded. Due to the occurrence of P1 and P3 flora in this portion of remnant vegetation, it is recommended the area be conserved and fenced off from livestock.
- Vegetation unit EInF was in Excellent condition and is just over 10ha in size, with P3 *Grevillea triloba* recorded within this vegetation unit. Under *Guidance Statement 51* (EPA, 2004) the impact of clearing this vegetation would be considered high to moderate, as a result, a Level 2 Flora and Vegetation Survey of vegetation unit EInF would be required. Alternatively, in keeping with *Position Statement 2* (EPA, 2000) and its requirement for alternative mechanisms that address biodiversity protection, it is recommended that this remnant be retained and managed as a conservation area.

6.0 LIMITATIONS

As with any biological survey, additional flora species including potential threatened, priority or other conservation significant species may be detected in subsequent surveys. For example, ephemeral species such as orchids are not always present in each year/season or at the particular time a single botanical survey is conducted. This is a common limitation to all botanical surveys.

Approximately 10% of Western Australian flora species are undescribed, with new species found regularly. The flora identifications for this project were completed in line with the taxonomic resources and expertise available at the time.

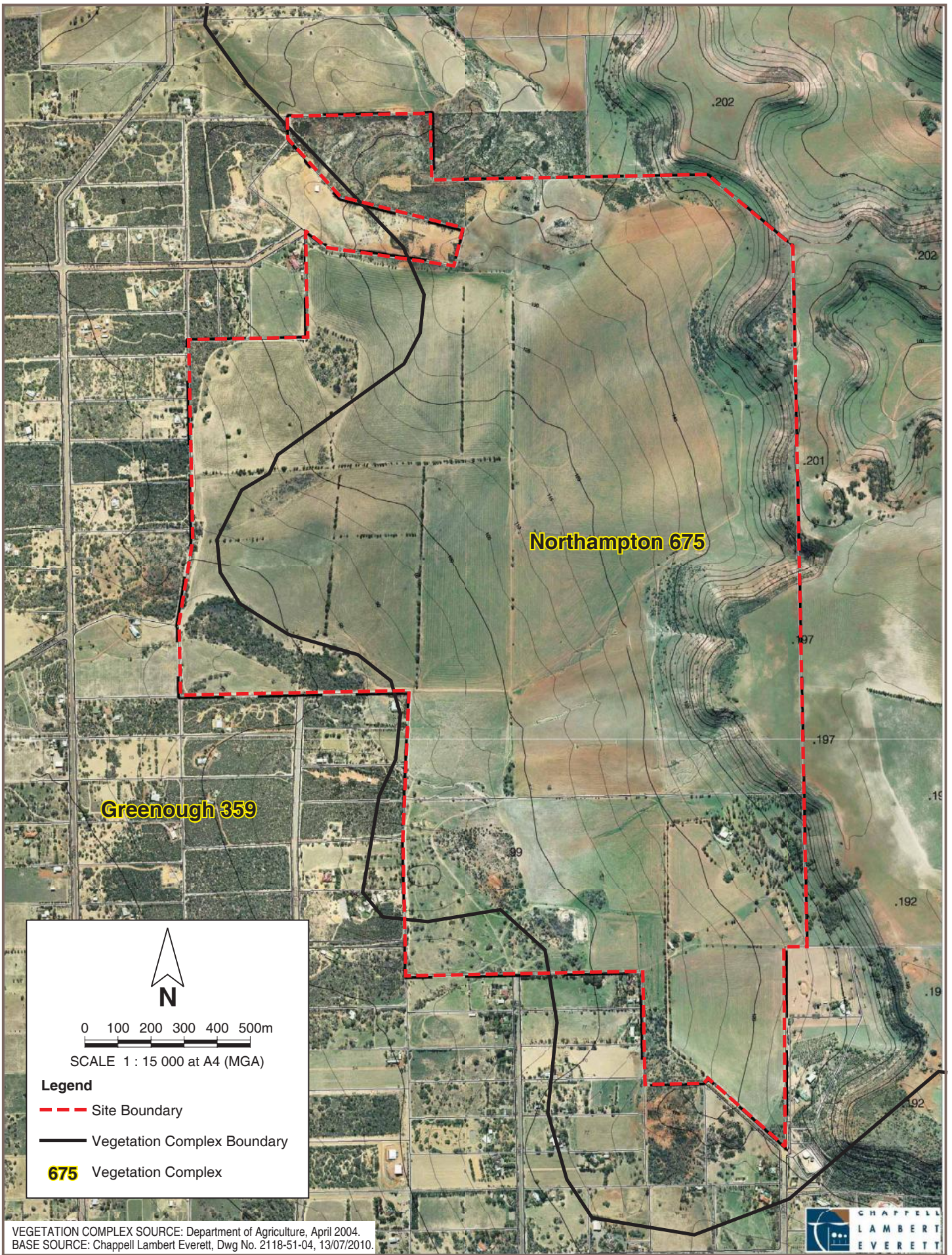
Conservation significant plant communities on site can not be positively confirmed without conducting a plot based survey.

7.0 REFERENCES

- Beard, J (1976), *Vegetation of the Geraldton Area*
- BOM (2011) *Climatic Statistics for Australian Locations*.
http://www.bom.gov.au/climate/averages/tables/cw_008051.shtml Accessed Online, May 2011
- CALM (1999), *Environmental Weed Strategy for Western Australia* Includes weedBase – a digital weed database, Department of Conservation and Land Management, Perth.
- Del Marco, A., Taylor, R., Clarke, K., Savage, K., Cullity, J. and Miles, C. (2004). *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*. Perth Biodiversity Project, Western Australian Local Government Association. West Perth.
- Desmond, A. & Chant, A. (2001) *Geraldton Sandplains 2 (GS2 - Geraldton Hills subregion)*. Department of Environment and Conservation
- Environment Australia. (2000). *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and development of Version 5.1 – Summary Report*. Environment Australia, Canberra
- EPA (2000), *Position Statement No. 2 - Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation with Particular Reference to the Agricultural Area*, Environmental Protection Authority, Perth.
- EPA (2004), *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) No 51 - Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, Environmental Protection Authority, Perth.
- EPA (2008), *Guidance Statement No. 33 - Environmental Guidance for Planning and Development*, Environmental Protection Authority, Western Australia.
- EPA (2010) *Environmental Protection Bulletin No. 10 Geraldton Regional Flora and Vegetation Survey*, Environmental Protection Authority, Western Australia
- Florabase® (2011). Department of Environment, Western Australian Herbarium <http://florabase.calm.wa.gov.au/>. Accessed Online, May 2011.
- GHD (2007) *Lots 80 & 81 Hackett Road, Waggrakine*. Unpublished report.
- Keighery, B (1994), *Bushland Plant Survey – A Guide to Plant Community Survey for the Community*, Wildflower Society of WA (Inc.), Nedlands, Western Australia.
- Noel Schoknecht, N, Tille, P and Purdie, B. (2004) *Soil-landscape mapping in south-western Australia: An overview of methodology and outputs*. Department of Agriculture.
- Smith, M.G. (2010). *Declared Rare and Priority Flora List for Western Australia, 16 September 2010*. Dept of Environment and Conservation. Como, W.A.

- Stuart-Street, A. & Clarke, M. (2005) *Greenough Region Catchment Appraisal*.
Department of Agriculture
- Thackway, R and Cresswell, I (eds.) (1995), *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0*, Australian Nature Conservation Agency, Canberra.
- WAPC (2010) *Geraldton Regional Flora and Vegetation Survey*. Western Australian Planning Commission, Perth.
- WAPC. (2000). *Bush Forever: Volume 2 Directory of Bush Forever Sites*, Perth.

FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-veg-f01.dgn

VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



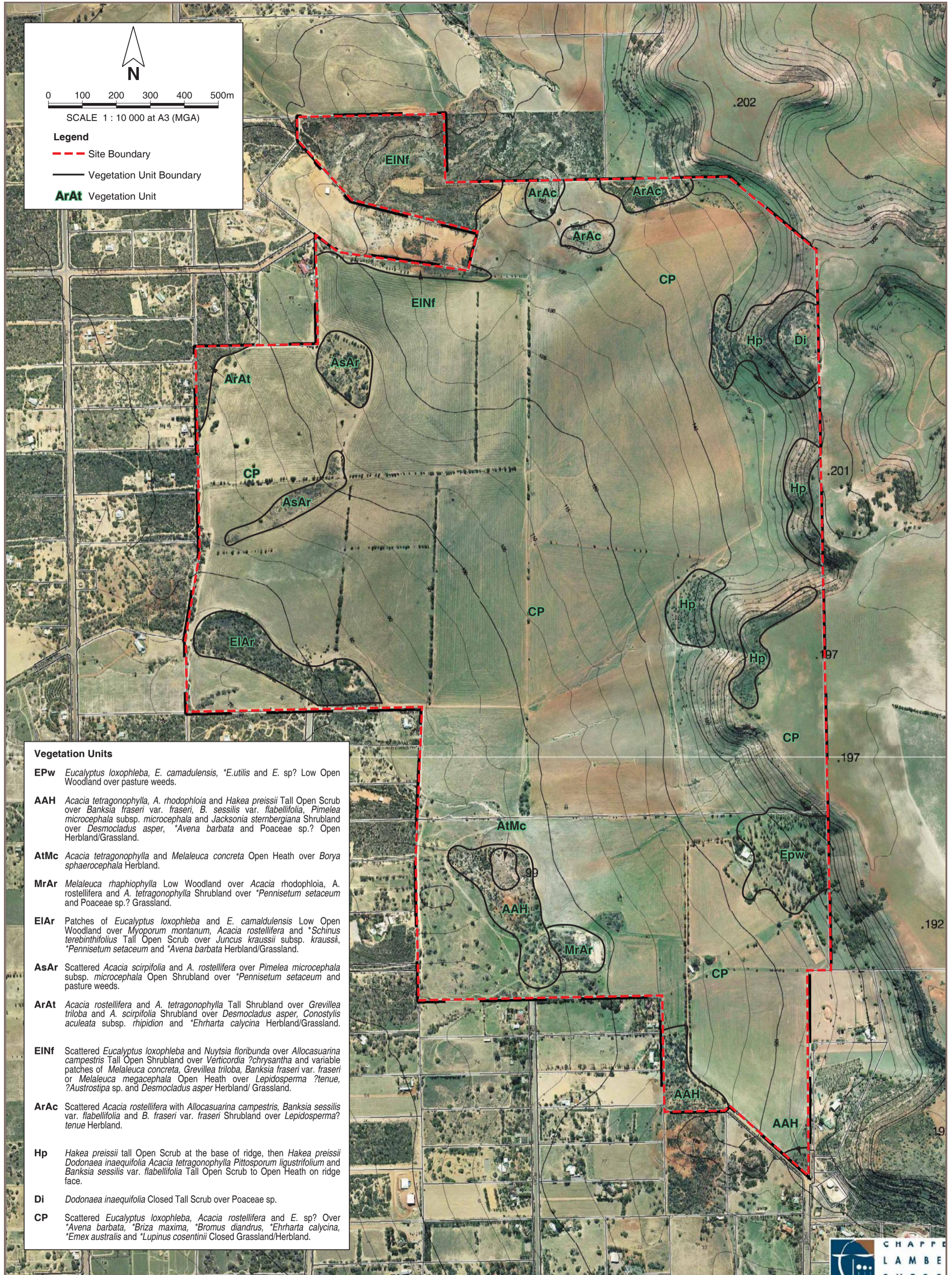
COTERRA
 ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers	Date: 19 May 2011
Job: HUMMOR01	Revision: A

BEARD VEGETATION ASSOCIATIONS

Figure 1



Vegetation Units

EPw	<i>Eucalyptus loxophleba</i> , <i>E. camadulensis</i> , * <i>E. utilis</i> and <i>E. sp?</i> Low Open Woodland over pasture weeds.
AAH	<i>Acacia tetragonophylla</i> , <i>A. rhodophloia</i> and <i>Hakea preissii</i> Tall Open Scrub over <i>Banksia fraseri</i> var. <i>fraseri</i> , <i>B. sessilis</i> var. <i>flabellifolia</i> , <i>Pimelea microcephala</i> subsp. <i>microcephala</i> and <i>Jacksonia sternbergiana</i> Shrubland over <i>Desmocladius asper</i> , * <i>Avena barbata</i> and <i>Poaceae sp?</i> Open Herbland/Grassland.
AtMc	<i>Acacia tetragonophylla</i> and <i>Melaleuca concreta</i> Open Heath over <i>Borya sphaerocephala</i> Herbland.
MrAr	<i>Melaleuca rhapsiophylla</i> Low Woodland over <i>Acacia rhodophloia</i> , <i>A. rostellifera</i> and <i>A. tetragonophylla</i> Shrubland over * <i>Pennisetum setaceum</i> and <i>Poaceae sp?</i> Grassland.
EIAr	Patches of <i>Eucalyptus loxophleba</i> and <i>E. camadulensis</i> Low Open Woodland over <i>Myoporum montanum</i> , <i>Acacia rostellifera</i> and * <i>Schinus terebinthifolius</i> Tall Open Scrub over <i>Juncus kraussii</i> subsp. <i>kraussii</i> , * <i>Pennisetum setaceum</i> and * <i>Avena barbata</i> Herbland/Grassland.
AsAr	Scattered <i>Acacia scirpifolia</i> and <i>A. rostellifera</i> over <i>Pimelea microcephala</i> subsp. <i>microcephala</i> Open Shrubland over * <i>Pennisetum setaceum</i> and pasture weeds.
ArAt	<i>Acacia rostellifera</i> and <i>A. tetragonophylla</i> Tall Shrubland over <i>Grevillea triloba</i> and <i>A. scirpifolia</i> Shrubland over <i>Desmocladius asper</i> , <i>Conostylis aculeata</i> subsp. <i>rhipidion</i> and * <i>Ehrharta calycina</i> Herbland/Grassland.
EINf	Scattered <i>Eucalyptus loxophleba</i> and <i>Nuytsia floribunda</i> over <i>Allocasuarina campestris</i> Tall Open Shrubland over <i>Verticordia ?chrysantha</i> and variable patches of <i>Melaleuca concreta</i> , <i>Grevillea triloba</i> , <i>Banksia fraseri</i> var. <i>fraseri</i> or <i>Melaleuca megacephala</i> Open Heath over <i>Lepidosperma ?tenua</i> , * <i>Austrostipa sp.</i> and <i>Desmocladius asper</i> Herbland/ Grassland.
ArAc	Scattered <i>Acacia rostellifera</i> with <i>Allocasuarina campestris</i> , <i>Banksia sessilis</i> var. <i>flabellifolia</i> and <i>B. fraseri</i> var. <i>fraseri</i> Shrubland over <i>Lepidosperma? tenue</i> Herbland.
Hp	<i>Hakea preissii</i> tall Open Scrub at the base of ridge, then <i>Hakea preissii Dodonaea inaequifolia</i> <i>Acacia tetragonophylla</i> <i>Pittosporum ligustrifolium</i> and <i>Banksia sessilis</i> var. <i>flabellifolia</i> Tall Open Scrub to Open Heath on ridge face.
Di	<i>Dodonaea inaequifolia</i> Closed Tall Scrub over <i>Poaceae sp.</i>
CP	Scattered <i>Eucalyptus loxophleba</i> , <i>Acacia rostellifera</i> and <i>E. sp?</i> Over * <i>Avena barbata</i> , * <i>Briza maxima</i> , * <i>Bromus diandrus</i> , * <i>Ehrharta calycina</i> , * <i>Emex australis</i> and * <i>Lupinus cosentinii</i> Closed Grassland/Herbland.



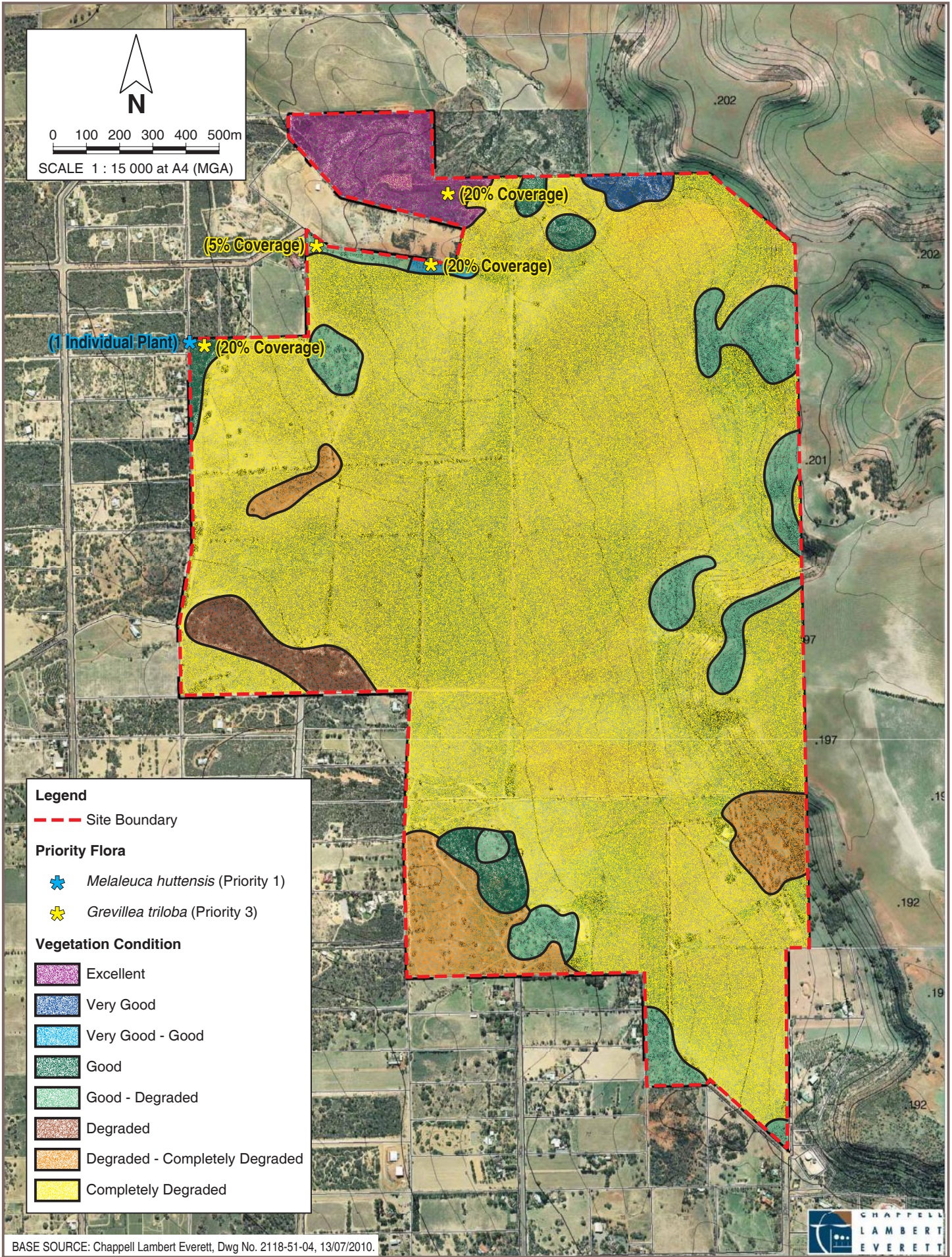
COTERRA ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers Date: 19 May 2011
 Job: HUMMOR01 Revision: A

VEGETATION UNITS

Figure 2



0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend

--- Site Boundary

Priority Flora

- Melaleuca huttensis* (Priority 1)
- Grevillea triloba* (Priority 3)

Vegetation Condition

- Excellent
- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



HUMMOR01-veg-f03.dgn
 PINPOINT CARTOGRAPHICS (08) 9562 7136

COTERRA ENVIRONMENT

Drawn: L. Rogers Date: 19 May 2011

Job: HUMMOR01 Revision: A

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA

Figure 3

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Flora Species List

APPENDIX A: Species List

* denotes weed species

P1 or P3 denotes Priority Flora 1 or 3

*p denotes planted WA species

Family	Species
ANACARDIACEAE	* <i>Schinus terebinthifolius</i>
ASPARAGACEAE	<i>Acanthocarpus preissii</i>
ASTERACEAE	* <i>Ursinia anthemoides</i>
BORYACEAE	<i>Borya sphaerocephala</i>
BRASSICACEAE	* <i>Brassica tournefortii</i>
CASUARINACEAE	<i>Allocasuarina campestris</i>
CHENOPODIACEAE	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i> <i>Rhagodia preissii</i> subsp. <i>obovata</i>
COLCHICACEAE	<i>Burchardia congesta</i>
CUCURBITACEAE	* <i>Citrullus lanatus</i>
CYPERACEAE	<i>Lepidosperma ? tenue</i> <i>Lepidosperma</i> sp.? <i>Mesomelaena pseudostygia</i>
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>
ERICACEAE	<i>Astroloma serratifolium</i>
FABACEAE	<i>Acacia daphnifolia</i> <i>Acacia oxyclada</i> <i>Acacia rhodophloia</i> <i>Acacia rostelifera</i> <i>Acacia saligna</i> subsp. <i>lindleyi</i> <i>Acacia scirpifolia</i> <i>Acacia tetragonophylla</i> <i>Daviesia divaricata</i> subsp. <i>lanulosa</i> <i>Gastrolobium triangulare</i> <i>Jacksonia sternbergiana</i> * <i>Lupinus cosentinii</i>

Family	Species
GOODENIACEAE	<i>Lechenaultia linarioides</i>
HAEMODORACEAE	<i>Conostylis aculeata</i> subsp. <i>hipidion</i>
HEMEROCALLIDACEAE	<i>Corynotheca micrantha</i> var. <i>micrantha</i> <i>Dianella revoluta</i> var. <i>divaricata</i> <i>Tricoryne elatior</i>
JUNCACEAE	<i>Juncus kraussii</i>
LAURACEAE	<i>Cassytha aurea</i>
LORANTHACEAE	<i>Amyema preissii</i> <i>Nuytsia floribunda</i>
MYRTACEAE	<i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> <i>Eucalyptus camaldulensis</i> var. <i>obtusata</i> <i>Eucalyptus loxophleba</i> <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i> *p <i>Eucalyptus utilis</i> <i>Eucalyptus</i> sp.? <i>Melaleuca concreta</i> P1 <i>Melaleuca huttensis</i> <i>Melaleuca megacephala</i> <i>Melaleuca raphiophylla</i> <i>?Thryptomene</i> sp. <i>Verticordia ?chrysantha</i>
PITTOSPORACEAE	<i>Pittosporum ligustrifolium</i> Pittosporaceae sp.?
POACEAE	<i>Amphipogon caricinus</i> <i>Austrodanthonia</i> sp. <i>?Austrostipa</i> sp. * <i>Avena barbata</i> * <i>Briza maxima</i> * <i>Bromus diandrus</i> * <i>Ehrharta calycina</i> * <i>Pennisetum setaceum</i> Poaceae sp.
POLYGONACEAE	* <i>Emex australis</i>

Family	Species
PROTEACEAE	<i>Banksia fraseri</i> var. <i>fraseri</i> <i>Banksia prionotes</i> <i>Banksia sessilis</i> var. <i>flabellifolia</i> <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> <i>Grevillea candelabroides</i>
	P3 <i>Grevillea triloba</i> <i>Hakea preissii</i> <i>Petrophile conifera</i>
RESTIONACEAE	<i>Desmocladus asper</i> <i>Lepidobolus preissianus</i>
SANTALACEAE	<i>Santalum acuminatum</i>
SAPINDACEAE	<i>Dodonaea inaequifolia</i>
SCROPHULARIACEAE	<i>Myoporum montanum</i>
SOLANACEAE	* <i>Lycium ferocissimum</i>
THYMELAEACEAE	<i>Pimelea microcephala</i> subsp. <i>microcephala</i>
VITACEAE	<i>Clematicissus angustissima</i>

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Vegetation Unit Photos

APPENDIX B – Vegetation Unit Photographs



Plate 1: AAH – Good to Degraded Condition



Plate 2: EIAr – Degraded Condition



Plate 3: ArAt – Good Condition



Plate 4: ArAc – Very Good Condition



Plate 5: EINF - Excellent Condition



Plate 6: EINF - Excellent Condition



Plate 7: Epw - Degraded to Completely Degraded Condition



Plate 8: Hp - Good to Degraded Condition

**APPENDIX C - DEC Threatened Flora and Fauna Database Search
Results (Naturemaps, 2011)**

NatureMap Species Report

Created By Guest user on 06/05/2011

Method 'By Circle'

Centre 114°39' 20" E,28°41' 30" S

Buffer 40km

Group By Kingdom

Kingdom	Species	Records
Animalia	597	8627
Chromista	18	33
Fungi	77	114
Plantae	1482	7231
TOTAL	2174	16005

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Animalia				
1.	<i>Ablabesmyia notabilis</i>			
2.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
3.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill (Inland Thornbill))			
4.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
5.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
6.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
7.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
8.	24282 <i>Accipiter fasciatus</i> subsp. <i>fasciatus</i>			
9.	<i>Acercella falcipes</i>			
10.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
11.	-1576 <i>Actitis hypoleucos</i>			
12.	<i>Aedes</i> sp.			
13.	25544 <i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
14.	<i>Agrotocorixa eurynome</i>			
15.	<i>Agrotocorixa parvipunctata</i>			
16.	<i>Ainudrilus</i> sp.			Y
17.	<i>Allodessus bistrigatus</i>			
18.	<i>Alona rigidicaudis</i> s.l.			
19.	<i>Alona</i> sp. nov. d (<i>Wicherina</i>)			Y
20.	30833 <i>Amphibolurus longirostris</i>			
21.	24310 <i>Anas castanea</i> (Chestnut Teal)			
22.	24312 <i>Anas gracilis</i> (Grey Teal)			
23.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
24.	25550 <i>Anas rhynchotis</i> subsp. <i>rhynchotis</i>			
25.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
26.	24332 <i>Anhinga melanogaster</i> subsp. <i>novaehollandiae</i>			
27.	-1591 <i>Anhinga novaehollandiae</i>			
28.	<i>Anisops hyperion</i>			
29.	<i>Anisops thienemanni</i>			
30.	25634 <i>Anous stolidus</i> (Common Noddy)			
31.	25635 <i>Anous tenuirostris</i> (Lesser Noddy)			
32.	25241 <i>Antaresia stimsoni</i> subsp. <i>stimsoni</i>			
33.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
34.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
35.	25670 <i>Anthus australis</i> (Australian Pipit)			
36.	-1612 <i>Anthus novaeseelandiae</i>			
37.	<i>Antiporus</i> sp.			
38.	25528 <i>Aphelocephala leucopsis</i> (Southern Whiteface)			
39.	24266 <i>Aphelocephala leucopsis</i> subsp. <i>castaneiventris</i>			
40.	24991 <i>Aprasia repens</i>			
41.	25743 <i>Aptenodytes patagonicus</i> (King Penguin)			
42.	25554 <i>Apus pacificus</i> (Fork-tailed Swift)			
43.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
44.	25538 <i>Aquila morphnoides</i> (Little Eagle)			
45.	25558 <i>Ardea ibis</i> (Cattle Egret)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
46.	-1578 <i>Ardea modesta</i>			
47.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
48.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
49.	-1583 <i>Ardenna carneipes</i>			
50.	-1571 <i>Ardenna pacifica</i>			
51.	24610 <i>Ardeotis australis</i> (Australian Bustard)		P4	
52.	25736 <i>Arenaria interpres</i> (Ruddy Turnstone)			
53.	<i>Arrenurus balladoniensis</i>			
54.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
55.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
56.	<i>Arteria sp. 1</i>			
57.	25236 <i>Aspidites ramsayi</i> (Woma)		S	
58.	<i>Asteron-complex sp. 2</i>			
59.	<i>Atractocerus kreuslerae</i>			
60.	<i>Aulonogyrus strigosus</i>			
61.	<i>Australocyclops australis</i>			
62.	<i>Australutica quaerens</i>			
63.	<i>Austrochiltonia subtenuis</i>			
64.	<i>Austrolestes aridus</i>			
65.	<i>Austrotrombella sp. nov.</i>			
66.	24318 <i>Aythya australis</i> (Hardhead)			
67.	-1633 <i>Barnardius zonarius</i>			
68.	<i>Bennelongia australis</i>			
69.	<i>Berosus approximans</i>			
70.	<i>Berosus australiae</i>			
71.	<i>Bezzia sp. 1</i>			
72.	<i>Bezzia sp. 2</i>			
73.	24319 <i>Biziura lobata</i> (Musk Duck)			
74.	<i>Boeckella triarticulata</i>			
75.	24251 <i>Bos taurus</i> (European Cattle)	Y		
76.	<i>Bostrychopsis jesuita</i>			
77.	34059 <i>Bothriembryon whiteleyi</i>		X	Y
78.	25245 <i>Brachyurophis semifasciata</i>			
79.	24723 <i>Cacatua pastinator</i> subsp. <i>butleri</i> (Butler's Corella)			
80.	24725 <i>Cacatua roseicapilla</i> subsp. <i>assimilis</i>			
81.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
82.	-1686 <i>Cacatua sp.</i>			
83.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
84.	-1590 <i>Cacomantis pallidus</i>			
85.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)			
86.	24780 <i>Calidris alba</i> (Sanderling)			
87.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)			
88.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)			
89.	24790 <i>Calidris tenuirostris</i> (Great Knot)			
90.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
91.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)		T	
92.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)		T	
93.	<i>Candonocypris sp. 682</i> (? <i>novaezelandiae</i>)			
94.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
95.	24507 <i>Catharacta antarctica</i> subsp. <i>lonnbergi</i>			
96.	<i>Cavasteron sp. 1</i>			
97.	<i>Cephrenes augiades</i> subsp. <i>sperthias</i>			
98.	<i>Cercophonius sp.</i>			
99.	<i>Ceriodaphnia sp. nov. d</i> (Berner sp.#5)			
100.	24564 <i>Certhionyx variegatus</i> (Pied Honeyeater)			
101.	<i>Chaetogaster diastrophus</i>			
102.	-1624 <i>Chalcites basalis</i>			
103.	-1581 <i>Chalcites lucidus</i>			
104.	-1615 <i>Chalcites osculans</i>			
105.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
106.	-1634 <i>Charadrius australis</i>			
107.	25573 <i>Charadrius bicinctus</i> (Double-banded Plover)			
108.	25574 <i>Charadrius dubius</i> (Little Ringed Plover)			
109.	25575 <i>Charadrius leschenaultii</i> (Greater Sand Plover)			
110.	24373 <i>Charadrius melanops</i> (Black-fronted Dotterel)			
111.	25576 <i>Charadrius mongolus</i> (Lesser Sand Plover)			
112.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
113.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck (Wood Duck))			
114.	-1602 <i>Cheramoeca leucosterna</i>			
115.	24488 <i>Cheramoeca leucosternus</i> (White-backed Swallow)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
116.	<i>Chironomus aff. alternans</i> (V24)			
117.	<i>Chironomus tepperi</i>			
118.	-1579 <i>Chlidonias hybrida</i>			
119.	-1637 <i>Chroicocephalus novaehollandiae</i>			
120.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i>			
121.	24833 <i>Cincloramphus cruralis</i> (Brown Songlark)			
122.	24834 <i>Cincloramphus mathewsi</i> (Rufous Songlark)			
123.	-1620 <i>Cinclosoma castanotum</i>			
124.	24288 <i>Circus approximans</i> (Swamp Harrier)			
125.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
126.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
127.	24396 <i>Climacteris rufa</i> (Rufous Treecreeper)			
128.	<i>Cloeon</i> sp.			
129.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
130.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
131.	<i>Colurella coluris</i>			
132.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
133.	24416 <i>Corvus bennetti</i> (Little Crow)			
134.	25592 <i>Corvus coronoides</i> (Australian Raven)			
135.	24417 <i>Corvus coronoides</i> subsp. <i>perplexus</i>			
136.	25593 <i>Corvus orru</i> (Torresian Crow)			
137.	-1666 <i>Corvus</i> sp.			
138.	<i>Corynoneura</i> sp. (V49)			
139.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
140.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
141.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
142.	24422 <i>Cracticus tibicen</i> subsp. <i>dorsalis</i> (White-backed Magpie)			
143.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
144.	24918 <i>Crenadactylus ocellatus</i> subsp. <i>ocellatus</i>			
145.	25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet)			
146.	<i>Croitana croites</i>			
147.	30893 <i>Cryptoblepharus buchanani</i>			
148.	25020 <i>Cryptoblepharus plagioccephalus</i>			
149.	<i>Cryptochironomus griseidorsum</i>			
150.	24881 <i>Ctenophorus maculatus</i> subsp. <i>maculatus</i>			
151.	24886 <i>Ctenophorus reticulatus</i> (Western Nettle Dragon)			
152.	25027 <i>Ctenotus australis</i>			
153.	25039 <i>Ctenotus fallens</i>			
154.	25065 <i>Ctenotus pantherinus</i> subsp. <i>pantherinus</i>			
155.	<i>Culex (culex) australicus</i>			
156.	<i>Culicoides</i> sp.			
157.	25086 <i>Cyclodomorphus branchialis</i>		T	
158.	25087 <i>Cyclodomorphus celatus</i>			
159.	24322 <i>Cygnus atratus</i> (Black Swan)			
160.	<i>Cypretta baylyi</i>			
161.	<i>Cypretta</i> sp. 527			
162.	<i>Cypricercus</i> sp. 442			
163.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
164.	<i>Daphnia cf. cephalata</i>			
165.	24995 <i>Delma australis</i>			
166.	24997 <i>Delma butleri</i>			
167.	25766 <i>Delma fraseri</i>			
168.	24999 <i>Delma grayii</i>			
169.	<i>Delma</i> sp ? nov SAP			Y
170.	25004 <i>Delma tincta</i>			
171.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i>			
172.	25346 <i>Dermodochelys coriacea</i> (Leatherback Turtle)		T	
173.	<i>Dero furcata</i>			
174.	<i>Dero nivea</i>			
175.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
176.	<i>Diplacodes bipunctata</i>			
177.	25469 <i>Diplodactylus granariensis</i>			
178.	24929 <i>Diplodactylus granariensis</i> subsp. <i>granariensis</i>			
179.	24938 <i>Diplodactylus ornatus</i>			
180.	24940 <i>Diplodactylus pulcher</i>			
181.	25359 <i>Disteira major</i>			
182.	<i>Doratifera</i> sp.			
183.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
184.	<i>Ecnomus pansus/turgidus</i>			
185.	-1623 <i>Egretta garzetta</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
186.	-1577 <i>Egretta novaehollandiae</i>			
187.	-1647 <i>Egretta sacra</i>			
188.	-1600 <i>Elanus axillaris</i>			
189.	25250 <i>Elapognathus coronatus</i> (Crowned Snake)			
190.	-1573 <i>Euseyornis melanops</i>			
191.	<i>Enoplognatha</i> sp.			
192.	-1569 <i>Eolophus roseicapillus</i>			
193.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
194.	-1629 <i>Eopsaltria griseogularis</i>			
195.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
196.	24568 <i>Epthianura aurifrons</i> (Orange Chat)			
197.	24570 <i>Epthianura tricolor</i> (Crimson Chat)			
198.	25109 <i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)			
199.	24379 <i>Erythrogonys cinctus</i> (Red-kneed Dotterel)			
200.	<i>Eucyclops australiensis</i>			
201.	<i>Eucypris virens</i>			
202.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
203.	<i>Euryopsis</i> sp. 7			
204.	<i>Euryopsis</i> sp. 9			
205.	24415 <i>Eurystomus orientalis</i> subsp. <i>pacificus</i>			
206.	<i>Eylais</i> sp.			
207.	25621 <i>Falco berigora</i> (Brown Falcon)			
208.	25622 <i>Falco cenchroides</i> (Australian Kestrel)			
209.	24472 <i>Falco cenchroides</i> subsp. <i>cenchrroides</i>			
210.	25623 <i>Falco longipennis</i> (Australian Hobby)			
211.	24474 <i>Falco longipennis</i> subsp. <i>longipennis</i>			
212.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
213.	24475 <i>Falco peregrinus</i> subsp. <i>macropus</i>		S	
214.	24041 <i>Felis catus</i> (Cat)	Y		
215.	25727 <i>Fulica atra</i> (Eurasian Coot)			
216.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
217.	24765 <i>Gallirallus philippensis</i> subsp. <i>mellori</i>			
218.	<i>Gamasomorpha</i> sp. 7			
219.	<i>Gamasomorpha</i> sp. 8			
220.	24959 <i>Gehyra variegata</i>			
221.	-1614 <i>Gelochelidon nilotica</i>			
222.	Gen. 1 sp. 1			
223.	Gen. 1 sp. 1			
224.	Gen. 1 sp. 1			
225.	Gen. 1 sp. 1			
226.	Gen. 1 sp. 1			
227.	Gen. 1 sp. 1			
228.	Gen. 1 sp. 1			
229.	Gen. 1 sp. 1			
230.	Gen. 1 sp. 1			
231.	Gen. 1 sp. 1			
232.	Gen. 1 sp. 1			
233.	Gen. 1 sp. 1			
234.	Gen. 1 sp. 2			
235.	Gen. 1 sp. 2			
236.	Gen. 1 sp. 2			
237.	Gen. 1 sp. 2			
238.	Gen. 1 sp. 2			
239.	Gen. 1 sp. 2			
240.	Gen. 1 sp. 2			
241.	Gen. 1 sp. 2			
242.	Gen. 1 sp. 2			
243.	Gen. 12 sp. 2			
244.	Gen. 12 sp. 4			
245.	Gen. 2 sp. 1			
246.	Gen. 2 sp. 1			
247.	Gen. 2 sp. 1			
248.	Gen. 2 sp. 1			
249.	Gen. 2 sp. 1			
250.	Gen. 2 sp. 1			
251.	Gen. 2 sp. 1			
252.	Gen. 2 sp. 1			
253.	Gen. 3 sp. 1			
254.	Gen. 3 sp. 1			
255.	Gen. 3 sp. 1			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
256.	Gen. 3 sp. 1			
257.	Gen. 3 sp. 1			
258.	Gen. 3 sp. 1			
259.	Gen. 3 sp. 1			
260.	Gen. 3 sp. 10			
261.	Gen. 3 sp. 11			
262.	Gen. 3 sp. 12			
263.	Gen. 3 sp. 3			
264.	Gen. 3 sp. 3			
265.	Gen. 5 sp. 1			
266.	Gen. 5 sp. 1			
267.	Gen. 5 sp. 1			
268.	Gen. 6 sp. 1			
269.	Gen. 6 sp. 1			
270.	Gen. ?? sp. 12			
271.	Gen. ?? sp. 12			
272.	Gen. A sp.			
273.	-1684 Genus sp.			
274.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
275.	25585 <i>Geopelia striata</i> (Peaceful Dove)			
276.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
277.	-1596 <i>Glyciphila melanops</i>			
278.	<i>Gmogola</i> sp. B			
279.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
280.	<i>Grayenulla australensis</i>			
281.	<i>Grymeus</i> sp. 10			
282.	<i>Grymeus</i> sp. 4			
283.	<i>Grymeus</i> sp. 9			
284.	<i>Gymnometriocnemus</i> sp. A			
285.	<i>Habronestes</i> sp. 15			
286.	<i>Habronestes</i> sp. 27			Y
287.	<i>Habronestes</i> sp. 5			
288.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
289.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
290.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
291.	<i>Haliplus gibbus</i>			
292.	24689 <i>Halobaena caerulea</i> (Blue Petrel)			
293.	24297 <i>Hamirostra melanosternon</i> (Black-breasted Buzzard)			
294.	<i>Harrisius</i> sp. A			
295.	25408 <i>Heleioporus albopunctatus</i> (Western Spotted Frog)			
296.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
297.	25412 <i>Heleioporus psammophilus</i> (Sand Frog)			
298.	<i>Helobdella papillornata</i>			
299.	<i>Hemianax papuensis</i>			
300.	<i>Hemicordulia tau</i>			
301.	<i>Heterocypris tatei</i>			
302.	24961 <i>Heteronotia binoei</i> (Bynoe's Gecko)			
303.	-1601 <i>Hieraaetus morphnoides</i>			
304.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
305.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
306.	25629 <i>Hirundo nigricans</i> (Tree Martin)			
307.	<i>Hyderodes crassus</i>			
308.	25366 <i>Hydrophis elegans</i>			
309.	-1642 <i>Hydroprogne caspia</i>			
310.	24075 <i>Hyperoodon planifrons</i> (Southern Bottlenose Whale)			Y
311.	<i>Hyphydrus elegans</i>			
312.	<i>Hypochrysops halyaetus</i>			
313.	33917 <i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)		T	
314.	<i>Ilyodromus</i> sp. 566 (aff. <i>amplicolis</i>)			
315.	<i>Ischnura aurora aurora</i>			
316.	<i>Isidorella</i> sp.			
317.	<i>Kerasteron</i> sp. 1			
318.	<i>Keratella procurva</i>			
319.	<i>Kiefferulus intertinctus</i>			
320.	-1641 <i>Lalage sueurii</i>			
321.	<i>Lampona cylindrata</i>			
322.	<i>Larsia ? albiceps</i>			
323.	25638 <i>Larus pacificus</i> (Pacific Gull)			
324.	<i>Latrodectus hasseltii</i>			
325.	<i>Lecane aculeata</i>			Y

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
326.	<i>Lecane bulla</i>			
327.	<i>Lecane closterocerca</i>			
328.	<i>Lecane hamata</i>			
329.	<i>Lecane ludwigii</i>			
330.	<i>Lecane luna</i>			
331.	<i>Lecane papuana</i>			
332.	24218 <i>Leporillus apicalis</i> (Lesser Stick-nest Rat)		X	
333.	25131 <i>Lerista distinguenda</i>			
334.	25133 <i>Lerista elegans</i>			
335.	25137 <i>Lerista gerrardii</i>			
336.	25147 <i>Lerista lineata</i>		P3	
337.	25148 <i>Lerista lineopunctulata</i>			
338.	25160 <i>Lerista planiventralis</i> subsp. <i>decora</i>			
339.	25165 <i>Lerista praepedita</i>			
340.	25005 <i>Lialis burtonis</i>			
341.	24575 <i>Lichenostomus keartlandi</i> (Grey-headed Honeyeater)			
342.	25659 <i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
343.	24577 <i>Lichenostomus ornatus</i> (Yellow-plumed Honeyeater)			
344.	24578 <i>Lichenostomus penicillatus</i> (White-plumed Honeyeater)			
345.	24579 <i>Lichenostomus plumulus</i> (Grey-fronted Honeyeater)			
346.	24581 <i>Lichenostomus virescens</i> (Singing Honeyeater)			
347.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
348.	<i>Limnocythere porphyretica</i>			
349.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
350.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)			
351.	25741 <i>Limosa limosa</i> (Black-tailed Godwit)			
352.	<i>Liodessus inornatus</i>			
353.	<i>Liparetrus</i> sp.			
354.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
355.	<i>Lophocharis salpina</i>			
356.	-1635 <i>Lophochroa leadbeateri</i>			
357.	<i>Lychas</i> sp. 3			
358.	<i>Lycidas chrysomelas</i>			
359.	<i>Lycidas</i> sp. 21			Y
360.	<i>Lycidas</i> sp. 3			
361.	<i>Lycidas</i> sp. 4			
362.	<i>Lycosa forresti</i>			
363.	<i>Lycosa</i> sp. 1			
364.	<i>Lycosa</i> sp. 10			
365.	<i>Lycosa</i> sp. 14			
366.	<i>Lycosa</i> sp. 17			
367.	<i>Lycosa</i> sp. 6			
368.	<i>Lycosa</i> sp. 8			
369.	<i>Lynceus</i> sp.			
370.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		T	
371.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
372.	24133 <i>Macropus irma</i> (Western Brush Wallaby)		P4	
373.	25489 <i>Macropus robustus</i>			
374.	24135 <i>Macropus robustus</i> subsp. <i>erubescens</i> (Euro, Biggada)			
375.	<i>Macrothrix breviseta</i>			
376.	<i>Macrothrix schauinslandi</i>			
377.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
378.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
379.	24544 <i>Malurus lamberti</i> subsp. <i>assimilis</i>			
380.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
381.	24551 <i>Malurus pulcherrimus</i> (Blue-breasted Fairy-wren)			
382.	-1674 <i>Malurus</i> sp.			
383.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
384.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
385.	<i>Maratus pavonis</i>			
386.	<i>Matilda</i> sp. 1			
387.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
388.	<i>Megaporus</i> sp.			
389.	24051 <i>Megaptera novaeangliae</i> (Humpback Whale)		T	
390.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
391.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
392.	25184 <i>Menetia greyii</i>			
393.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
394.	<i>Mesocyclops brooksi</i>			
395.	-1636 <i>Microcarbo melanoleucos</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
396.	25693 <i>Microeca fascinans</i> (Jacky Winter)			
397.	<i>Micronecta gracilis</i>			
398.	<i>Micronecta robusta</i>			
399.	25542 <i>Milvus migrans</i> (Black Kite)			
400.	<i>Missulena</i> sp. 5			
401.	<i>Missulena</i> sp. 6			
402.	24904 <i>Moloch horridus</i> (Thorny Devil)			
403.	<i>Monohelea</i> sp. 3			
404.	25240 <i>Morelia spilota</i> subsp. <i>imbricata</i> (Carpet Python)		S	
405.	25191 <i>Morethia lineocellata</i>			
406.	25192 <i>Morethia obscura</i>			
407.	-1595 <i>Morus serrator</i>			
408.	24601 <i>Motacilla alba</i> subsp. <i>ocularis</i>			Y
409.	24223 <i>Mus musculus</i> (House Mouse)	Y		
410.	25610 <i>Myiagra inquieta</i> (Restless Flycatcher)			
411.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
412.	<i>Myrmopopaea</i> sp.			
413.	<i>Necterosoma</i> sp.			
414.	<i>Necterosoma wollastoni</i>			
415.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
416.	25425 <i>Neobatrachus kunapalari</i> (Kunapalari Frog)			
417.	25426 <i>Neobatrachus pelobatoides</i> (Humming Frog)			
418.	25428 <i>Neobatrachus wilmorei</i> (Plonking Frog)			
419.	24210 <i>Neophoca cinerea</i> (Australian Sea Lion)		S	
420.	<i>Neostorena</i> sp. 12			
421.	<i>Neostorena</i> sp. 4			
422.	24968 <i>Nephurus levis</i> subsp. <i>occidentalis</i>			
423.	30941 <i>Nephurus millii</i> (Barking Gecko)			
424.	<i>Nilobezzia</i> sp. 1			
425.	25748 <i>Ninox novaeseelandiae</i> (Boobook Owl)			
426.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
427.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
428.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
429.	24495 <i>Oceanites marinus</i> subsp. <i>dulciae</i>			
430.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
431.	<i>Oecetis</i> sp.			
432.	-1606 <i>Onychoprion anaethetus</i>			
433.	-1656 <i>Onychoprion fuscata</i>			
434.	<i>Opopaea</i> sp. 1			
435.	<i>Opopaea</i> sp. 10			
436.	<i>Opopaea</i> sp. 11			
437.	<i>Opopaea</i> sp. 12			
438.	<i>Opopaea</i> sp. 2			
439.	<i>Opopaea</i> sp. 3			
440.	<i>Opopaea</i> sp. 4			
441.	<i>Opopaea</i> sp. 7			
442.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
443.	<i>Orthetrum caledonicum</i>			
444.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
445.	34016 <i>Ovis aries</i> (Sheep)			
446.	24328 <i>Oxyura australis</i> (Blue-billed Duck)			
447.	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
448.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
449.	-1611 <i>Pandion cristatus</i>			
450.	<i>Parachironomus</i> sp. 1 (VSCL35)			
451.	<i>Paracyclops chiltoni</i>			
452.	<i>Parakiefferiella</i> sp. A			
453.	<i>Paramerina levidensis</i>			
454.	<i>Paramerina</i> sp.a			
455.	<i>Pararchaea</i> sp. 2			
456.	25254 <i>Parasuta monachus</i>			
457.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
458.	25687 <i>Passer domesticus</i> (House Sparrow)	Y		
459.	24642 <i>Passer montanus</i> (Eurasian Tree Sparrow)	Y		
460.	-1631 <i>Pelagodroma marina</i>			
461.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
462.	-1638 <i>Petrochelidon ariel</i>			
463.	-1640 <i>Petrochelidon nigricans</i>			
464.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
465.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
466.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
467.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
468.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
469.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
470.	<i>Phenasteron longiconductor</i>			
471.	<i>Philodina</i> sp.			Y
472.	<i>Phoracantha lata</i>			
473.	<i>Phoracantha rugithoracica</i>			
474.	-1643 <i>Phylidonyris niger</i>			
475.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
476.	24073 <i>Physeter macrocephalus</i> (Sperm Whale)		P4	
477.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
478.	25721 <i>Platycercus zonarius</i> (Australian Ringneck (Ring-necked Parrot))			
479.	<i>Platynectes decempunctatus</i> var. <i>polygrammus</i>			
480.	<i>Platynectes</i> sp.			
481.	<i>Platyomopsis</i> sp.			
482.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)			
483.	25509 <i>Pletholax gracilis</i> (Keeled Legless Lizard)			
484.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i>			
485.	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)			
486.	24383 <i>Pluvialis squatarola</i> (Grey Plover)			
487.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
488.	25510 <i>Pogona minor</i>			
489.	24907 <i>Pogona minor</i> subsp. <i>minor</i>			
490.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
491.	<i>Polypedilum nubifer</i>			
492.	<i>Polypedilum watsoni</i>			
493.	30854 <i>Polytelis anthopeplus</i> subsp. <i>westralis</i>			
494.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
495.	34013 <i>Pomatostomus superciliosus</i> subsp. <i>ashbyi</i> (White-browed Babbler (western wheatbelt))		P4	
496.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
497.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
498.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
499.	<i>Pristina jenkiniae</i>			
500.	<i>Procladius paludicola</i>			
501.	33991 <i>Psacodonotus seriatus</i> ((cricket))		P1	Y
502.	-1655 <i>Psephotus varius</i>			
503.	25261 <i>Pseudechis australis</i> (Mulga Snake)			
504.	24230 <i>Pseudomys albocinereus</i> (Ash-grey Mouse)			
505.	25263 <i>Pseudonaja modesta</i> (Ringed Brown Snake)			
506.	25264 <i>Pseudonaja nuchalis</i> (Gwardar)			
507.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
508.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill (Chiming Wedgebill))			
509.	24173 <i>Pteropus scapulatus</i> (Little Red Flying-fox)			
510.	-1625 <i>Purnella albifrons</i>			
511.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
512.	25009 <i>Pygopus nigriceps</i>			
513.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
514.	25271 <i>Ramphotyphlops australis</i>			
515.	25279 <i>Ramphotyphlops hamatus</i>			
516.	25281 <i>Ramphotyphlops leptosoma</i>			
517.	25285 <i>Ramphotyphlops pinguis</i>			
518.	25288 <i>Ramphotyphlops waitii</i>			
519.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
520.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
521.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
522.	<i>Rhantus</i> sp.			
523.	-1654 <i>Rhipidura albiscapa</i>			
524.	25613 <i>Rhipidura fuliginosa</i> (Grey Fantail)			
525.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
526.	<i>Sarscyridopsis aculeata</i>			
527.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
528.	24279 <i>Sericornis frontalis</i> subsp. <i>maculatus</i>			
529.	<i>Simocephalus elizabethae</i>			
530.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
531.	25267 <i>Simoselaps littoralis</i> (West Coast Banded Snake)			
532.	<i>Simulium ornatipes</i>			
533.	30948 <i>Smicromis brevirostris</i> (Weebill)			
534.	24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
535.	24109 <i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			
536.	24112 <i>Sminthopsis granulipes</i> (White-tailed Dunnart)			
537.	<i>Sondra</i> sp. 1			
538.	<i>Steatoda</i> sp. 1			
539.	-1574 <i>Stercorarius antarcticus</i>			
540.	-1619 <i>Stercorarius maccormicki</i>			Y
541.	24517 <i>Stercorarius parasiticus</i> (Arctic Skua)			
542.	25640 <i>Sterna dougallii</i> (Roseate Tern)			
543.	24530 <i>Sterna nereis</i> subsp. <i>nereis</i>			
544.	-1599 <i>Sternula nereis</i>			
545.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
546.	24426 <i>Strepera versicolor</i> subsp. <i>plumbea</i>			
547.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
548.	30950 <i>Streptopelia senegalensis</i> subsp. <i>senegalensis</i>	Y		
549.	25518 <i>Strophurus spinigerus</i>			
550.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
551.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe (Black-throated Grebe))			
552.	24207 <i>Tachyglossus aculeatus</i> (Echidna)			
553.	24185 <i>Tadarida australis</i> (White-striped Freetail-bat)			
554.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck (Mountain Duck))			
555.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
556.	30871 <i>Taeniopygia guttata</i> subsp. <i>castanotis</i>			
557.	<i>Tanytarsus fuscithorax/semibarbitarsus</i>			
558.	<i>Tanytarsus</i> sp. F			Y
559.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
560.	<i>Tasmanocoenis tillyardi</i>			
561.	<i>Textracella</i> sp. 1			
562.	34135 <i>Thalassarche cauta</i> (Shy Albatross)		T	
563.	34007 <i>Thalassarche chlororhynchos</i> (Atlantic Yellow-nosed Albatross)		T	
564.	-1582 <i>Thalassarche melanophris</i>			
565.	-1622 <i>Thalasseus bergii</i>			
566.	<i>Thienemanniella</i> sp. (V19)			
567.	24844 <i>Threskiornis molucca</i> (Australian White Ibis)			
568.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
569.	25203 <i>Tiliqua occipitalis</i> (Western Bluetongue)			
570.	25519 <i>Tiliqua rugosa</i>			
571.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
572.	24308 <i>Todiramphus pyrrhopygia</i> (Red-backed Kingfisher)			
573.	-1613 <i>Todiramphus pyrrhopygius</i>			
574.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
575.	-1617 <i>Tribonyx ventralis</i>			
576.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
577.	24803 <i>Tringa brevipes</i> (Grey-tailed Tattler)			
578.	24806 <i>Tringa glareola</i> (Wood Sandpaper)			
579.	24808 <i>Tringa nebularia</i> (Common Greenshank)			
580.	<i>Triplectides australis</i>			
581.	24851 <i>Turnix velox</i> (Little Button-quail)			
582.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
583.	24852 <i>Tyto alba</i> subsp. <i>delicatula</i>			
584.	-1626 <i>Tyto javanica</i>			
585.	24855 <i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i>		P3	
586.	24983 <i>Underwoodisaurus millii</i> (Barking Gecko)			
587.	<i>Urodacus</i> sp. 1			
588.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
589.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
590.	25227 <i>Varanus tristis</i> subsp. <i>tristis</i> (Racehorse Monitor)			
591.	<i>Venatrix pullastra</i>			
592.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
593.	<i>Xanthagrion erythroneurum</i>			
594.	-1639 <i>Xenus cinereus</i>			
595.	<i>Zillimata scintillans</i>			
596.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye (Silvereye))			
597.	24856 <i>Zosterops lateralis</i> subsp. <i>gouldi</i>			
Chromista				
598.	26586 <i>Caulocystis uvifera</i>			
599.	26731 <i>Cystoseira trinodis</i>			
600.	26766 <i>Dictyopteris muelleri</i>			
601.	26767 <i>Dictyopteris plagiogramma</i>			
602.	29537 <i>Dictyota fastigiata</i>			
603.	29939 <i>Dictyota moniliformis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
604.	35216 <i>Dictyota paniculata</i>			
605.	26946 <i>Hormophysa cuneiformis</i>			
606.	27043 <i>Lobophora variegata</i>			
607.	27090 <i>Myriodesma quercifolium</i>			
608.	27118 <i>Padina sanctae-crucis</i>			
609.	27123 <i>Perithalia caudata</i>			
610.	-9620 <i>Sargassum cinctum</i>			Y
611.	27236 <i>Sargassum decurrens</i>			
612.	27245 <i>Sargassum ilicifolium</i>			
613.	27264 <i>Scaberia agardhii</i>			
614.	27273 <i>Scytothalia dorycarpa</i>			
615.	27373 <i>Zonaria turneriana</i>			

Fungi

616.	27574 <i>Acarospora citrina</i>			
617.	-10227 <i>Alternaria brassicae</i>			Y
618.	-11461 <i>Alternaria japonica</i>			Y
619.	-4469 <i>Alternaria solani</i>			
620.	-13185 <i>Ascochyta rabiei</i>			
621.	27587 <i>Aspicilia calcarea</i>			
622.	27593 <i>Buellia alboatra</i>			
623.	-5725 <i>Buellia</i> sp.			
624.	-5296 <i>Caloplaca burneimensis</i>			
625.	27625 <i>Caloplaca cinnabarina</i>			
626.	27628 <i>Caloplaca erythrostickta</i>			
627.	-12556 <i>Caloplaca kaernefeltii</i>			
628.	31099 <i>Caloplaca kantvilasii</i>			
629.	27638 <i>Caloplaca marina</i>			
630.	-3957 <i>Caloplaca mereschkowskiana</i>			
631.	-11616 <i>Caloplaca michelagoensis</i>			
632.	31095 <i>Caloplaca montisfracti</i>			
633.	-12902 <i>Caloplaca</i> sp.			
634.	-6058 <i>Caloplaca yorkensis</i>			Y
635.	27645 <i>Candelariella xanthostigmoides</i>			
636.	27649 <i>Canoparmelia pruinata</i>			
637.	-8172 <i>Cercospora echii</i>			Y
638.	-13018 <i>Cladosporium herbarum</i>			Y
639.	-4180 <i>Cochliobolus victoriae</i>			
640.	-8329 <i>Colletotrichum gloeosporioides</i>			
641.	-7183 <i>Colletotrichum orbiculare</i>			Y
642.	27718 <i>Diploschistes euganeus</i>			
643.	-3855 <i>Drechslera teres</i>			
644.	27741 <i>Endocarpon simplicatum</i>			
645.	-9728 <i>Endocarpon</i> sp.			
646.	27748 <i>Flavoparmelia rutidota</i>			
647.	-9847 <i>Flavoparmelia</i> sp.			
648.	-4702 <i>Fusarium equiseti</i>			
649.	-12094 <i>Fusarium oxysporum</i>			Y
650.	-6320 <i>Gaeumannomyces graminis</i> var. <i>tritici</i>			
651.	-11951 <i>Graphis</i> sp.			
652.	-11257 <i>Hyperphyscia</i> sp.			
653.	-11223 <i>Leptosphaeria nodorum</i>			
654.	-5611 <i>Mycosphaerella capsellae</i>			Y
655.	27956 <i>Pertusaria thiospoda</i>			
656.	20167 <i>Pertusaria trachyspora</i>		P2	
657.	-9407 <i>Phaeogyroporus portentosus</i>			
658.	27972 <i>Physcia jackii</i>			
659.	-9592 <i>Physoderma trifolii</i>			
660.	-10822 <i>Placidium lacinulatum</i>			
661.	-3905 <i>Placidium</i> sp.			
662.	27998 <i>Psora crenata</i>			
663.	-7216 <i>Puccinia coronata</i>			
664.	-5068 <i>Puccinia graminis</i>			
665.	-6842 <i>Puccinia graminis</i> forma <i>avenae</i>			
666.	-12538 <i>Puccinia graminis</i> forma <i>tritici</i>			
667.	-12188 <i>Puccinia haemodori</i>			
668.	28007 <i>Punctelia subalbicans</i>			
669.	28017 <i>Pyxine cocoes</i>			
670.	28052 <i>Rinodina thiomela</i>			
671.	-12715 <i>Septoria lycopersici</i>			Y
672.	28060 <i>Siphula coriacea</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
673.	28065 <i>Teloschistes chrysophthalmus</i>			
674.	28075 <i>Toninia glaucocarpa</i>			
675.	-9750 <i>Toninia</i> sp.			
676.	28080 <i>Trapeliopsis psammophila</i>			
677.	-6370 <i>Uromyces polygoni-aviculariae</i>			
678.	-8367 <i>Uromycladium tepperianum</i>			
679.	28102 <i>Xanthoparmelia alternata</i>			
680.	28104 <i>Xanthoparmelia amplexula</i>			
681.	28145 <i>Xanthoparmelia isidiosa</i>			
682.	29019 <i>Xanthoparmelia kondininensis</i>		P2	
683.	28156 <i>Xanthoparmelia nana</i>			
684.	29964 <i>Xanthoparmelia sargentii</i>		P1	
685.	28180 <i>Xanthoparmelia succedans</i>			
686.	28181 <i>Xanthoparmelia taractica</i>			
687.	28192 <i>Xanthoparmelia yowaensis</i>			
688.	-10456 <i>Xanthoria ectanea</i>			
689.	30455 <i>Xanthoria elixii</i>			
690.	28193 <i>Xanthoria ligulata</i>			
691.	28194 <i>Xanthoria parietina</i>			
692.	-3959 <i>Xanthoria parietinoides</i>			Y

Plantae

693.	4889 <i>Abutilon cryptopetalum</i>			
694.	-4675 <i>Acacia Plurinerves-Microneurae Phyllodes >8-nerved, terete(Misc.- SW)</i>			
695.	3197 <i>Acacia aciphylla</i>			
696.	3199 <i>Acacia acuarria</i>			
697.	3200 <i>Acacia acuminata (Jam)</i>			
698.	3207 <i>Acacia alata (Winged Wattle)</i>			
699.	16111 <i>Acacia alata var. biglandulosa</i>			
700.	3225 <i>Acacia ashbyae</i>			
701.	3238 <i>Acacia bidentata</i>			
702.	3242 <i>Acacia blakelyi</i>			
703.	15471 <i>Acacia brumalis</i>			
704.	3265 <i>Acacia comans</i>			
705.	-10495 <i>Acacia comans Variant No. 1</i>			
706.	15473 <i>Acacia congesta subsp. congesta</i>			
707.	3269 <i>Acacia coolgardiensis (Spinifex Wattle)</i>			
708.	3282 <i>Acacia cyclops (Coastal Wattle)</i>			
709.	20435 <i>Acacia daphnifolia</i>			
710.	3301 <i>Acacia dielsii</i>			
711.	3323 <i>Acacia ericifolia</i>			
712.	3358 <i>Acacia guinetii (Guinet's Wattle)</i>		P4	Y
713.	3376 <i>Acacia idiomorpha</i>			
714.	3391 <i>Acacia jacksonioides</i>			
715.	-8604 <i>Acacia lasiocarpa var. *</i>			
716.	-4811 <i>Acacia lasiocarpa var. ?</i>			
717.	11611 <i>Acacia lasiocarpa var. lasiocarpa</i>			
718.	-4667 <i>Acacia lasiocarpa var. lasiocarpa (flat pinnule variant)</i>			
719.	15721 <i>Acacia lasiocarpa var. sedifolia</i>			
720.	3412 <i>Acacia latipes</i>			
721.	-10506 <i>Acacia latipes Variant No. 2</i>			
722.	15476 <i>Acacia latipes subsp. latipes</i>			
723.	11448 <i>Acacia leptospermoides subsp. leptospermoides</i>			
724.	-5526 <i>Acacia leptospermoides subsp. leptospermoides/psammophila</i>			
725.	11330 <i>Acacia leptospermoides subsp. psammophila</i>		P3	
726.	3419 <i>Acacia ligulata (Umbrella Bush)</i>			
727.	3437 <i>Acacia megacephala</i>		P2	
728.	15290 <i>Acacia neurophylla subsp. erugata</i>			
729.	15291 <i>Acacia neurophylla subsp. neurophylla</i>			
730.	3466 <i>Acacia oldfieldii</i>			
731.	3470 <i>Acacia orbifolia</i>			
732.	3474 <i>Acacia oxyclada</i>			
733.	14134 <i>Acacia pelophila</i>		P1	
734.	3515 <i>Acacia restiacea</i>			
735.	3525 <i>Acacia rostellifera (Summer-scented Wattle)</i>			
736.	-12473 <i>Acacia rostellifera x xanthina</i>			
737.	3527 <i>Acacia saligna (Orange Wattle)</i>			
738.	30033 <i>Acacia saligna subsp. lindleyi</i>			
739.	-8016 <i>Acacia saligna x xanthina</i>			Y
740.	3532 <i>Acacia scirpifolia</i>			
741.	3534 <i>Acacia sclerosperma (Limestone Wattle)</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
742.	3541 <i>Acacia sessilis</i>			
743.	3546 <i>Acacia signata</i>			
744.	-6755 <i>Acacia</i> sp.			
745.	20344 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798)			
746.	29118 <i>Acacia</i> sp. small seed (B.R. Maslin 7830)			
747.	-11839 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798) subsp.			
748.	8951 <i>Acacia spathulata</i>			
749.	3549 <i>Acacia spathulifolia</i>			
750.	15484 <i>Acacia sphacelata</i> subsp. <i>sphacelata</i>			
751.	12268 <i>Acacia sphenophylla</i>			
752.	15294 <i>Acacia stereophylla</i> var. <i>stereophylla</i>			
753.	3577 <i>Acacia tetragonophylla</i> (Kurara)			
754.	3581 <i>Acacia trigonophylla</i>			
755.	3587 <i>Acacia ulicina</i>			
756.	3604 <i>Acacia xanthina</i> (White-stemmed Wattle)			
757.	1205 <i>Acanthocarpus canaliculatus</i>			
758.	1207 <i>Acanthocarpus parviflorus</i>		P3	
759.	1208 <i>Acanthocarpus preissii</i>			
760.	1209 <i>Acanthocarpus robustus</i>			
761.	-9369 <i>Acanthocarpus</i> sp.			
762.	20797 <i>Acanthocarpus</i> sp. <i>Ajana</i> (C.A. Gardner 8596)			
763.	26441 <i>Acanthopora spicifera</i>			
764.	32310 <i>Acaulon triquetrum</i>			Y
765.	26447 <i>Acrothamnion preissii</i>			
766.	19901 <i>Actinobole oldfieldianum</i>			
767.	7817 <i>Actinobole uliginosum</i> (Flannel Cudweed)			
768.	7818 <i>Actites megalocarpus</i> (Dune Thistle)			
769.	11837 <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (Common Woollybush)			
770.	4582 <i>Adriana quadripartita</i> (Bitter Bush)			
771.	20331 <i>Aeonium arboreum</i>	Y		
772.	176 <i>Agrostis avenacea</i> (Blowgrass)			
773.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
774.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
775.	1376 <i>Allium orientale</i>	Y		
776.	-7430 <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> / <i>prinsepiana</i>			
777.	1721 <i>Allocasuarina campestris</i>			
778.	1725 <i>Allocasuarina dielsiana</i> (Northern Sheoak)			
779.	1731 <i>Allocasuarina huegeliana</i> (Rock Sheoak)			
780.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
781.	-6080 <i>Allocasuarina</i> sp.			
782.	1739 <i>Allocasuarina thuyoides</i> (Horned Sheoak)			
783.	2652 <i>Alternanthera nodiflora</i> (Common Joyweed)			
784.	19465 <i>Aluta aspera</i> subsp. <i>hesperia</i>			
785.	20173 <i>Alyogyne coronopifolia</i>			
786.	-7864 <i>Alyogyne coronopifolia</i> x <i>purpurea</i>			Y
787.	4905 <i>Alyogyne hakeifolia</i>			
788.	4906 <i>Alyogyne huegelii</i> (Lilac Hibiscus)			
789.	17975 <i>Alyogyne huegelii</i> var. <i>grossulariifolia</i>			
790.	15458 <i>Alyogyne huegelii</i> var. <i>huegelii</i>			
791.	15459 <i>Alyogyne huegelii</i> var. <i>wrayae</i>			
792.	4907 <i>Alyogyne pinoniana</i> (Sand Hibiscus)			
793.	20082 <i>Alyogyne purpurea</i>			
794.	20078 <i>Alyogyne wrayae</i>			
795.	6565 <i>Alyxia buxifolia</i> (Dysentery Bush)			
796.	2671 <i>Amaranthus viridis</i> (Green Amaranth)	Y		
797.	6209 <i>Ammi majus</i> (Bishop's Weed)	Y		
798.	126 <i>Amphibolis antarctica</i> (Sea Nymph)			
799.	127 <i>Amphibolis griffithii</i>			
800.	196 <i>Amphipogon caricinus</i> (Long Greybeard Grass)			
801.	-3593 <i>Amphipogon caricinus</i> - <i>strictus</i> complex			
802.	12025 <i>Amphipogon caricinus</i> var. <i>caricinus</i>			
803.	26463 <i>Amphiroa gracilis</i>			
804.	2372 <i>Amyema fitzgeraldii</i> (Pincushion Mistletoe)			
805.	13266 <i>Amyema miraculosa</i> subsp. <i>miraculosa</i>			
806.	-11696 <i>Amyema miraculosum</i>			Y
807.	2383 <i>Amyema preissii</i> (Wireleaf Mistletoe)			
808.	6480 <i>Anagallis arvensis</i> (Pimpernel)	Y		
809.	7827 <i>Angianthus cunninghamii</i> (Coast Angianthus)			
810.	-4422 <i>Angianthus</i> sp.			
811.	7836 <i>Angianthus tomentosus</i> (Camel-grass)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
812.	1409 <i>Anigozanthos humilis</i> (Catspaw)			
813.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
814.	1411 <i>Anigozanthos manglesii</i> (Mangles Kangaroo Paw)			
815.	11565 <i>Anigozanthos manglesii</i> subsp. <i>quadrans</i>			
816.	2332 <i>Anthobolus foveolatus</i>			
817.	11725 <i>Anthocercis ilicifolia</i> subsp. <i>ilicifolia</i>			
818.	6948 <i>Anthocercis intricata</i>		P3	
819.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
820.	-7127 <i>Anthoceros</i> sp.			
821.	6953 <i>Anthotroche walcottii</i>			
822.	3180 <i>Aphanopetalum clematideum</i>			
823.	1117 <i>Aphelia cyperoides</i>			
824.	12040 <i>Apium prostratum</i> var. <i>prostratum</i> (Sea Celery)			
825.	7838 <i>Arctotheca calendula</i> (Cape Weed)	Y		
826.	7839 <i>Arctotheca populifolia</i> (Dune Arctotheca)	Y		
827.	17797 <i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	Y		
828.	207 <i>Aristida contorta</i> (Bunched Kerosene Grass)			
829.	210 <i>Aristida holathera</i>			
830.	12063 <i>Aristida holathera</i> var. <i>holathera</i>			
831.	11542 <i>Arrhenatherum elatius</i> var. <i>bulbosum</i> (Onion Twitch)	Y		
832.	1266 <i>Arthropodium dyeri</i>			
833.	-11798 <i>Arthropodium</i> sp.			
834.	6580 <i>Asclepias curassavica</i> (Redhead Cottonbush)	Y		
835.	-10279 <i>Asterella</i> sp.			
836.	7845 <i>Asteridea asteroides</i>			
837.	7850 <i>Asteridea nivea</i>			
838.	6328 <i>Astroloma glaucescens</i>			
839.	6332 <i>Astroloma microdonta</i> (Sandplain Cranberry)			
840.	16941 <i>Astroloma pedicellatum</i>			
841.	6336 <i>Astroloma serratifolium</i> (Kondrung)			
842.	2450 <i>Atriplex amnicola</i> (Swamp Saltbush)			
843.	2452 <i>Atriplex cinerea</i> (Grey Saltbush)			
844.	2463 <i>Atriplex isatidea</i> (Coast Saltbush)			
845.	2476 <i>Atriplex semilunaris</i> (Annual Saltbush)			
846.	-8696 <i>Atriplex</i> sp.			
847.	2479 <i>Atriplex stipitata</i> (Mallee Saltbush)			
848.	17951 <i>Austrodanthonia acerosa</i>			
849.	17950 <i>Austrodanthonia caespitosa</i>			
850.	17945 <i>Austrodanthonia setacea</i>			
851.	-3439 <i>Austrodanthonia setacea</i> group			
852.	-8365 <i>Austrodanthonia</i> sp.			
853.	17234 <i>Austrostipa compressa</i>			
854.	17235 <i>Austrostipa crinita</i>			
855.	17237 <i>Austrostipa elegantissima</i>			
856.	17239 <i>Austrostipa exilis</i>			
857.	17240 <i>Austrostipa flavescens</i>			
858.	17241 <i>Austrostipa hemipogon</i>			
859.	17244 <i>Austrostipa macalpinei</i>			
860.	17246 <i>Austrostipa nitida</i>			
861.	17251 <i>Austrostipa scabra</i>			
862.	37421 <i>Austrostipa</i> sp. <i>Marchagee</i> (B.R. Maslin 1407)			
863.	17254 <i>Austrostipa tenuifolia</i>			
864.	17255 <i>Austrostipa trichophylla</i>			
865.	17257 <i>Austrostipa variabilis</i>			
866.	231 <i>Avellinia michelii</i>	Y		
867.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
868.	234 <i>Avena fatua</i> (Wild Oat)	Y		
869.	5341 <i>Baeckea crispiflora</i>			
870.	5350 <i>Baeckea grandiflora</i> (Large-flowered Baeckea)			
871.	16815 <i>Baeckea</i> sp. <i>Mingenew</i> (M.E. Trudgen 12029)			
872.	14476 <i>Baeckea</i> sp. <i>Walkaway</i> (A.S. George 11249)		P3	
873.	5366 <i>Baeckea staminosa</i>		P1	
874.	1799 <i>Banksia ashbyi</i> (Ashby's Banksia)			
875.	1800 <i>Banksia attenuata</i> (Slender Banksia)			
876.	32623 <i>Banksia carlinoides</i> (Pink Dryandra)			
877.	32576 <i>Banksia dallanneyi</i> (Couch Honeyypot)			
878.	1816 <i>Banksia elegans</i> (Elegant Banksia)		P4	
879.	32524 <i>Banksia fraseri</i> var. <i>ashbyi</i>			
880.	32523 <i>Banksia fraseri</i> var. <i>fraseri</i>			
881.	1828 <i>Banksia leptophylla</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
882.	11386 <i>Banksia leptophylla</i> var. <i>melletica</i>			
883.	1829 <i>Banksia lindleyana</i> (Porcupine Banksia)			
884.	-1257 <i>Banksia menz_ellii</i>			
885.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
886.	1842 <i>Banksia prionotes</i> (Acorn Banksia)			
887.	1846 <i>Banksia scabrella</i> (Burma Road Banksia)		P4	
888.	1847 <i>Banksia sceptrum</i> (Sceptre Banksia)			
889.	32079 <i>Banksia sessilis</i> var. <i>flabellifolia</i>			
890.	32080 <i>Banksia sessilis</i> var. <i>sessilis</i>			
891.	1855 <i>Banksia victoriae</i> (Woolly Orange Banksia)			
892.	32315 <i>Barbula calycina</i>			
893.	15037 <i>Bartsia trixago</i>	Y		
894.	2482 <i>Bassia scoparia</i>	Y		
895.	740 <i>Baumea arthropophylla</i>			
896.	743 <i>Baumea juncea</i> (Bare Twigrush)			
897.	17761 <i>Beaufortia aestiva</i>			
898.	-4152 <i>Beaufortia</i> sp.			
899.	4601 <i>Beyeria viscosa</i> (Pinkwood)			
900.	20815 <i>Biserrula pelecinus</i>	Y		Y
901.	31606 <i>Blackallia nudiflora</i> (Wedge-leaved Cryptandra)		P3	
902.	7856 <i>Blennochora drummondii</i>			
903.	2770 <i>Boerhavia coccinea</i> (Tar Vine)			
904.	-5923 <i>Boerhavia</i> sp.			
905.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
906.	6609 <i>Bonamia rosea</i> (Felted Bellflower)			
907.	-4800 <i>Bonamia</i> sp.			
908.	4409 <i>Boronia coerulescens</i>			
909.	11498 <i>Boronia coerulescens</i> subsp. <i>spicata</i>			
910.	11274 <i>Boronia coerulescens</i> subsp. <i>spinescens</i>			
911.	4414 <i>Boronia cymosa</i> (Granite Boronia)			
912.	4438 <i>Boronia ramosa</i>			
913.	11381 <i>Boronia ramosa</i> subsp. <i>anethifolia</i>			
914.	16639 <i>Boronia scabra</i> subsp. <i>scabra</i>			
915.	-4748 <i>Boronia</i> sp.			
916.	1273 <i>Borya sphaerocephala</i> (Pincushions)			
917.	30232 <i>Bossiaea calcicola</i>		P3	
918.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
919.	3719 <i>Bossiaea spinescens</i>			
920.	240 <i>Bothriochloa ewartiana</i> (Desert Bluegrass)			
921.	15000 <i>Brachychiton populneus</i> subsp. <i>populneus</i>	Y		
922.	30132 <i>Brachyloma pirara</i>			
923.	8661 <i>Brachypodium distachyon</i> (False Brome)	Y		
924.	7870 <i>Brachyscome cheilocarpa</i>			
925.	7871 <i>Brachyscome ciliaris</i>			
926.	7872 <i>Brachyscome ciliocarpa</i>			
927.	7878 <i>Brachyscome iberidifolia</i>			
928.	7881 <i>Brachyscome oncocarpa</i>			
929.	7882 <i>Brachyscome perpusilla</i>			
930.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
931.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
932.	245 <i>Briza minor</i> (Shivery Grass)	Y		
933.	248 <i>Bromus catharticus</i> (Prairie Grass)	Y		
934.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
935.	250 <i>Bromus hordeaceus</i> (Soft Brome)	Y		
936.	252 <i>Bromus madritensis</i> (Madrid Brome)	Y		
937.	253 <i>Bromus rubens</i> (Red Brome)	Y		
938.	7413 <i>Brunonia australis</i> (Native Cornflower)			
939.	6675 <i>Buglossoides arvensis</i> (Corn Gromwell)	Y		
940.	12770 <i>Burchardia congesta</i>			
941.	3167 <i>Bursaria occidentalis</i>			
942.	15445 <i>Caesia alfordii</i>			
943.	1276 <i>Caesia micrantha</i> (Pale Grass-lily)			
944.	29439 <i>Caesia</i> sp. Wongan (K.F. Kenneally 8820)			
945.	3002 <i>Cakile maritima</i> (Sea Rocket)	Y		
946.	15337 <i>Caladenia bryceana</i> subsp. <i>cracens</i>		T	
947.	1584 <i>Caladenia deformis</i> (Blue Fairy Orchid)			
948.	11136 <i>Caladenia denticulata</i>			
949.	13618 <i>Caladenia elegans</i>		T	
950.	1592 <i>Caladenia flava</i> (Cowslip Orchid)			
951.	15348 <i>Caladenia flava</i> subsp. <i>flava</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
952.	15349 <i>Caladenia flava</i> subsp. <i>maculata</i>			
953.	15502 <i>Caladenia footeana</i>			
954.	13857 <i>Caladenia hoffmanii</i>		T	
955.	-11348 <i>Caladenia hoffmanii</i> x <i>longicauda</i>			
956.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
957.	1602 <i>Caladenia longicauda</i> (Common White Spider Orchid)			
958.	15360 <i>Caladenia longicauda</i> subsp. <i>borealis</i>			
959.	1603 <i>Caladenia longiclavata</i> (Clubbed Spider Orchid)			
960.	17760 <i>Caladenia nobilis</i>			
961.	1611 <i>Caladenia radialis</i> (Drooping Spider Orchid)			
962.	15378 <i>Caladenia reptans</i> subsp. <i>impensa</i>			
963.	1620 <i>Caladenia wanosa</i> (Kalbarri Spider Orchid)		T	
964.	2845 <i>Calandrinia brevipedata</i> (Short-stalked Purslane)			
965.	2846 <i>Calandrinia calyptata</i> (Pink Purslane)			
966.	2848 <i>Calandrinia corrigioloides</i> (Strap Purslane)			
967.	2854 <i>Calandrinia granulifera</i> (Pygmy Purslane)			
968.	2855 <i>Calandrinia lehmannii</i>			
969.	2860 <i>Calandrinia polyandra</i> (Parakeelya)			
970.	2867 <i>Calandrinia remota</i>			
971.	-3613 <i>Calandrinia</i> sp.			
972.	20478 <i>Calandrinia</i> sp. Blackberry (D.M. Porter 171)			
973.	19832 <i>Calandrinia</i> sp. Ongerup (K.R. Newbey 11834)			
974.	20477 <i>Calandrinia</i> sp. SW coastal (J. Dodd 753)			
975.	19304 <i>Calectasia browneana</i>		P2	
976.	5395 <i>Callistemon phoeniceus</i> (Lesser Bottlebrush)			
977.	36560 <i>Callitris arenaria</i> (Sandplain Cypress)			
978.	26533 <i>Callophycus costatus</i>			
979.	26536 <i>Callophycus oppositifolius</i>			
980.	5401 <i>Calothamnus blepharospermus</i>			
981.	34196 <i>Calothamnus chrysanthereus</i> (Claw Flower)			
982.	35856 <i>Calothamnus glaber</i>			
983.	35696 <i>Calothamnus phellosus</i>			
984.	35756 <i>Calothamnus quadrifidus</i> subsp. <i>angustifolius</i>			
985.	35758 <i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> (Murchison Clawflower)			
986.	35759 <i>Calothamnus quadrifidus</i> subsp. <i>obtusus</i>			
987.	5429 <i>Calothamnus sanguineus</i> (Silky-leaved Blood flower)			
988.	7903 <i>Calotis hispidula</i> (Bindy Eye)			
989.	7905 <i>Calotis multicaulis</i> (Many-stemmed Burr-daisy)			
990.	-12966 <i>Calotis</i> sp.			
991.	5443 <i>Calytrix brevifolia</i>			
992.	5450 <i>Calytrix depressa</i>			
993.	5462 <i>Calytrix gracilis</i>			
994.	5465 <i>Calytrix leschenaultii</i>			
995.	5468 <i>Calytrix oldfieldii</i>			
996.	19978 <i>Calytrix pimeleoides</i>		P3	
997.	5475 <i>Calytrix purpurea</i>		P2	
998.	5479 <i>Calytrix strigosa</i>			
999.	5485 <i>Calytrix variabilis</i>			
1000.	2796 <i>Carpobrotus modestus</i> (Inland Pigface)			
1001.	-7790 <i>Carpobrotus praecox</i>			Y
1002.	2798 <i>Carpobrotus virescens</i> (Coastal Pigface)			
1003.	7911 <i>Carthamus lanatus</i> (Saffron Thistle)	Y		
1004.	7913 <i>Carthamus tinctorius</i>	Y		
1005.	12073 <i>Cassytha aurea</i> var. <i>aurea</i>			
1006.	11351 <i>Cassytha aurea</i> var. <i>hirta</i>			
1007.	2952 <i>Cassytha glabella</i> (Tangled Dodder Laurel)			
1008.	11211 <i>Cassytha glabella</i> forma <i>dispar</i>			
1009.	11857 <i>Cassytha glabella</i> forma <i>glabella</i>			
1010.	2956 <i>Cassytha pomiformis</i> (Dodder Laurel)			
1011.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
1012.	11242 <i>Cassytha racemosa</i> forma <i>pilosa</i>			
1013.	11799 <i>Cassytha racemosa</i> forma <i>racemosa</i>			
1014.	-9051 <i>Cassytha</i> sp.			
1015.	1742 <i>Casuarina obesa</i> (Swamp Sheoak)			
1016.	13685 <i>Catapodium rigidum</i> (Rigid Fescue)	Y		
1017.	26555 <i>Caulerpa brownii</i>			
1018.	26556 <i>Caulerpa cactoides</i>			
1019.	26557 <i>Caulerpa cliffonii</i>			
1020.	26560 <i>Caulerpa distichophylla</i>			
1021.	27380 <i>Caulerpa flexilis</i> var. <i>muelleri</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1022.	26573 <i>Caulerpa racemosa</i>			
1023.	26578 <i>Caulerpa simpliciuscula</i>			
1024.	258 <i>Cenchrus ciliaris</i> (Buffel Grass)	Y		
1025.	259 <i>Cenchrus echinatus</i> (Burrgrass)	Y		
1026.	262 <i>Cenchrus longispinus</i> (Spiny Burrgrass)	Y		
1027.	29721 <i>Cenchrus setiger</i> (Birdwood Grass)	Y		
1028.	6539 <i>Centaurium erythraea</i> (Common Centaury)	Y		
1029.	6542 <i>Centaurium tenuiflorum</i>	Y		
1030.	6214 <i>Centella asiatica</i>			
1031.	19759 <i>Centipeda crateriformis</i> subsp. <i>crateriformis</i>			
1032.	26587 <i>Centroceras clavulatum</i>			
1033.	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
1034.	1124 <i>Centrolepis cephaliformis</i>			
1035.	1125 <i>Centrolepis drummondiana</i>			
1036.	1131 <i>Centrolepis inconspicua</i>			
1037.	1133 <i>Centrolepis pilosa</i>			
1038.	1134 <i>Centrolepis polygyna</i> (Wiry Centrolepis)			
1039.	7922 <i>Cephalopterum drummondii</i> (Pompom Head)			
1040.	7923 <i>Cephalosorus carpesioides</i>			
1041.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
1042.	7924 <i>Ceratogyne obionoides</i> (Wingwort)			
1043.	17685 <i>Chaetanthus aristatus</i>			
1044.	18156 <i>Chamaecytisus palmensis</i> (Tagasaste)	Y		
1045.	11299 <i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>			
1046.	-3963 <i>Chamaescilla</i> sp.			
1047.	8788 <i>Chamaescilla versicolor</i>			
1048.	14808 <i>Chamelaucium drummondii</i> subsp. <i>drummondii</i>			
1049.	5496 <i>Chamelaucium micranthum</i>			
1050.	5497 <i>Chamelaucium pauciflorum</i>			
1051.	35596 <i>Chamelaucium</i> sp. <i>Yuna</i> (A.C. Burns 53)		P2	
1052.	5498 <i>Chamelaucium uncinatum</i> (Geraldton Wax)			
1053.	1513 <i>Chasmanthe floribunda</i> (African Cornflag)	Y		
1054.	12796 <i>Cheilanthes adiantoides</i>			
1055.	31 <i>Cheilanthes austrotenuifolia</i>			
1056.	12818 <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			
1057.	31768 <i>Cheiranthra simplicifolia</i>			
1058.	2489 <i>Chenopodium gaudichaudianum</i> (Cottony Saltbush)			
1059.	2494 <i>Chenopodium murale</i> (Nettle-leaf Goosefoot)	Y		
1060.	270 <i>Chloris pumilio</i>			
1061.	271 <i>Chloris truncata</i> (Windmill Grass)			
1062.	7925 <i>Chondrilla juncea</i> (Skeleton Weed)	Y		
1063.	763 <i>Chorizandra enodis</i> (Black Bristlerush)			
1064.	13111 <i>Chorizema aciculare</i> subsp. <i>laxum</i>			
1065.	13115 <i>Chorizema humile</i>		T	
1066.	13114 <i>Chorizema racemosum</i>			
1067.	11900 <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Y		
1068.	7928 <i>Chrysanthemum coronarium</i>	Y		
1069.	12612 <i>Chrysocephalum apiculatum</i>			
1070.	7933 <i>Chthonocephalus pseudevax</i> (Woolly Groundheads)			
1071.	-9828 <i>Chthonocephalus</i> sp.			
1072.	6543 <i>Cicendia filiformis</i> (Slender Cicendia)	Y		
1073.	7936 <i>Cirsium arvense</i> (Canada Thistle)	Y		Y
1074.	-7982 <i>Cirsium</i> sp.			Y
1075.	7370 <i>Citrullus lanatus</i> (Pie Melon)	Y		
1076.	26659 <i>Cladophora valonioides</i>			
1077.	26663 <i>Cladurus elatus</i>			
1078.	26665 <i>Clavicleonium ovatum</i>			
1079.	4853 <i>Clematicissus angustissima</i>			
1080.	10804 <i>Clematis linearifolia</i>			
1081.	26677 <i>Codium mamillosum</i>			
1082.	2778 <i>Codonocarpus cotinifolius</i> (Native Poplar)			
1083.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
1084.	4555 <i>Comesperma integerrimum</i>			
1085.	4560 <i>Comesperma rhadinocarpum</i> (Slender-fruited Comesperma)		P2	
1086.	4561 <i>Comesperma scoparium</i> (Broom Milkwort)			
1087.	4563 <i>Comesperma spinosum</i> (Spiny Milkwort)			
1088.	4564 <i>Comesperma virgatum</i> (Milkwort)			
1089.	20541 <i>Commersonia bivillosa</i>		P1	
1090.	5002 <i>Commersonia gaudichaudii</i>			
1091.	5004 <i>Commersonia microphylla</i>		P2	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1092.	2776 <i>Commicarpus australis</i> (Perennial Tar Vine)			
1093.	15608 <i>Conospermum acerosum</i> subsp. <i>hirsutum</i>			
1094.	15512 <i>Conospermum boreale</i> subsp. <i>ascendens</i>			
1095.	15513 <i>Conospermum boreale</i> subsp. <i>boreale</i>			
1096.	1876 <i>Conospermum incurvum</i> (Plume Smokebush)			
1097.	16849 <i>Conospermum microflorum</i>			
1098.	1882 <i>Conospermum stoechadis</i> (Common Smokebush)			
1099.	15611 <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> (Common Smokebush)			
1100.	15523 <i>Conospermum wycherleyi</i>			
1101.	15522 <i>Conospermum wycherleyi</i> subsp. <i>wycherleyi</i>			
1102.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
1103.	11641 <i>Conostylis aculeata</i> subsp. <i>rhipidion</i>			
1104.	-8419 <i>Conostylis aculeata</i> x <i>prolifera</i> subsp. <i>rhipidion</i>			Y
1105.	1420 <i>Conostylis androstemma</i> (Trumpets)			
1106.	1423 <i>Conostylis aurea</i> (Golden Conostylis)			
1107.	12027 <i>Conostylis candicans</i> subsp. <i>calcicola</i>			
1108.	-6130 <i>Conostylis candicans</i> x <i>robusta</i>			
1109.	-12821 <i>Conostylis candicans</i> x <i>stylioides</i>			
1110.	1442 <i>Conostylis neocymosa</i>			
1111.	1446 <i>Conostylis prolifera</i> (Mat Cottonheads)			
1112.	1448 <i>Conostylis resinosa</i>			
1113.	1450 <i>Conostylis robusta</i>			
1114.	1456 <i>Conostylis stylioides</i>			
1115.	5502 <i>Conothamnus trinervis</i>			
1116.	6614 <i>Convolvulus remotus</i>			
1117.	7938 <i>Conyza albida</i> (Tall Fleabane)	Y		
1118.	7939 <i>Conyza bonariensis</i> (Flaxleaf Fleabane)	Y		
1119.	2891 <i>Corrigiola litoralis</i> (Strapwort)	Y		
1120.	17104 <i>Corymbia calophylla</i> (Marri)			
1121.	11834 <i>Corynotheca micrantha</i> var. <i>acanthoclada</i>			
1122.	11283 <i>Corynotheca micrantha</i> var. <i>micrantha</i>			
1123.	7943 <i>Cotula australis</i> (Common Cotula)			
1124.	7944 <i>Cotula bipinnata</i> (Ferry Cotula)	Y		
1125.	7945 <i>Cotula coronopifolia</i> (Waterbuttons)	Y		
1126.	3136 <i>Crassula alata</i>	Y		
1127.	17701 <i>Crassula closiana</i>			
1128.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
1129.	11709 <i>Crassula colorata</i> var. <i>acuminata</i>			
1130.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
1131.	3138 <i>Crassula decumbens</i> (Rufous Stonecrop)			
1132.	11349 <i>Crassula decumbens</i> var. <i>decumbens</i>			
1133.	3142 <i>Crassula natans</i>	Y		
1134.	19861 <i>Cristonia biloba</i>			
1135.	35839 <i>Cristonia stenophylla</i>			
1136.	4792 <i>Cryptandra arbutiflora</i> (Waxy Cryptandra)			
1137.	16018 <i>Cryptandra arbutiflora</i> var. <i>borealis</i>			
1138.	31614 <i>Cryptandra multispina</i>			
1139.	4802 <i>Cryptandra mutila</i>			
1140.	9076 <i>Cryptandra myriantha</i>			
1141.	4809 <i>Cryptandra pungens</i>			
1142.	-7517 <i>Cryptandra</i> sp.			
1143.	4811 <i>Cryptandra spyridioides</i>			
1144.	9077 <i>Cryptandra wichurae</i>			Y
1145.	26709 <i>Cryptonemia undulata</i>			
1146.	29599 <i>Cryptostegia grandiflora</i>	Y		
1147.	6663 <i>Cuscuta epithymum</i> (Lesser Dodder)	Y		
1148.	11021 <i>Cuscuta planiflora</i>	Y		
1149.	-11671 <i>Cuscuta</i> sp.			
1150.	15114 <i>Cyanicula gemmata</i>			
1151.	6216 <i>Cyclosporum leptophyllum</i>	Y		
1152.	281 <i>Cymbopogon obtectus</i> (Silkyheads)			
1153.	-12436 <i>Cymbopogon</i> sp.			
1154.	6584 <i>Cynanchum floribundum</i> (Dumara Bush)			
1155.	283 <i>Cynodon dactylon</i> (Couch)	Y		
1156.	786 <i>Cyperus cunninghamii</i>			
1157.	789 <i>Cyperus difformis</i> (Rice Sedge)			
1158.	794 <i>Cyperus gymnocaulos</i> (Spiny Flat-sedge)			
1159.	809 <i>Cyperus rigidellus</i>			
1160.	810 <i>Cyperus rotundus</i> (Nut Grass)	Y		
1161.	-13069 <i>Cyperus</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1162.	815 <i>Cyperus tenellus</i> (Tiny Flatsedge)	Y		
1163.	818 <i>Cyperus vaginatus</i> (Stiffleaf Sedge)			
1164.	10916 <i>Cyrtostylis huegelii</i>			
1165.	7421 <i>Dampiera altissima</i> (Tall Dampiera)			
1166.	7443 <i>Dampiera haematotricha</i>			
1167.	7448 <i>Dampiera incana</i> (Hoary Dampiera)			
1168.	11326 <i>Dampiera incana</i> var. <i>fuscescens</i>			
1169.	7453 <i>Dampiera lindleyi</i>			
1170.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
1171.	7459 <i>Dampiera oligophylla</i> (Sparse-leaved Dampiera)			
1172.	-10054 <i>Dampiera</i> sp.			
1173.	7475 <i>Dampiera spicigera</i> (Spiked Dampiera)			
1174.	5522 <i>Darwinia pauciflora</i>			
1175.	26738 <i>Dasya elongata</i>			
1176.	26752 <i>Dasyclonium incisum</i>			
1177.	26753 <i>Dasyphila preissii</i>			
1178.	10823 <i>Datura innoxia</i>	Y		
1179.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
1180.	3797 <i>Daviesia cardiophylla</i>			
1181.	3807 <i>Daviesia divaricata</i> (Marmo)			
1182.	18561 <i>Daviesia divaricata</i> subsp. <i>lanulosa</i>			
1183.	3814 <i>Daviesia hakeoides</i>			
1184.	11879 <i>Daviesia hakeoides</i> subsp. <i>hakeoides</i>			
1185.	3831 <i>Daviesia pedunculata</i>			
1186.	3832 <i>Daviesia physodes</i>			
1187.	17663 <i>Desmocladius asper</i>			
1188.	17624 <i>Desmocladius glomeratus</i>		P2	Y
1189.	17662 <i>Desmocladius lateriticus</i>			
1190.	17846 <i>Desmocladius parthenicus</i>			
1191.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
1192.	11636 <i>Dianella revoluta</i> var. <i>divaricata</i>			
1193.	1287 <i>Dichopogon capillipes</i>			
1194.	-5372 <i>Dichopogon</i> sp.			
1195.	26758 <i>Dicranema revolutum</i>			
1196.	6760 <i>Dicrastylis fulva</i>			
1197.	26762 <i>Dictyomenia sonderi</i>			
1198.	-5123 <i>Dictyomenia</i> sp.			
1199.	26763 <i>Dictyomenia tridens</i>			
1200.	26782 <i>Digenea simplex</i>			
1201.	311 <i>Digitaria ciliaris</i> (Summer Grass)	Y		
1202.	1509 <i>Dioscorea hastifolia</i> (Warrine)			
1203.	15270 <i>Diplolaena geraldtonensis</i>			
1204.	-10113 <i>Diplolaena geraldtonensis</i> x <i>grandiflora</i>			Y
1205.	4456 <i>Diplolaena grandiflora</i> (Wild Rose)			
1206.	15273 <i>Diplolaena leemaniana</i>			
1207.	18541 <i>Diplopeltis huegelii</i> subsp. <i>huegelii</i>			
1208.	18542 <i>Diplopeltis huegelii</i> subsp. <i>subintegra</i>			
1209.	4748 <i>Diplopeltis petiolaris</i>			
1210.	7961 <i>Dittrichia graveolens</i> (Stinkwort)	Y		
1211.	11049 <i>Diuris corymbosa</i>			
1212.	1634 <i>Diuris laxiflora</i> (Bee Orchid)			
1213.	12936 <i>Diuris recurva</i>		P4	
1214.	-8553 <i>Diuris refracta</i>			
1215.	1638 <i>Diuris setacea</i> (Bristly Donkey Orchid)			
1216.	19457 <i>Diuris</i> sp. <i>Eneabba</i> (A.H. Burbidge 3941)			
1217.	4754 <i>Dodonaea aptera</i> (Coast Hop-bush)			
1218.	4761 <i>Dodonaea ericoides</i>			
1219.	4766 <i>Dodonaea inaequifolia</i>			
1220.	4768 <i>Dodonaea larreoides</i>			
1221.	13633 <i>Drakaea concolor</i>		T	
1222.	3092 <i>Drosera bulbosa</i> (Red-leaved Sundew)			
1223.	13219 <i>Drosera bulbosa</i> subsp. <i>bulbosa</i>			
1224.	13220 <i>Drosera bulbosa</i> subsp. <i>major</i>			
1225.	3098 <i>Drosera glanduligera</i> (Pimpernel Sundew)			
1226.	8910 <i>Drosera humilis</i>			
1227.	3106 <i>Drosera macrantha</i> (Bridal Rainbow)			
1228.	14298 <i>Drosera macrantha</i> subsp. <i>macrantha</i>			
1229.	3107 <i>Drosera macrophylla</i> (Showy Sundew)			
1230.	11196 <i>Drosera menziesii</i> subsp. <i>thysanosepala</i>			
1231.	11246 <i>Drosera neesii</i> subsp. <i>borealis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1232.	3116 <i>Drosera omissa</i> (Bright Sundew)			
1233.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
1234.	3127 <i>Drosera radicans</i>			
1235.	8911 <i>Drosera rosulata</i>			
1236.	3131 <i>Drosera stolonifera</i> (Leafy Sundew)			
1237.	4458 <i>Drummondita ericoides</i> (Moresby Range Drummondita)		T	Y
1238.	1908 <i>Dryandra fraseri</i>			
1239.	6966 <i>Duboisia hopwoodii</i> (Pituri)			
1240.	31334 <i>Duperreya sericea</i>			
1241.	33597 <i>Dysphania melanocarpa</i> forma <i>melanocarpa</i> (Black Goosefoot)			
1242.	33480 <i>Dysphania pumilio</i> (Clammy Goosefoot)			
1243.	1066 <i>Ecdeiocolea monostachya</i>			
1244.	6681 <i>Echium plantagineum</i> (Paterson's Curse)	Y		
1245.	11485 <i>Ehrharta brevifolia</i> var. <i>cuspidata</i>	Y		
1246.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
1247.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
1248.	1644 <i>Elythranthera emarginata</i> (Pink Enamel Orchid)			
1249.	2510 <i>Enchylaena lanata</i>			
1250.	12064 <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Barrier Saltbush)			
1251.	29555 <i>Enekbatus bounites</i>		P2	Y
1252.	376 <i>Eragrostis curvula</i> (African Lovegrass)	Y		
1253.	378 <i>Eragrostis dielsii</i> (Mallee Lovegrass)			
1254.	393 <i>Eragrostis setifolia</i> (Neverfail Grass)			
1255.	5536 <i>Eremaea acutifolia</i> (Rusty Eremaea)		P2	
1256.	5537 <i>Eremaea beaufortiooides</i>			
1257.	5538 <i>Eremaea brevifolia</i>			
1258.	14102 <i>Eremaea ebracteata</i> var. <i>ebracteata</i>			
1259.	5541 <i>Eremaea pauciflora</i>			
1260.	7185 <i>Eremophila brevifolia</i> (Spotted Eremophila)		P2	
1261.	7189 <i>Eremophila clarkei</i> (Turpentine Bush)			
1262.	7200 <i>Eremophila drummondii</i>			
1263.	7215 <i>Eremophila glabra</i> (Tar Bush)			
1264.	17175 <i>Eremophila glabra</i> subsp. <i>albicans</i>			
1265.	14193 <i>Eremophila glabra</i> subsp. <i>carcosa</i>			
1266.	14191 <i>Eremophila glabra</i> subsp. <i>tomentosa</i>			
1267.	7230 <i>Eremophila latrobei</i> (Warty Fuchsia Bush)			
1268.	7273 <i>Eremophila strongylophylla</i>			
1269.	17162 <i>Eremophila subfloccosa</i> subsp. <i>lanata</i>			
1270.	408 <i>Eriachne flaccida</i> (Claypan Grass)			
1271.	413 <i>Eriachne mucronata</i> (Mountain Wanderrie Grass)			
1272.	415 <i>Eriachne ovata</i>			
1273.	1646 <i>Eriochilus dilatatus</i> (White Bunny Orchid)			
1274.	30432 <i>Eriochilus dilatatus</i> subsp. <i>brevifolius</i>			
1275.	15410 <i>Eriochilus dilatatus</i> subsp. <i>dilatatus</i>			
1276.	15413 <i>Eriochilus dilatatus</i> subsp. <i>undulatus</i>			
1277.	4331 <i>Erodium aureum</i>	Y		
1278.	4335 <i>Erodium cygnorum</i> (Blue Heronsbill)			
1279.	4336 <i>Erodium moschatum</i> (Musky Crowfoot)	Y		
1280.	3013 <i>Eruca sativa</i> (Purplevein Rocket)	Y		
1281.	14376 <i>Erymophyllum ramosum</i> subsp. <i>involucratum</i>			
1282.	12740 <i>Erymophyllum tenellum</i>			
1283.	26823 <i>Erythroclonium sonderi</i>			
1284.	12896 <i>Eucalyptus arachnaea</i> (Black-stemmed Mallee)			
1285.	12895 <i>Eucalyptus arachnaea</i> subsp. <i>arachnaea</i>			
1286.	9141 <i>Eucalyptus baudiniana</i>			
1287.	13039 <i>Eucalyptus blaxellii</i>		P4	
1288.	-4900 <i>Eucalyptus blaxellii</i> / <i>loxophleba</i>			Y
1289.	-3984 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i>			Y
1290.	-7085 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i> subsp. <i>supralaevis</i>			Y
1291.	35345 <i>Eucalyptus camaldulensis</i> subsp. <i>obtusa</i> (Blunt-budded River Red Gum)			
1292.	15441 <i>Eucalyptus camaldulensis</i> var. <i>obtusa</i> (Blunt-budded River Red Gum)			
1293.	13510 <i>Eucalyptus cuprea</i> (Mallee Box)		T	
1294.	15494 <i>Eucalyptus diminuta</i>			
1295.	15804 <i>Eucalyptus dolichocera</i>			
1296.	13550 <i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>		P4	
1297.	5640 <i>Eucalyptus eudesmioides</i> (Malalie)			
1298.	5648 <i>Eucalyptus flocktoniae</i> (Merri)			
1299.	5673 <i>Eucalyptus horistes</i>			
1300.	5681 <i>Eucalyptus jucunda</i> (Yuna Mallee)			
1301.	11295 <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> (York Gum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1302.	13038 <i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i>			
1303.	5722 <i>Eucalyptus obtusiflora</i> (Dongara Mallee)			
1304.	5725 <i>Eucalyptus oldfieldii</i> (Oldfield's Mallee)			
1305.	5730 <i>Eucalyptus oraria</i> (Ooragmandee)			
1306.	5756 <i>Eucalyptus pyriformis</i> (Pear-fruited Mallee)			
1307.	5761 <i>Eucalyptus rigidula</i> (Stiff-leaved Mallee)			
1308.	5763 <i>Eucalyptus rudis</i> (Flooded Gum)			
1309.	12883 <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i>			
1310.	5793 <i>Eucalyptus transcontinentalis</i> (Redwood)			
1311.	11011 <i>Eulalia aurea</i>			
1312.	4617 <i>Euphorbia australis</i> (Namana)			
1313.	4620 <i>Euphorbia boophthona</i> (Gascoyne Spurge)			
1314.	4626 <i>Euphorbia drummondii</i> (Caustic Weed)			
1315.	17896 <i>Euphorbia drummondii</i> subsp. <i>drummondii</i>			
1316.	20014 <i>Euphorbia hyssopifolia</i>	Y		
1317.	4638 <i>Euphorbia peplus</i> (Petty Spurge)	Y		
1318.	4644 <i>Euphorbia sharkoensis</i>			
1319.	12097 <i>Euphorbia tannensis</i> subsp. <i>eremophila</i> (Desert Spurge)			
1320.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
1321.	-4286 <i>Euptilota</i> sp.			
1322.	10765 <i>Exocarpos sparteus</i> (Broom Ballart)			
1323.	1515 <i>Ferraria crispa</i> (Black Flag)	Y		
1324.	430 <i>Festuca arundinacea</i> (Tall Fescue)	Y		
1325.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
1326.	18392 <i>Freesia alba</i> x <i>leichtlinii</i>	Y		
1327.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
1328.	904 <i>Gahnia drummondii</i>			
1329.	906 <i>Gahnia lanigera</i> (Little Sedge)			
1330.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
1331.	7323 <i>Galium murale</i> (Small Goosegrass)	Y		
1332.	3907 <i>Gastrolobium laytonii</i> (Breelya)			
1333.	20482 <i>Gastrolobium nervosum</i>			
1334.	3912 <i>Gastrolobium oxylobioides</i> (Champion Bay Poison)			
1335.	3915 <i>Gastrolobium plicatum</i>			
1336.	3917 <i>Gastrolobium propinquum</i> (Hutt River Poison)		P3	
1337.	3924 <i>Gastrolobium spinosum</i> (Prickly Poison)			
1338.	19189 <i>Gastrolobium triangulare</i>			Y
1339.	16311 <i>Gazania linearis</i>	Y		
1340.	38241 <i>Geleznovia</i> sp. <i>Binnu</i> (K.A. Shepherd & J. Wege KS 1301)			
1341.	38242 <i>Geleznovia</i> sp. <i>Marchagee</i> (A. Crawford ADC 1353)			
1342.	4483 <i>Geleznovia verrucosa</i>			
1343.	12780 <i>Gilberta tenuifolia</i>			
1344.	33620 <i>Glischrocaryon angustifolium</i>			
1345.	6143 <i>Glischrocaryon aureum</i> (Common Popflower)			
1346.	7060 <i>Glossostigma diandrum</i>			
1347.	3938 <i>Glycine canescens</i> (Silky Glycine)			
1348.	8002 <i>Gnephosis tenuissima</i>			
1349.	19215 <i>Gompholobium glutinosum</i>			
1350.	10777 <i>Gompholobium gompholobioides</i>			
1351.	3951 <i>Gompholobium marginatum</i>			
1352.	19295 <i>Gompholobium pungens</i>			
1353.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
1354.	2677 <i>Gomphrena celosioides</i> (Gomphrena Weed)	Y		
1355.	11801 <i>Gonocarpus confertifolius</i> var. <i>helmsii</i>			
1356.	6159 <i>Gonocarpus nodulosus</i>			
1357.	6160 <i>Gonocarpus paniculatus</i>			
1358.	7495 <i>Goodenia berardiana</i>			
1359.	29362 <i>Goodenia coerulea</i>			
1360.	17806 <i>Goodenia drummondii</i> subsp. <i>drummondii</i>			
1361.	7513 <i>Goodenia hassallii</i>			
1362.	12551 <i>Goodenia micrantha</i>			
1363.	7527 <i>Goodenia mimuloides</i>			
1364.	7535 <i>Goodenia pinnatifida</i> (Cutleaf Goodenia)			
1365.	1951 <i>Grevillea amplexans</i>			
1366.	19357 <i>Grevillea amplexans</i> subsp. <i>amplexans</i>			
1367.	1956 <i>Grevillea argyrophylla</i> (Silvery-leaved Grevillea)			
1368.	15763 <i>Grevillea biformis</i> subsp. <i>biformis</i>			
1369.	1965 <i>Grevillea biternata</i>			
1370.	1968 <i>Grevillea bracteosa</i> (Bracted Grevillea)			
1371.	33579 <i>Grevillea bracteosa</i> subsp. <i>howatharra</i>		T	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1372.	1973 <i>Grevillea candelabroides</i>			
1373.	18116 <i>Grevillea commutata</i> subsp. <i>commutata</i>			
1374.	18130 <i>Grevillea commutata</i> subsp. <i>pinnatisecta</i>			
1375.	13453 <i>Grevillea didymobotrya</i> subsp. <i>didymobotrya</i>			
1376.	13454 <i>Grevillea didymobotrya</i> subsp. <i>involuta</i>			
1377.	1989 <i>Grevillea dielsiana</i> (<i>Diels Grevillea</i>)			
1378.	1999 <i>Grevillea erinacea</i>		P3	
1379.	2001 <i>Grevillea eriostachya</i> (<i>Flame Grevillea</i>)			
1380.	15816 <i>Grevillea filifolia</i>		P1	Y
1381.	15817 <i>Grevillea hirtella</i>		P3	
1382.	2022 <i>Grevillea integrifolia</i> (<i>Entire-leaved Grevillea</i>)			
1383.	2023 <i>Grevillea intricata</i>			
1384.	2032 <i>Grevillea leucopteris</i> (<i>White Plume Grevillea</i>)			
1385.	13416 <i>Grevillea petrophiloides</i> subsp. <i>petrophiloides</i>			
1386.	2063 <i>Grevillea phanerophlebia</i> (<i>Prominent Vein Grevillea</i>)		T	
1387.	8638 <i>Grevillea pinaster</i>			
1388.	15839 <i>Grevillea preissii</i> subsp. <i>preissii</i>			
1389.	-3994 <i>Grevillea</i> sp.			
1390.	2113 <i>Grevillea triloba</i>		P3	
1391.	17416 <i>Guichenotia angustifolia</i>			
1392.	5011 <i>Guichenotia ledifolia</i>			
1393.	5012 <i>Guichenotia macrantha</i> (<i>Large-flowered Guichenotia</i>)			
1394.	5013 <i>Guichenotia micrantha</i> (<i>Small Flowered Guichenotia</i>)			
1395.	-11458 <i>Guichenotia</i> sp.			
1396.	2807 <i>Gunnopsia quadrifida</i> (<i>Sturts Pigface</i>)			
1397.	2783 <i>Gyrostemon racemiger</i>			
1398.	2784 <i>Gyrostemon ramulosus</i> (<i>Corkybark</i>)			
1399.	2788 <i>Gyrostemon subnudus</i>			
1400.	1465 <i>Haemodorum discolor</i>			
1401.	1468 <i>Haemodorum laxum</i>			
1402.	1470 <i>Haemodorum paniculatum</i> (<i>Mardja</i>)			
1403.	1472 <i>Haemodorum simplex</i>			
1404.	1473 <i>Haemodorum simulans</i>			
1405.	-4252 <i>Haemodorum</i> sp.			
1406.	1474 <i>Haemodorum sparsiflorum</i>			
1407.	2131 <i>Hakea auriculata</i>			
1408.	2135 <i>Hakea bucculenta</i> (<i>Red Pokers</i>)			
1409.	2140 <i>Hakea circumalata</i>			
1410.	2146 <i>Hakea costata</i> (<i>Ribbed Hakea</i>)			
1411.	11924 <i>Hakea cygna</i> subsp. <i>cygna</i> (<i>Swan Fruit Hakea</i>)			
1412.	16908 <i>Hakea eneabba</i>			
1413.	2166 <i>Hakea incrassata</i> (<i>Marble Hakea</i>)			
1414.	2175 <i>Hakea lissocarpha</i> (<i>Honey Bush</i>)			
1415.	2190 <i>Hakea oldfieldii</i>		P3	
1416.	16901 <i>Hakea orthorrhyncha</i> var. <i>filiformis</i>			
1417.	2195 <i>Hakea platysperma</i> (<i>Cricket Ball Hakea</i>)			
1418.	2196 <i>Hakea preissii</i> (<i>Needle Tree</i>)			
1419.	2197 <i>Hakea prostrata</i> (<i>Harsh Hakea</i>)			
1420.	12233 <i>Hakea psilorrhyncha</i>			
1421.	2198 <i>Hakea pycnoneura</i>			
1422.	17557 <i>Hakea recurva</i> subsp. <i>recurva</i>			
1423.	2206 <i>Hakea stenocarpa</i> (<i>Narrow-fruited Hakea</i>)			
1424.	2214 <i>Hakea trifurcata</i> (<i>Two-leaf Hakea</i>)			
1425.	17485 <i>Halgania anagalloides</i>			
1426.	6685 <i>Halgania argyrophylla</i>			
1427.	10904 <i>Halgania bebrana</i>			
1428.	30294 <i>Halgania gustafsenii</i> var. <i>Mid West</i> (<i>G. Perry 370</i>)			
1429.	6696 <i>Halgania sericiflora</i>			
1430.	29716 <i>Halgania</i> sp. <i>Wongan Hills</i> (<i>K.F. Kenneally 2393</i>)			
1431.	13141 <i>Haliptilon roseum</i>			
1432.	-6317 <i>Halophila</i> sp.			
1433.	6180 <i>Haloragis trigonocarpa</i>			
1434.	17781 <i>Hannafordia quadrivalvis</i> subsp. <i>quadrivalvis</i>			
1435.	28253 <i>Hedynois rhagadioloides</i> subsp. <i>cretica</i>	Y		
1436.	8008 <i>Helianthus annuus</i> (<i>Sunflower</i>)	Y		
1437.	29594 <i>Helichrysum luteoalbum</i> (<i>Jersey Cudweed</i>)			
1438.	8027 <i>Helichrysum macranthum</i>			
1439.	17299 <i>Heliotropium ammophilum</i>			
1440.	6707 <i>Heliotropium curassavicum</i> (<i>Smooth Heliotrope</i>)			
1441.	26912 <i>Helminthocladia australis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1442.	11451 <i>Hemarthria uncinata</i> var. <i>uncinata</i>			
1443.	6840 <i>Hemiandra rubriflora</i>			
1444.	6849 <i>Hemigenia diplanthera</i>			
1445.	6869 <i>Hemigenia saligna</i>		P3	
1446.	26915 <i>Hennedya crispa</i>			
1447.	26925 <i>Heterocladia caudata</i>			
1448.	26927 <i>Heterodoxia denticulata</i>			
1449.	5108 <i>Hibbertia acerosa</i> (Needle Leaved Guinea Flower)			
1450.	5112 <i>Hibbertia aurea</i>			
1451.	5115 <i>Hibbertia conspicua</i> (Leafless Hibbertia)			
1452.	5116 <i>Hibbertia crassifolia</i>			
1453.	5120 <i>Hibbertia desmophylla</i>			
1454.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
1455.	5148 <i>Hibbertia mylnei</i>			
1456.	5158 <i>Hibbertia potentilliflora</i>			
1457.	5166 <i>Hibbertia rupicola</i>			
1458.	-10292 <i>Hibbertia</i> sp.			
1459.	5171 <i>Hibbertia spicata</i>			
1460.	11481 <i>Hibbertia spicata</i> subsp. <i>spicata</i>			
1461.	5177 <i>Hibbertia verrucosa</i>			
1462.	4927 <i>Hibiscus drummondii</i> (Drummond's Hibiscus)			
1463.	9085 <i>Hibiscus huegelii</i> (Lilac Hibiscus)			Y
1464.	-7172 <i>Hibiscus</i> sp.			
1465.	5807 <i>Homalocalyx chapmanii</i>		P2	
1466.	5812 <i>Homalocalyx inerrabundus</i>		P2	
1467.	8476 <i>Hordeum hystrix</i> (Mediterranean Region Barley Grass)	Y		
1468.	449 <i>Hordeum leporinum</i> (Barley Grass)	Y		
1469.	450 <i>Hordeum marinum</i>	Y		
1470.	3968 <i>Hovea trisperma</i> (Common Hovea)			
1471.	12741 <i>Hyalosperma cotula</i>			
1472.	12742 <i>Hyalosperma demissum</i>			
1473.	-12666 <i>Hyalosperma glutinosa</i> subsp. <i>glutinosa</i>			
1474.	12743 <i>Hyalosperma glutinosum</i>			
1475.	15447 <i>Hyalosperma glutinosum</i> subsp. <i>glutinosum</i>			
1476.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
1477.	5221 <i>Hybanthus floribundus</i>			
1478.	12007 <i>Hybanthus floribundus</i> subsp. <i>floribundus</i>			
1479.	6223 <i>Hydrocotyle alata</i>			
1480.	6226 <i>Hydrocotyle callicarpa</i> (Small Pennywort)			
1481.	11546 <i>Hydrocotyle pilifera</i> var. <i>glabrata</i>			
1482.	452 <i>Hyparrhenia hirta</i> (Tambookie Grass)	Y		
1483.	5180 <i>Hypericum gramineum</i> (Small St John's Wort)			
1484.	5181 <i>Hypericum japonicum</i> (Matted St John's Wort)			
1485.	26973 <i>Hypnea valentiae</i>			
1486.	5817 <i>Hypocalymma angustifolium</i> (White Myrtle)			
1487.	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
1488.	1070 <i>Hypolaena exsulca</i>			
1489.	11699 <i>Hypoxis glabella</i> var. <i>glabella</i>			
1490.	11604 <i>Hypoxis glabella</i> var. <i>leptantha</i>			
1491.	1503 <i>Hypoxis occidentalis</i>			
1492.	11736 <i>Hypoxis occidentalis</i> var. <i>occidentalis</i>			
1493.	14884 <i>Indigofera occidentalis</i>			
1494.	6620 <i>Ipomoea cairica</i> (Coast Morning Glory)	Y		
1495.	6622 <i>Ipomoea carnea</i>	Y		
1496.	6630 <i>Ipomoea indica</i> (Morning Glory)	Y		
1497.	8087 <i>Isoetopsis graminifolia</i> (Cushion Grass)			
1498.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
1499.	911 <i>Isolepis congrua</i>			
1500.	912 <i>Isolepis cyperoides</i>			
1501.	917 <i>Isolepis marginata</i> (Coarse Club-rush)	Y		
1502.	923 <i>Isolepis setiformis</i>			
1503.	2227 <i>Isopogon divergens</i> (Spreading Coneflower)			
1504.	2229 <i>Isopogon dubius</i> (Pincushion Coneflower)			
1505.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
1506.	3992 <i>Isotropis cuneifolia</i> (Granny Bonnets)			
1507.	19700 <i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			
1508.	-7160 <i>Isotropis</i> sp.			
1509.	3998 <i>Jacksonia angulata</i>			
1510.	14780 <i>Jacksonia arenicola</i>			
1511.	14783 <i>Jacksonia calcicola</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1512.	4006 <i>Jacksonia cupulifera</i>			
1513.	4010 <i>Jacksonia floribunda</i> (Holly Pea)			
1514.	4015 <i>Jacksonia hakeoides</i>			
1515.	14778 <i>Jacksonia nutans</i>			
1516.	14785 <i>Jacksonia rigida</i>			
1517.	-6184 <i>Jacksonia</i> sp.			
1518.	4029 <i>Jacksonia sternbergiana</i> (Stinkwood)			
1519.	-5319 <i>Jania</i> sp.			
1520.	6500 <i>Jasminum calcareum</i> (Poison Creeper)			
1521.	20454 <i>Juncus acutus</i> subsp. <i>acutus</i>	Y		
1522.	1178 <i>Juncus bufonius</i> (Toad Rush)	Y		
1523.	1180 <i>Juncus capitatus</i> (Capitate Rush)	Y		
1524.	11922 <i>Juncus kraussii</i> subsp. <i>australiensis</i>			
1525.	1194 <i>Juncus radula</i>			
1526.	4043 <i>Kennedia prorepens</i>			
1527.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
1528.	5022 <i>Keraudrenia hermanniifolia</i>			
1529.	12008 <i>Kickxia elatine</i> subsp. <i>crinita</i>	Y		
1530.	26994 <i>Kuetzingia angusta</i>			
1531.	26995 <i>Kuetzingia canaliculata</i>			
1532.	3667 <i>Labichea lanceolata</i> (Tall Labichea)			
1533.	11289 <i>Labichea lanceolata</i> subsp. <i>lanceolata</i>			
1534.	11545 <i>Labichea teretifolia</i> subsp. <i>grandistipulata</i>			
1535.	4046 <i>Lablab purpureus</i> (Lablab Bean)	Y		
1536.	20019 <i>Lachnagrostis filiformis</i>			
1537.	6780 <i>Lachnostachys eriobotrya</i> (Lambswool)			
1538.	6781 <i>Lachnostachys ferruginea</i> (Rusty Lambstail)			
1539.	-11593 <i>Lachnostachys</i> sp.			
1540.	17209 <i>Lachnostachys verbascifolia</i> var. <i>verbascifolia</i>			
1541.	18585 <i>Lagenophora huegelii</i>			
1542.	468 <i>Lamarckia aurea</i> (Goldentop)	Y		
1543.	6733 <i>Lantana camara</i> (Common Lantana)	Y		
1544.	-12044 <i>Lantana</i> sp.			Y
1545.	9099 <i>Lasiopetalum angustifolium</i> (Narrow Leaved Lasiopetalum)			
1546.	27001 <i>Laurencia filiformis</i>			
1547.	27002 <i>Laurencia forsteri</i>			
1548.	27005 <i>Laurencia majuscula</i>			
1549.	13284 <i>Lawrencella rosea</i>			
1550.	4959 <i>Lawrencella squamata</i>			
1551.	1305 <i>Laxmannia omnifertilis</i>			
1552.	11679 <i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i>			
1553.	11732 <i>Laxmannia sessiliflora</i> subsp. <i>sessiliflora</i>			
1554.	-10586 <i>Laxmannia</i> sp.			
1555.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
1556.	7580 <i>Lechenaultia linarioides</i> (Yellow Leschenaultia)			
1557.	19727 <i>Leiocarpa semicalva</i> subsp. <i>semicalva</i>			
1558.	27011 <i>Lenormandia latifolia</i>			
1559.	27013 <i>Lenormandia spectabilis</i>			
1560.	3018 <i>Lepidium africanum</i> (Rubble Peppergrass)	Y		
1561.	3030 <i>Lepidium lyratogynum</i>			
1562.	1073 <i>Lepidobolus chaetocephalus</i> (Bristle-headed Chaff Rush)			
1563.	1075 <i>Lepidobolus preissianus</i>			
1564.	18074 <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
1565.	-3273 <i>Lepidosperma</i> aff. <i>squamatum</i> (GJK & NG 5462)			
1566.	-3376 <i>Lepidosperma</i> aff. <i>tenuis</i>			
1567.	928 <i>Lepidosperma brunonianum</i>			
1568.	930 <i>Lepidosperma costale</i>			
1569.	936 <i>Lepidosperma leptostachyum</i>			
1570.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
1571.	944 <i>Lepidosperma scabrum</i>			
1572.	-10997 <i>Lepidosperma</i> sp.			
1573.	-3301 <i>Lepidosperma</i> sp. (NG 3944)			Y
1574.	-10998 <i>Lepidosperma</i> sp. <i>K</i>			
1575.	29147 <i>Lepidosperma</i> sp. <i>Moresby Range</i> (R.J. Cranfield 2751)		P1	Y
1576.	29145 <i>Lepidosperma</i> sp. <i>Zuytdorp</i> (G.J. Keighery & N. Gibson 1710)			
1577.	945 <i>Lepidosperma squamatum</i>			
1578.	947 <i>Lepidosperma tenuis</i>			
1579.	1653 <i>Leporella fimbriata</i> (Hare Orchid)			
1580.	19124 <i>Leptochloa fusca</i> subsp. <i>fusca</i>			
1581.	2350 <i>Leptomeria pauciflora</i> (Sparse-flowered Currant Bush)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1582.	15428 <i>Leptosema aphyllum</i>			
1583.	5853 <i>Leptospermum oligandrum</i>			
1584.	6354 <i>Leucopogon allittii</i>			
1585.	31794 <i>Leucopogon borealis</i>		P2	Y
1586.	6412 <i>Leucopogon marginatus</i>		T	
1587.	14832 <i>Leucopogon oblongus</i>			Y
1588.	6437 <i>Leucopogon psammophilus</i>		P1	
1589.	-7718 <i>Leucopogon</i> sp.			
1590.	20365 <i>Leucopogon</i> sp. Howatharra (D. & N. McFarland 1046)		P2	Y
1591.	31754 <i>Leucopogon</i> sp. Kojarena (J. Brooker 232)		P1	Y
1592.	20364 <i>Leucopogon</i> sp. Mid West (J.S. Beard 7388)			
1593.	20360 <i>Leucopogon</i> sp. Moresby Range (S. Patrick 2614)		P3	
1594.	-3306 <i>Leucopogon</i> sp. Morseby Range (GJK & NG 6526)			Y
1595.	37042 <i>Leucopogon</i> sp. Nabawa (M. Hislop 2765)			Y
1596.	34157 <i>Leucopogon</i> sp. Northern ciliate (R. Davis 3393)			
1597.	27018 <i>Leveillea jungermannioides</i>			
1598.	7670 <i>Levenhookia dubia</i> (Hairy Stylewort)			
1599.	7671 <i>Levenhookia leptantha</i> (Trumpet Stylewort)			
1600.	7676 <i>Levenhookia pusilla</i> (Midget Stylewort)			
1601.	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
1602.	6489 <i>Limonium sinuatum</i> (Perennial Sea Lavender)	Y		
1603.	7075 <i>Linaria maroccana</i>	Y		
1604.	4362 <i>Linum marginale</i> (Wild Flax)			
1605.	7400 <i>Lobelia alata</i> (Angled Lobelia)			
1606.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
1607.	7402 <i>Lobelia gibbosa</i> (Tall Lobelia)			
1608.	7407 <i>Lobelia rhytidospema</i> (Wrinkled-seeded Lobelia)			
1609.	16798 <i>Logania litoralis</i>			
1610.	6512 <i>Logania spermacocea</i>			
1611.	6515 <i>Logania vaginalis</i> (White Spray)			
1612.	10957 <i>Lolium perenne</i> x <i>rigidum</i>	Y		
1613.	478 <i>Lolium rigidum</i> (Wimmera Ryegrass)	Y		
1614.	11384 <i>Lolium temulentum</i> forma <i>temulentum</i>	Y		
1615.	1226 <i>Lomandra effusa</i> (Scented Matrush)			
1616.	1231 <i>Lomandra maritima</i>			
1617.	14542 <i>Lomandra micrantha</i> subsp. <i>micrantha</i>			
1618.	1234 <i>Lomandra nigricans</i>			
1619.	4060 <i>Lotus australis</i> (Austral Trefoil)			
1620.	4066 <i>Lupinus cosentinii</i>	Y		
1621.	6968 <i>Lycium ferocissimum</i> (African Boxthorn)	Y		
1622.	18049 <i>Lyginia imberbis</i>			
1623.	2396 <i>Lysiana casuarinae</i>			
1624.	36375 <i>Lysimachia arvensis</i> (Pimpernel)	Y		
1625.	34736 <i>Lysinema pentapetalum</i>			
1626.	5281 <i>Lythrum hyssopifolia</i> (Lesser Loosestrife)	Y		
1627.	2839 <i>Macarthuria australis</i>			
1628.	4070 <i>Macroptilium atropurpureum</i> (Purple Bean)	Y		
1629.	2539 <i>Maireana convexa</i> (Mulga Bluebush)			
1630.	2556 <i>Maireana planifolia</i> (Low Bluebush)			
1631.	-12679 <i>Maireana</i> sp.			
1632.	5861 <i>Malleostemon hursthousei</i>			
1633.	5864 <i>Malleostemon peltiger</i>			
1634.	14469 <i>Malleostemon</i> sp. Moonyoonooka (R.J. Cranfield 2947)		P2	Y
1635.	4961 <i>Malva parviflora</i> (Marshmallow)	Y		
1636.	19421 <i>Marianthus bicolor</i> (Painted Marianthus)			
1637.	17632 <i>Marianthus ringens</i>			
1638.	76 <i>Marsilea hirsuta</i> (Nardoo)			
1639.	-13015 <i>Marsilea</i> sp.			
1640.	11275 <i>Medicago laciniata</i> var. <i>laciniata</i>	Y		
1641.	4077 <i>Medicago minima</i> (Small Burr Medic)	Y		
1642.	4079 <i>Medicago polymorpha</i> (Burr Medic)	Y		
1643.	15064 <i>Melaleuca acuminata</i> subsp. <i>websteri</i>			
1644.	37580 <i>Melaleuca acutifolia</i>			
1645.	5876 <i>Melaleuca aspalathoides</i>			
1646.	19384 <i>Melaleuca bisulcata</i>			
1647.	19048 <i>Melaleuca campanae</i>			
1648.	5887 <i>Melaleuca cardiophylla</i> (Tangling Melaleuca)			
1649.	5893 <i>Melaleuca concreta</i>			
1650.	16088 <i>Melaleuca coroncarpa</i>			
1651.	5904 <i>Melaleuca depressa</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1652.	15602 <i>Melaleuca fulgens</i> subsp. <i>steadmanii</i>			
1653.	18129 <i>Melaleuca hollidayi</i>			
1654.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
1655.	19451 <i>Melaleuca huttensis</i>		P1	
1656.	5922 <i>Melaleuca lanceolata</i> (Rottnest Teatree)			
1657.	5930 <i>Melaleuca leiopyxis</i>			
1658.	18112 <i>Melaleuca leuropoma</i>			
1659.	18435 <i>Melaleuca longistaminea</i>			
1660.	5936 <i>Melaleuca megacephala</i>			
1661.	5958 <i>Melaleuca radula</i> (Graceful Honeymyrtle)			
1662.	5959 <i>Melaleuca rhapsiophylla</i> (Swamp Paperbark)			
1663.	-3184 <i>Melaleuca</i> sp.			
1664.	37660 <i>Melaleuca spectabilis</i>			Y
1665.	19449 <i>Melaleuca stereophloia</i>			
1666.	18598 <i>Melaleuca systema</i>			
1667.	5983 <i>Melaleuca trichophylla</i>			
1668.	-3611 <i>Melaleuca uncinata</i> group			
1669.	-9503 <i>Melaleuca urceolaris</i> x <i>zonalis</i>			
1670.	5987 <i>Melaleuca viminea</i> (Mohan)			
1671.	13280 <i>Melaleuca viminea</i> subsp. <i>viminea</i>			
1672.	4085 <i>Melilotus indicus</i>	Y		
1673.	14985 <i>Melinis repens</i>	Y		
1674.	6884 <i>Mentha spicata</i> (Spearmint)	Y		
1675.	2813 <i>Mesembryanthemum crystallinum</i> (Iceplant)	Y		
1676.	954 <i>Mesomelaena preissii</i>			
1677.	955 <i>Mesomelaena pseudostygia</i>			
1678.	27070 <i>Metamastophora flabellata</i>			
1679.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
1680.	37680 <i>Micromyrtus collina</i>		P1	
1681.	19855 <i>Micromyrtus rubricalyx</i>		P2	Y
1682.	8814 <i>Microtis brownii</i>			
1683.	17423 <i>Microtis graniticola</i>			
1684.	10954 <i>Microtis media</i> (Tall Mignonette Orchid)			
1685.	15419 <i>Microtis media</i> subsp. <i>media</i>			
1686.	-3881 <i>Microtis</i> sp.			
1687.	8105 <i>Millotia myosotidifolia</i>			
1688.	8107 <i>Minuria cunninghamii</i> (Bush Minuria)			
1689.	4089 <i>Mirbelia depressa</i>			
1690.	4091 <i>Mirbelia floribunda</i> (Purple Mirbelia)			
1691.	4097 <i>Mirbelia ramulosa</i>			
1692.	4100 <i>Mirbelia spinosa</i>			
1693.	4104 <i>Mirbelia trichocalyx</i>			
1694.	7085 <i>Misopates orontium</i> (Lesser Snapdragon)	Y		
1695.	33136 <i>Molineriella minuta</i> (Small Hairgrass)	Y		
1696.	29418 <i>Monoculus monstrosus</i>	Y		
1697.	7410 <i>Monopsis debilis</i>	Y		
1698.	37440 <i>Monopsis debilis</i> var. <i>depressa</i>	Y		
1699.	19584 <i>Monotaxis bracteata</i>			
1700.	4663 <i>Monotaxis lurida</i>			Y
1701.	19177 <i>Moraea setifolia</i>	Y		
1702.	2412 <i>Muehlenbeckia adpressa</i> (Climbing Lignum)			
1703.	7289 <i>Myoporum caprarioides</i> (Slender Myoporum)			
1704.	7291 <i>Myoporum insulare</i> (Blueberry Tree)			
1705.	17158 <i>Myoporum montanum</i> (Native Myrtle)			
1706.	10978 <i>Nemcia pauciflora</i>			
1707.	6243 <i>Neosciadium glochidiatum</i>			
1708.	492 <i>Neurachne alopecuroidea</i> (Foftail Mulga Grass)			
1709.	27100 <i>Neurymenia fraxinifolia</i>			
1710.	6974 <i>Nicotiana glauca</i> (Tree Tobacco)	Y		
1711.	11327 <i>Nicotiana occidentalis</i> subsp. <i>hesperis</i>			
1712.	11331 <i>Nicotiana occidentalis</i> subsp. <i>obliqua</i>			
1713.	6978 <i>Nicotiana rotundifolia</i> (Round-leaved Tobacco)			
1714.	4366 <i>Nitraria billardierei</i> (Nitre Bush)			
1715.	27103 <i>Nizymenia conferta</i>			
1716.	1381 <i>Nothoscordum gracile</i>	Y		
1717.	2401 <i>Nuytsia floribunda</i> (Christmas Tree)			
1718.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
1719.	15449 <i>Olearia dampieri</i> subsp. <i>dampieri</i>			
1720.	15450 <i>Olearia dampieri</i> subsp. <i>eremicola</i>			
1721.	8136 <i>Olearia homolepis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1722.	19801 <i>Oligochaetochilus sanguineus</i>			
1723.	19804 <i>Oligochaetochilus vittatus</i>			
1724.	-11061 <i>Opercularia</i> sp.			
1725.	18256 <i>Opercularia spermacocea</i>			
1726.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
1727.	-9864 <i>Opuntia</i> sp.			
1728.	7122 <i>Orobanche minor</i> (Lesser Broomrape)	Y		
1729.	11749 <i>Orthrosanthus laxus</i> var. <i>laxus</i> (Morning Iris)			
1730.	27107 <i>Osmundaria prolifera</i>			
1731.	4355 <i>Oxalis perennans</i>			
1732.	4356 <i>Oxalis pes-caprae</i> (Soursob)	Y		
1733.	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
1734.	36259 <i>Palisada cruciata</i>			
1735.	503 <i>Panicum decompositum</i> (Native Millet)			
1736.	516 <i>Parapholis incurva</i> (Coast Bargrass)	Y		
1737.	17114 <i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>			
1738.	7089 <i>Parentucellia latifolia</i> (Common Bartsia)	Y		
1739.	7090 <i>Parentucellia viscosa</i> (Sticky Bartsia)	Y		
1740.	12670 <i>Parietaria cardiostegia</i>			
1741.	1762 <i>Parietaria debilis</i> (Pellitory)			
1742.	10975 <i>Paspalidium basicladum</i>			
1743.	-12177 <i>Paspalidium</i> sp.			
1744.	-1528 <i>Paspalidium</i> sp. <i>indet</i>			
1745.	528 <i>Paspalum distichum</i> (Water Couch)	Y		
1746.	533 <i>Paspalum vaginatum</i> (Salt Water Couch)	Y		
1747.	1550 <i>Patersonia occidentalis</i> (Purple Flag)			
1748.	30476 <i>Patersonia occidentalis</i> var. <i>latifolia</i>			
1749.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
1750.	537 <i>Pennisetum glaucum</i> (Pearl Millet)	Y		
1751.	541 <i>Pennisetum setaceum</i> (Fountain Grass)	Y		
1752.	542 <i>Pennisetum villosum</i> (Feathertop)	Y		
1753.	7593 <i>Pentaptilon careyi</i>			
1754.	543 <i>Pentaschistis airoides</i> (False Hairgrass)	Y		
1755.	24022 <i>Pentaschistis airoides</i> subsp. <i>airoides</i>	Y		
1756.	11052 <i>Pericaria prostrata</i>			
1757.	2255 <i>Persoonia angustiflora</i>			
1758.	15629 <i>Persoonia hexagona</i>			
1759.	15632 <i>Persoonia stricta</i>			
1760.	2286 <i>Petrophile brevifolia</i>			
1761.	2290 <i>Petrophile conifera</i>			
1762.	2301 <i>Petrophile macrostachya</i>			
1763.	2303 <i>Petrophile megalostegia</i>			
1764.	29192 <i>Petrophile pilostyla</i> subsp. <i>pilostyla</i>			
1765.	10784 <i>Petrophile scabriuscula</i>			
1766.	19825 <i>Petrorhagia dubia</i>	Y		
1767.	27134 <i>Phacelocarpus peperocarpos</i>			
1768.	-12141 <i>Phaeoceros laevis</i>			
1769.	551 <i>Phalaris minor</i> (Lesser Canary Grass)	Y		
1770.	20460 <i>Pheladenia deformis</i>			
1771.	18505 <i>Philothea wonganensis</i>		T	
1772.	1173 <i>Philydrella pygmaea</i> (Butterfly Flowers)			
1773.	14306 <i>Philydrella pygmaea</i> subsp. <i>pygmaea</i>			
1774.	16825 <i>Phyllangium divergens</i>			
1775.	-3338 <i>Phyllangium paradoxum</i> complex.			
1776.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
1777.	4681 <i>Phyllanthus maitlandianus</i>			
1778.	4685 <i>Phyllanthus scaber</i>			
1779.	6009 <i>Pileanthus filifolius</i> (Summer Coppercups)			
1780.	20219 <i>Pileanthus peduncularis</i> subsp. <i>peduncularis</i>			
1781.	20220 <i>Pileanthus rubronitidus</i>			
1782.	18250 <i>Pileanthus vernicosus</i>			
1783.	5231 <i>Pimelea angustifolia</i> (Narrow-leaved Pimelea)			
1784.	5232 <i>Pimelea argentea</i> (Silvery Leaved Pimelea)			
1785.	5244 <i>Pimelea floribunda</i>			
1786.	5246 <i>Pimelea gilgiana</i>			
1787.	11402 <i>Pimelea imbricata</i> var. <i>piliger</i>			
1788.	11185 <i>Pimelea microcephala</i> subsp. <i>microcephala</i>			
1789.	19744 <i>Pittosporum angustifolium</i>			
1790.	19745 <i>Pittosporum ligustrifolium</i>			
1791.	3173 <i>Pittosporum phylliraeoides</i> (Weeping Pittosporum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1792.	6798 <i>Pityrodia atriplicina</i>			
1793.	6811 <i>Pityrodia hemigenioides</i>			
1794.	6814 <i>Pityrodia loxocarpa</i>			
1795.	6816 <i>Pityrodia oldfieldii</i> (Oldfields Foxglove)			
1796.	6824 <i>Pityrodia verbascina</i> (Golden Bush)			
1797.	11785 <i>Plantago coronopus</i> subsp. <i>commutata</i>	Y		
1798.	7299 <i>Plantago debilis</i>			
1799.	6247 <i>Platysace cirrosa</i> (Karna)			
1800.	6255 <i>Platysace juncea</i>			
1801.	14996 <i>Platysace</i> sp. <i>Eneabba</i> (R. Hnatiuk 770001)			
1802.	27156 <i>Plocamium mertensii</i>			
1803.	571 <i>Poa annua</i> (Winter Grass)	Y		
1804.	577 <i>Poa poliformis</i> (Coastal Poa)			
1805.	8172 <i>Podolepis canescens</i>			
1806.	8173 <i>Podolepis capillaris</i> (Wiry Podolepis)			
1807.	8177 <i>Podolepis lessonii</i>			
1808.	8182 <i>Podotrochea angustifolia</i> (Sticky Longheads)			
1809.	8184 <i>Podotrochea gnaphalioides</i> (Golden Long-heads)			
1810.	8188 <i>Pogonolepis stricta</i>			
1811.	29919 <i>Polianthion wichurae</i>			
1812.	2905 <i>Polycarpon tetraphyllum</i> (Fourleaf Allseed)	Y		
1813.	2419 <i>Polygonum aviculare</i> (Wireweed)	Y		
1814.	582 <i>Polypogon monspeliensis</i> (Annual Beardgrass)	Y		
1815.	27173 <i>Polysiphonia decipiens</i>			
1816.	4688 <i>Poranthera drummondii</i>			
1817.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
1818.	2884 <i>Portulaca oleracea</i> (Purslane)	Y		
1819.	111 <i>Potamogeton ochreateus</i> (Blunt Pondweed)			
1820.	1669 <i>Prasophyllum cyphochilum</i> (Pouched Leek Orchid)			
1821.	1671 <i>Prasophyllum elatum</i> (Tall Leek Orchid)			
1822.	1672 <i>Prasophyllum fimbria</i> (Fringed Leek Orchid)			
1823.	1674 <i>Prasophyllum giganteum</i> (Bronze Leek Orchid)			
1824.	16688 <i>Prasophyllum gracile</i>			
1825.	-1736 <i>Prasophyllum macrostachyum</i> var. <i>ringens</i>			
1826.	1682 <i>Prasophyllum sargentii</i>			
1827.	3620 <i>Prosopis pallida</i> (Algaroba)	Y		
1828.	6919 <i>Prostanthera magnifica</i> (Magnificent Prostanthera)			
1829.	8189 <i>Pseudognaphalium luteoalbum</i> (Jersey Cudweed)	Y		
1830.	57 <i>Pteridium esculentum</i> (Bracken)			
1831.	13255 <i>Pterochaeta paniculata</i>			
1832.	1690 <i>Pterostylis nana</i> (Snail Orchid)			
1833.	1693 <i>Pterostylis recurva</i> (Jug Orchid)			
1834.	12217 <i>Pterostylis sanguinea</i>			
1835.	18657 <i>Pterostylis</i> sp. <i>inland</i> (A.C. Beauglehole 11880)			
1836.	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
1837.	2710 <i>Ptilotus chortophytum</i>			
1838.	2716 <i>Ptilotus declinatus</i> (Curved Mulla Mulla)			
1839.	2717 <i>Ptilotus divaricatus</i> (Climbing Mulla Mulla)			
1840.	11251 <i>Ptilotus divaricatus</i> var. <i>divaricatus</i>			
1841.	2718 <i>Ptilotus drummondii</i> (Narrowleaf Mulla Mulla)			
1842.	11260 <i>Ptilotus drummondii</i> var. <i>drummondii</i> (Pussytail)			
1843.	11797 <i>Ptilotus drummondii</i> var. <i>minor</i>			
1844.	2719 <i>Ptilotus eriochichus</i>			
1845.	11225 <i>Ptilotus exaltatus</i> var. <i>exaltatus</i> (Tall Mulla Mulla)			
1846.	11577 <i>Ptilotus gaudichaudii</i> var. <i>gaudichaudii</i>			
1847.	12001 <i>Ptilotus gaudichaudii</i> var. <i>parviflorus</i>			
1848.	11311 <i>Ptilotus grandiflorus</i> var. <i>grandiflorus</i>			
1849.	11775 <i>Ptilotus humilis</i> subsp. <i>humilis</i>			
1850.	17962 <i>Ptilotus humilis</i> subsp. <i>parviflorus</i>			
1851.	2742 <i>Ptilotus manglesii</i> (Pom Poms)			
1852.	2747 <i>Ptilotus obovatus</i> (Cotton Bush)			
1853.	2751 <i>Ptilotus polystachyus</i> (Prince of Wales Feather)			
1854.	17657 <i>Ptilotus polystachyus</i> var. <i>polystachyus</i> (Prince of Wales Feather)			
1855.	28340 <i>Ptilotus</i> sp. <i>Northampton</i> (R. Davis 10952)			
1856.	11364 <i>Ptilotus stirlingii</i> var. <i>stirlingii</i>			
1857.	2766 <i>Ptilotus villosiflorus</i>			
1858.	16367 <i>Pyrorchis nigricans</i> (Red beaks)			
1859.	8195 <i>Quinetia urvillei</i>			
1860.	4964 <i>Radyera farragei</i> (Knobby Hibiscus)			
1861.	3061 <i>Raphanus raphanistrum</i> (Wild Radish)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1862.	8197 <i>Reichardia tingitana</i> (False Sowthistle)	Y		
1863.	3083 <i>Reseda alba</i> (White Mingonette)	Y		
1864.	3085 <i>Reseda luteola</i> (Wild Mingonette)	Y		
1865.	19183 <i>Retama raetam</i>	Y		
1866.	11930 <i>Rhagodia baccata</i> subsp. <i>dioica</i> (Sea Berry Saltbush)			
1867.	2583 <i>Rhagodia latifolia</i>			
1868.	11316 <i>Rhagodia latifolia</i> subsp. <i>recta</i>			
1869.	2584 <i>Rhagodia preissii</i>			
1870.	11240 <i>Rhagodia preissii</i> subsp. <i>obovata</i>			
1871.	11254 <i>Rhagodia preissii</i> subsp. <i>preissii</i>			
1872.	-7999 <i>Rhagodia</i> sp.			
1873.	13308 <i>Rhodanthe charsleyae</i>			
1874.	13241 <i>Rhodanthe chlorocephala</i> subsp. <i>rosea</i>			
1875.	13242 <i>Rhodanthe chlorocephala</i> subsp. <i>splendida</i>			
1876.	13300 <i>Rhodanthe citrina</i>			
1877.	15035 <i>Rhodanthe corymbosa</i>			
1878.	13294 <i>Rhodanthe laevis</i>			
1879.	13234 <i>Rhodanthe manglesii</i>			
1880.	13249 <i>Rhodanthe oppositifolia</i> subsp. <i>oppositifolia</i>			
1881.	13296 <i>Rhodanthe polycephala</i>			
1882.	13251 <i>Rhodanthe propinqua</i>			
1883.	13309 <i>Rhodanthe spicata</i>			
1884.	13254 <i>Rhodanthe stricta</i>			
1885.	27224 <i>Rhodymenia sonderi</i>			
1886.	4699 <i>Ricinocarpos psilocladus</i>			
1887.	19942 <i>Ricinocarpos undulatus</i>			
1888.	4705 <i>Ricinus communis</i> (Castor Oil Plant)	Y		
1889.	1556 <i>Romulea rosea</i> (Guildford Grass)	Y		
1890.	3066 <i>Rorippa nasturtium-aquaticum</i> (Watercress)	Y		
1891.	10970 <i>Rostraria cristata</i>	Y		
1892.	11151 <i>Rostraria pumila</i>	Y		
1893.	20419 <i>Rulingia borealis</i>			
1894.	5059 <i>Rulingia densiflora</i>			
1895.	2433 <i>Rumex crispus</i> (Curled Dock)	Y		
1896.	2438 <i>Rumex obtusifolius</i> (Broadleaf Dock)	Y		Y
1897.	-13100 <i>Ruppia</i> sp.			
1898.	30434 <i>Salsola australis</i>			
1899.	18599 <i>Salsola tragus</i>			
1900.	6929 <i>Salvia verbenaca</i> (Wild Sage)	Y		
1901.	79 <i>Salvinia molesta</i> (Salvinia)	Y		
1902.	6484 <i>Samolus repens</i> (Creeping Brookweed)			
1903.	14108 <i>Samolus repens</i> var. <i>floribundus</i>			
1904.	14107 <i>Samolus repens</i> var. <i>paucifolius</i>			
1905.	2356 <i>Santalum acuminatum</i> (Quandong)			
1906.	2359 <i>Santalum spicatum</i> (Sandalwood)			
1907.	2593 <i>Sarcocornia quinqueflora</i> (Beaded Samphire)			
1908.	27230 <i>Sarconema filiforme</i>			
1909.	7595 <i>Scaevola anchusifolia</i>			
1910.	7603 <i>Scaevola canescens</i> (Grey Scaevola)			
1911.	7606 <i>Scaevola crassifolia</i> (Thick-leaved Fan-flower)			
1912.	13068 <i>Scaevola globosa</i>		P3	
1913.	7614 <i>Scaevola globulifera</i>			
1914.	7618 <i>Scaevola humifusa</i> (Procumbent Scaevola)			
1915.	7619 <i>Scaevola lanceolata</i>			
1916.	7627 <i>Scaevola oldfieldii</i>		P3	
1917.	7634 <i>Scaevola phlebopetala</i> (Velvet Fanflower)			
1918.	7637 <i>Scaevola porocarya</i> (Striate-fruit Scaevola)			
1919.	7643 <i>Scaevola sericophylla</i>			
1920.	-8719 <i>Scaevola</i> sp.			
1921.	7644 <i>Scaevola spinescens</i> (Currant Bush)			
1922.	13152 <i>Scaevola thesioides</i> subsp. <i>thesioides</i>			
1923.	7648 <i>Scaevola tomentosa</i> (Raggedleaf Fanflower)			
1924.	12588 <i>Scaevola virgata</i>			
1925.	11027 <i>Schinus terebinthifolius</i>	Y		
1926.	8200 <i>Schoenia cassiniana</i> (Schoenia)			
1927.	13356 <i>Schoenia filifolia</i> subsp. <i>subulifolia</i>		T	
1928.	972 <i>Schoenus armeria</i>			
1929.	17571 <i>Schoenus badius</i>		P2	
1930.	982 <i>Schoenus clandestinus</i>			
1931.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrusher)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1932.	17606	<i>Schoenus griffinianus</i>		P3	
1933.	994	<i>Schoenus humilis</i>			
1934.	1002	<i>Schoenus nanus</i> (Tiny Bog Rush)			
1935.	1006	<i>Schoenus odontocarpus</i>			
1936.	1009	<i>Schoenus pleiostemoneus</i>			
1937.	1013	<i>Schoenus sculptus</i> (Gimlet Bog-rush)			
1938.	-8000	<i>Schoenus</i> sp.			
1939.	16254	<i>Schoenus</i> sp. G Broad Sheath (K.L. Wilson 2633)			
1940.	1026	<i>Schoenus unispiculatus</i>			
1941.	17409	<i>Schoenus varicellae</i>			
1942.	6030	<i>Scholtzia ciliata</i>			
1943.	6034	<i>Scholtzia laxiflora</i>			
1944.	6035	<i>Scholtzia leptantha</i>			
1945.	6036	<i>Scholtzia oligandra</i> (Pink Scholtzia)			
1946.	6037	<i>Scholtzia parviflora</i>			
1947.	-10542	<i>Scholtzia</i> sp.			
1948.	20092	<i>Scholtzia</i> sp. Burma Road (A.C. Burns 138)			
1949.	14655	<i>Scholtzia</i> sp. Kojarena (A.M. Ashby 1904)		P1	Y
1950.	17398	<i>Scholtzia</i> sp. Northampton (A. Strid 20714)			
1951.	15427	<i>Scholtzia spatulata</i>			
1952.	6041	<i>Scholtzia umbellifera</i>			
1953.	27274	<i>Sebdenia flabellata</i>			
1954.	6	<i>Selaginella gracillima</i> (Tiny Clubmoss)			
1955.	8207	<i>Senecio glossanthus</i> (Slender Groundsel)			
1956.	15678	<i>Senecio hispidulus</i> var. <i>hispidulus</i>			
1957.	20663	<i>Senecio multicaulis</i> subsp. <i>multicaulis</i>			
1958.	20161	<i>Senecio pinnatifolius</i>			
1959.	25884	<i>Senecio pinnatifolius</i> var. <i>latilobus</i>			
1960.	12276	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			
1961.	12279	<i>Senna artemisioides</i> subsp. <i>helmsii</i>			
1962.	12282	<i>Senna artemisioides</i> subsp. <i>stricta</i>			Y
1963.	18444	<i>Senna charlesiana</i>			
1964.	12305	<i>Senna glutinosa</i> subsp. <i>chatelainiana</i>			
1965.	-9409	<i>Senna</i> sp.			
1966.	31575	<i>Serichonus gracilipes</i>		P3	
1967.	4970	<i>Sida calyxhymenia</i> (Tall Sida)			
1968.	19712	<i>Sida</i> sp. dark green fruits (S. van Leeuwen 2260)			
1969.	15972	<i>Silene gallica</i> var. <i>gallica</i>	Y		
1970.	8225	<i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
1971.	14583	<i>Siloxerus multiflorus</i>			
1972.	3068	<i>Sinapis arvensis</i> (Charlock)	Y		
1973.	6988	<i>Solanum americanum</i> (Glossy Nightshade)	Y		
1974.	7006	<i>Solanum ellipticum</i> (Potato Bush)			
1975.	7018	<i>Solanum lasiophyllum</i> (Flannel Bush)			
1976.	7020	<i>Solanum linnaeanum</i>	Y		
1977.	7022	<i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
1978.	7023	<i>Solanum nummularium</i> (Money-leaved Solanum)			
1979.	7025	<i>Solanum oldfieldii</i>			
1980.	11241	<i>Solanum orbiculatum</i> subsp. <i>orbiculatum</i> (Round-leaved Solanum)			
1981.	7037	<i>Solanum symonii</i>			
1982.	27281	<i>Solleria robusta</i>			
1983.	8231	<i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
1984.	617	<i>Sorghum halepense</i> (Johnson Grass)	Y		
1985.	-9207	<i>Sorghum</i> sp.			
1986.	35236	<i>Sorghum x drummondii</i> (Sudan Grass)	Y		
1987.	1312	<i>Sowerbaea laxiflora</i> (Purple Tassels)			
1988.	2912	<i>Spergula arvensis</i> (Corn Spurry)	Y		
1989.	2915	<i>Spergularia rubra</i> (Sand Spurry)	Y		
1990.	-11526	<i>Spergularia</i> sp.			
1991.	4203	<i>Sphaerolobium gracile</i>			
1992.	625	<i>Spinifex longifolius</i> (Beach Spinifex)			
1993.	635	<i>Sporobolus virginicus</i> (Marine Couch)			
1994.	4828	<i>Spyridium globulosum</i> (Basket Bush)			
1995.	4730	<i>Stackhousia dielsii</i> (Yellow Stackhousia)			
1996.	4733	<i>Stackhousia monogyna</i>			
1997.	7102	<i>Stemodia viscosa</i> (Pagurda)			
1998.	16190	<i>Stenanthemum complicatum</i>			
1999.	15065	<i>Stenanthemum notiale</i> subsp. <i>notiale</i>			
2000.	13476	<i>Stenanthemum pomaderroides</i>			
2001.	2316	<i>Stirlingia latifolia</i> (Blueboy)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2002.	27318	<i>Struvea plumosa</i>			
2003.	7679	<i>Stylidium adpressum</i> (Trigger-on-stilts)			
2004.	30278	<i>Stylidium androsaceum</i>			
2005.	7694	<i>Stylidium bulbiferum</i> (Circus Triggerplant)			
2006.	7698	<i>Stylidium caricifolium</i> (Milkmaids)			
2007.	7709	<i>Stylidium crossoccephalum</i> (Posy Triggerplant)			
2008.	7712	<i>Stylidium despectum</i> (Dwarf Triggerplant)			
2009.	7716	<i>Stylidium diuroides</i> (Donkey Triggerplant)			
2010.	12855	<i>Stylidium drummondianum</i>		P3	
2011.	7720	<i>Stylidium elongatum</i> (Tall Triggerplant)			
2012.	7721	<i>Stylidium emarginatum</i>			
2013.	17412	<i>Stylidium kalbarriense</i>			
2014.	7749	<i>Stylidium leptophyllum</i> (Needle-leaved Triggerplant)			
2015.	7759	<i>Stylidium macrocarpum</i> (Flagon Triggerplant)			
2016.	7773	<i>Stylidium petiolare</i> (Horn Triggerplant)			
2017.	25837	<i>Stylidium purpureum</i>			
2018.	7785	<i>Stylidium repens</i> (Matted Triggerplant)			
2019.	19247	<i>Stylidium septentrionale</i>			
2020.	17510	<i>Stylidium</i> sp. Kalbarri (A. Carr 145)			
2021.	17578	<i>Stylidium udusicola</i>			
2022.	3181	<i>Stylobasium australe</i>			
2023.	3182	<i>Stylobasium spathulatum</i> (Pebble Bush)			
2024.	1260	<i>Stypandra glauca</i> (Blind Grass)			
2025.	4220	<i>Swainsona canescens</i> (Grey Swainsona)			
2026.	19805	<i>Symphotrichum subulatum</i> (Bushy Starwort)	Y		
2027.	16861	<i>Synaphea recurva</i>			
2028.	-6840	<i>Synaphea</i> sp. ASG 34			
2029.	15533	<i>Synaphea spinulosa</i> subsp. <i>borealis</i>			Y
2030.	15532	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
2031.	20024	<i>Tagetes erecta</i>	Y		
2032.	15741	<i>Tamarix aphylla</i> (Athel Tree)	Y		
2033.	33319	<i>Tecticornia indica</i> subsp. <i>bidens</i>			
2034.	4256	<i>Templetonia retusa</i> (Cockies Tongues)			
2035.	2791	<i>Tersonia cyathiflora</i> (Button Creeper)			
2036.	2820	<i>Tetragonia decumbens</i> (Sea Spinach)	Y		
2037.	2823	<i>Tetragonia implexicoma</i> (Bower Spinach)			
2038.	1035	<i>Tetralia microcarpa</i>			
2039.	4528	<i>Tetralia confertifolia</i>			
2040.	-9994	<i>Thalassodendron</i> sp.			
2041.	1701	<i>Thelymitra antennifera</i> (Vanilla Orchid)			
2042.	-12431	<i>Thelymitra antennifera</i> x <i>macrophylla</i>			
2043.	10856	<i>Thelymitra benthamiana</i> (Cinnamon Sun Orchid)			
2044.	1707	<i>Thelymitra flexuosa</i> (Twisted Sun Orchid)			
2045.	20732	<i>Thelymitra petrophila</i>			
2046.	673	<i>Themeda triandra</i>			
2047.	10874	<i>Thinopyrum distichum</i>	Y		
2048.	5084	<i>Thomasia grandiflora</i> (Large Flowered Thomasia)			
2049.	2644	<i>Threlkeldia diffusa</i> (Coast Bonefruit)			
2050.	6051	<i>Thryptomene baeckeacea</i>			
2051.	6055	<i>Thryptomene denticulata</i>			
2052.	6057	<i>Thryptomene hyporhysis</i>			
2053.	6064	<i>Thryptomene racemulosa</i>			
2054.	-10092	<i>Thryptomene</i> sp.			
2055.	36097	<i>Thryptomene</i> sp. Greenough River (J. Docherty 169)			
2056.	19115	<i>Thryptomene</i> sp. Moresby Range (A.S. George 14873)		P3	Y
2057.	20366	<i>Thryptomene</i> sp. Red Bluff (A.G. Gunness 2358)			
2058.	17265	<i>Thryptomene</i> sp. Yuna Reserve (A.C. Burns 100)		P2	
2059.	6066	<i>Thryptomene stenophylla</i>		P2	
2060.	6067	<i>Thryptomene strongylophylla</i>			
2061.	1319	<i>Thysanotus arenarius</i>			
2062.	14387	<i>Thysanotus brittanii</i>			
2063.	1328	<i>Thysanotus dichotomus</i> (Branching Fringe Lily)			
2064.	1338	<i>Thysanotus manglesianus</i> (Fringed Lily)			
2065.	1343	<i>Thysanotus patersonii</i>			
2066.	1346	<i>Thysanotus pyramidalis</i>			
2067.	1348	<i>Thysanotus rectantherus</i>			
2068.	-9372	<i>Thysanotus</i> sp.			
2069.	1351	<i>Thysanotus sparteus</i>			
2070.	27335	<i>Tolypocladia calodictyon</i>			
2071.	27336	<i>Tolypocladia glomerulata</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2072.	1368 <i>Trachyandra divaricata</i>	Y		
2073.	19253 <i>Trachymene ceratocarpa</i>			
2074.	6268 <i>Trachymene cyanopetala</i>			
2075.	6279 <i>Trachymene ornata</i> (Spongefruit)			
2076.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
2077.	1485 <i>Tribonanthes violacea</i>			
2078.	-7030 <i>Tribulus</i> sp.			
2079.	6727 <i>Trichodesma zeylanicum</i> (Camel Bush)			
2080.	13559 <i>Trichodesma zeylanicum</i> var. <i>grandiflorum</i>			
2081.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
2082.	17542 <i>Trifolium arvense</i> var. <i>arvense</i>	Y		
2083.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
2084.	17763 <i>Trifolium campestre</i> var. <i>campestre</i> (Hop Clover)	Y		
2085.	4297 <i>Trifolium glomeratum</i> (Cluster Clover)	Y		
2086.	4298 <i>Trifolium hirtum</i> (Rose Clover)	Y		
2087.	4313 <i>Trifolium subterraneum</i> (Subterranean Clover)	Y		
2088.	142 <i>Triglochin calcitrapum</i>			
2089.	15821 <i>Triglochin huegelii</i>			
2090.	15820 <i>Triglochin linearis</i>			
2091.	147 <i>Triglochin mucronata</i>			
2092.	18587 <i>Triglochin nana</i>			
2093.	-8420 <i>Triglochin</i> sp.			
2094.	19175 <i>Triglochin</i> sp. <i>B Flora of Australia</i> (P.G. Wilson 4294)			
2095.	17885 <i>Triodia bromoides</i>		P4	
2096.	17882 <i>Triodia danthonioides</i>			
2097.	705 <i>Tripogon loliiformis</i> (Five Minute Grass)			
2098.	4737 <i>Tripterococcus brunonis</i> (Winged Stackhousia)			
2099.	708 <i>Triticum aestivum</i> (Wheat)	Y		
2100.	4360 <i>Tropaeolum majus</i> (Garden Nasturtium)	Y		
2101.	4840 <i>Trymalium daphnifolium</i>			
2102.	18326 <i>Urochloa panicoides</i>	Y		
2103.	9008 <i>Urodon dasyphyllus</i> (Mop Bushpea)			
2104.	8254 <i>Urospermum picroides</i> (False Hawkbit)	Y		
2105.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
2106.	38388 <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
2107.	1767 <i>Urtica urens</i> (Small Nettle)	Y		
2108.	7656 <i>Velleia cynopotamica</i>			
2109.	7664 <i>Velleia rosea</i> (Pink Velleia)			
2110.	8257 <i>Vellereophyton dealbatum</i> (White Cudweed)	Y		
2111.	15725 <i>Verbesina encelioides</i>	Y		
2112.	7666 <i>Verreauxia reinwardtii</i> (Common Verreauxia)			
2113.	12399 <i>Verticordia capillaris</i>		P4	
2114.	12401 <i>Verticordia centipeda</i>			
2115.	6073 <i>Verticordia chrysantha</i>			
2116.	12402 <i>Verticordia chrysanthella</i>			
2117.	14709 <i>Verticordia chrysostachys</i> var. <i>chrysostachys</i>			
2118.	12403 <i>Verticordia chrysostachys</i> var. <i>pallida</i>		P3	
2119.	-5117 <i>Verticordia chrysostachys</i> var. <i>pallida</i> x			Y
2120.	15432 <i>Verticordia densiflora</i> var. <i>densiflora</i>			
2121.	12413 <i>Verticordia densiflora</i> var. <i>roseostella</i>		P3	
2122.	12414 <i>Verticordia densiflora</i> var. <i>stelluligera</i>			
2123.	14712 <i>Verticordia dichroma</i> var. <i>dichroma</i>		P3	
2124.	6083 <i>Verticordia grandis</i> (Scarlet Featherflower)			
2125.	12430 <i>Verticordia huegelii</i> var. <i>stylosa</i>			
2126.	12437 <i>Verticordia laciniata</i>			
2127.	15622 <i>Verticordia lepidophylla</i> var. <i>lepidophylla</i>			
2128.	12443 <i>Verticordia monadelpha</i> var. <i>callitricha</i>			
2129.	15435 <i>Verticordia monadelpha</i> var. <i>monadelpha</i>			
2130.	12444 <i>Verticordia muelleriana</i> subsp. <i>minor</i>		P2	
2131.	10822 <i>Verticordia nobilis</i>			
2132.	6102 <i>Verticordia oculata</i>			
2133.	6106 <i>Verticordia penicillaris</i>		P4	
2134.	6107 <i>Verticordia pennigera</i>			
2135.	6109 <i>Verticordia picta</i> (Painted Featherflower)			
2136.	15615 <i>Verticordia spicata</i> subsp. <i>spicata</i>			
2137.	27360 <i>Vidalia spiralis</i>			
2138.	4325 <i>Viminaria juncea</i> (Swishbush)			
2139.	8262 <i>Vittadinia cervicalis</i>			
2140.	11387 <i>Vittadinia cervicalis</i> var. <i>cervicalis</i>			
2141.	11278 <i>Vittadinia cervicalis</i> var. <i>occidentalis</i>		P1	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2142.	8264 <i>Vittadinia dissecta</i>			
2143.	8266 <i>Vittadinia gracilis</i>			
2144.	-8692 <i>Vittadinia</i> sp.			
2145.	722 <i>Vulpia bromoides</i> (Squirrel Tail Fescue)	Y		
2146.	724 <i>Vulpia myuros</i> (Rat's Tail Fescue)	Y		
2147.	12052 <i>Vulpia myuros</i> forma megalura	Y		
2148.	33101 <i>Vulpia myuros</i> forma myuros	Y		
2149.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
2150.	7388 <i>Wahlenbergia multicaulis</i>			
2151.	7389 <i>Wahlenbergia preissii</i>			
2152.	7393 <i>Wahlenbergia tumidifruca</i>			
2153.	8275 <i>Waitzia acuminata</i> (Orange Immortelle)			
2154.	13331 <i>Waitzia acuminata</i> var. <i>acuminata</i>			
2155.	13330 <i>Waitzia acuminata</i> var. <i>albicans</i>			
2156.	13328 <i>Waitzia nitida</i>			
2157.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
2158.	32455 <i>Weissia controversa</i>			
2159.	6939 <i>Westringia dampieri</i>			
2160.	1391 <i>Wurmbea densiflora</i>			
2161.	1393 <i>Wurmbea dilatata</i>			
2162.	1394 <i>Wurmbea dioica</i> (Early Nancy)			
2163.	12072 <i>Wurmbea dioica</i> subsp. <i>alba</i>			
2164.	1398 <i>Wurmbea monantha</i>			
2165.	1401 <i>Wurmbea pygmaea</i>			
2166.	-9534 <i>Wurmbea</i> sp. <i>Nabawa</i> (T.D. Macfarlane et al. TDM 4408)			Y
2167.	1403 <i>Wurmbea tenella</i> (Eight Nancy)			
2168.	1404 <i>Wurmbea tubulosa</i> (Long-flowered Nancy)		T	
2169.	1252 <i>Xanthorrhoea drummondii</i>			
2170.	1256 <i>Xanthorrhoea preissii</i> (Grass tree)			
2171.	19938 <i>Xerochrysum bracteatum</i>			
2172.	7113 <i>Zaluzianskya divaricata</i> (Spreading Night Phlox)	Y		
2173.	4385 <i>Zygophyllum apiculatum</i> (Gallweed)			
2174.	4390 <i>Zygophyllum fruticosum</i> (Shrubby Twinleaf)			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX D - EPBC Act Protected Matters Search Results



EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 06/05/11 17:02:48

[Summary](#)

[Details](#)

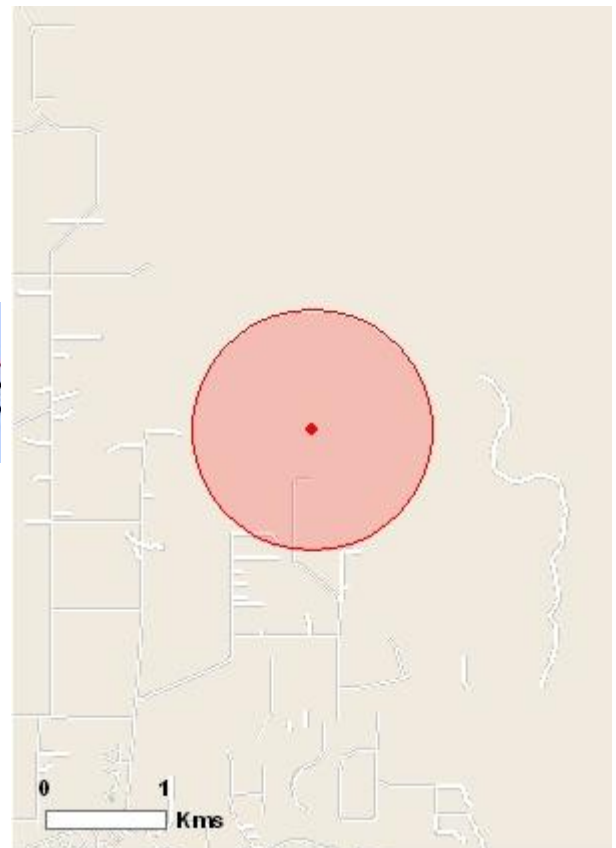
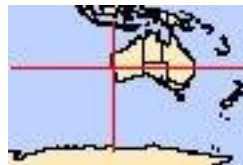
[Matters of NES](#)

[Other matters protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia (Geoscience
Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	3
Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	7
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

BIRDS

[Calyptorhynchus latirostris](#)

Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
---	------------	--

PLANTS

[Drummondita ericoides](#)

Morseby Range Drummondita [9193]	Endangered	Species or species habitat likely to occur within area
-------------------------------------	------------	--

[Eucalyptus cuprea](#)

Mallee Box [56773]	Endangered	Species or species habitat likely to occur within area
--------------------	------------	--

Migratory Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

Migratory Marine Birds

[Apus pacificus](#)

Fork-tailed Swift [678]		Species or species habitat may occur within area
-------------------------	--	--

[Ardea alba](#)

Great Egret, White Egret [59541]		Species or species habitat may occur within area
-------------------------------------	--	--

[Ardea ibis](#)

Cattle Egret [59542]		Species or species habitat may occur within area
----------------------	--	--

Migratory Terrestrial Species

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
-------------------------------	--	--

[Merops ornatus](#)

Rainbow Bee-eater [670]		Species or species habitat may occur within area
-------------------------	--	--

Migratory Wetlands Species

[Ardea alba](#)

Great Egret, White Egret
[59541] Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542] Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

Birds

[Apus pacificus](#)

Fork-tailed Swift [678] Species or species habitat may occur within area

[Ardea alba](#)

Great Egret, White Egret
[59541] Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542] Species or species habitat may occur within area

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943] Species or species habitat likely to occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670] Species or species habitat may occur within area

Extra Information

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
------	--------	------------------

Mammals

[Capra hircus](#)

Goat [2] Species or species habitat likely to occur within area

[Felis catus](#)

Cat, House Cat, Domestic Cat
[19] Species or species habitat likely to occur within area

[Oryctolagus cuniculus](#)

Rabbit, European Rabbit [128] Species or species habitat likely to occur within area

[Vulpes vulpes](#)

Red Fox, Fox [18] Species or species habitat likely to occur within area

Plants

[Cenchrus ciliaris](#)

Buffel-grass, Black Buffel-grass
[20213] Species or species habitat may occur within area

[Lantana camara](#)

Lantana, Common Lantana,
Kamara Lantana, Large-leaf
Lantana, Pink Flowered
Lantana, Red Flowered Lantana,
Species or species habitat may occur within area

Red-Flowered Sage, White
Sage, Wild Sage [10892]
[Lycium ferocissimum](#)
African Boxthorn, Boxthorn
[19235]

Species or species habitat may occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.68636 114.6643

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

[Accessibility](#) | [Disclaimer](#) | [Privacy](#) | [© Commonwealth of Australia](#) | [Help](#)

Last updated: Thursday, 16-Sep-2010 09:13:25 EST

[Department of Sustainability, Environment, Water, Population and Communities](#)

GPO Box 787

Canberra ACT 2601 Australia

+61 2 6274 1111 [ABN](#)

| [Australian Government](#) |

APPENDIX E - DIA Registered Sites Search Results



Search Criteria

0 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6823202	270696
6826048	272100

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

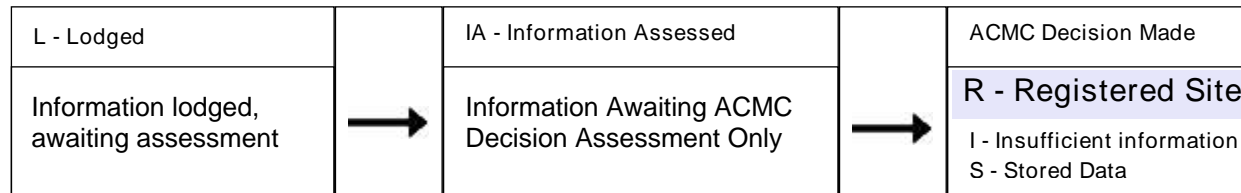
Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register of Aboriginal Sites established and maintained under the Aboriginal Heritage Act 1972 (AHA).

Legend

Restriction	Access	Coordinate Accuracy
N No restriction	C Closed	Accuracy is shown as a code in brackets following the site coordinates.
M Male access only	O Open	[Reliable] The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
F Female access	V Vulnerable	[Unreliable] The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status



*Explanation of Assessment

Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not the final assessment.

Final assessment and decisions will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

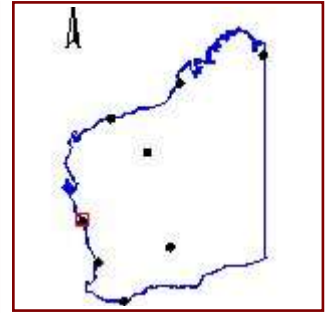
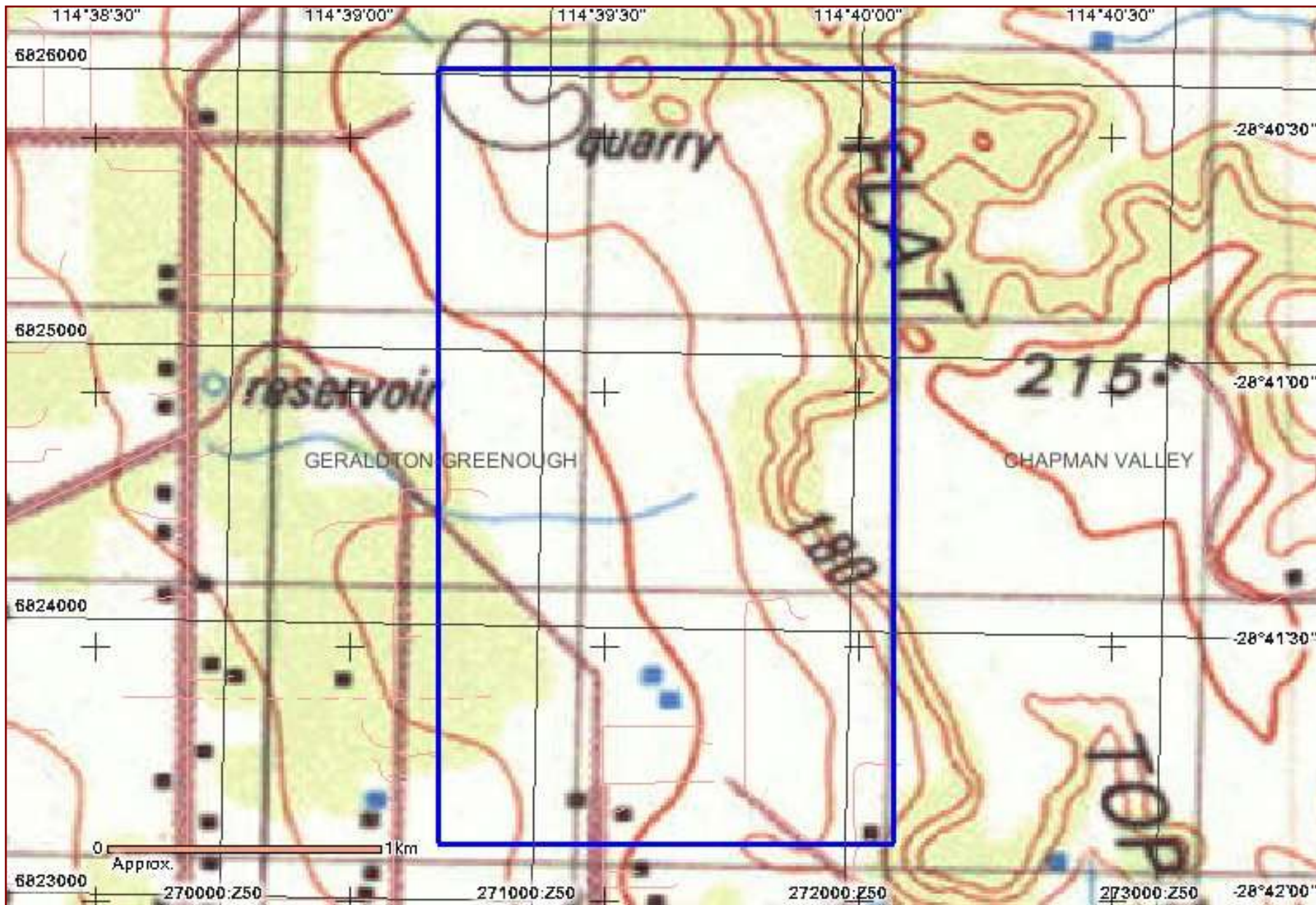
Sites Shown on Maps

Site boundaries may not appear on maps at low zoom levels







List of Registered Aboriginal Sites with Map

No results



Legend

Selected Heritage Sites

-  Registered Sites
-  Town
-  Map Area
-  Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

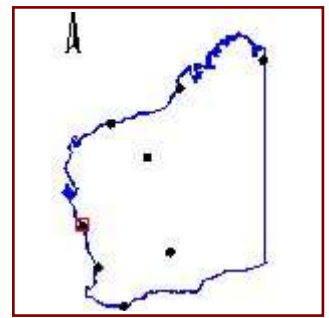
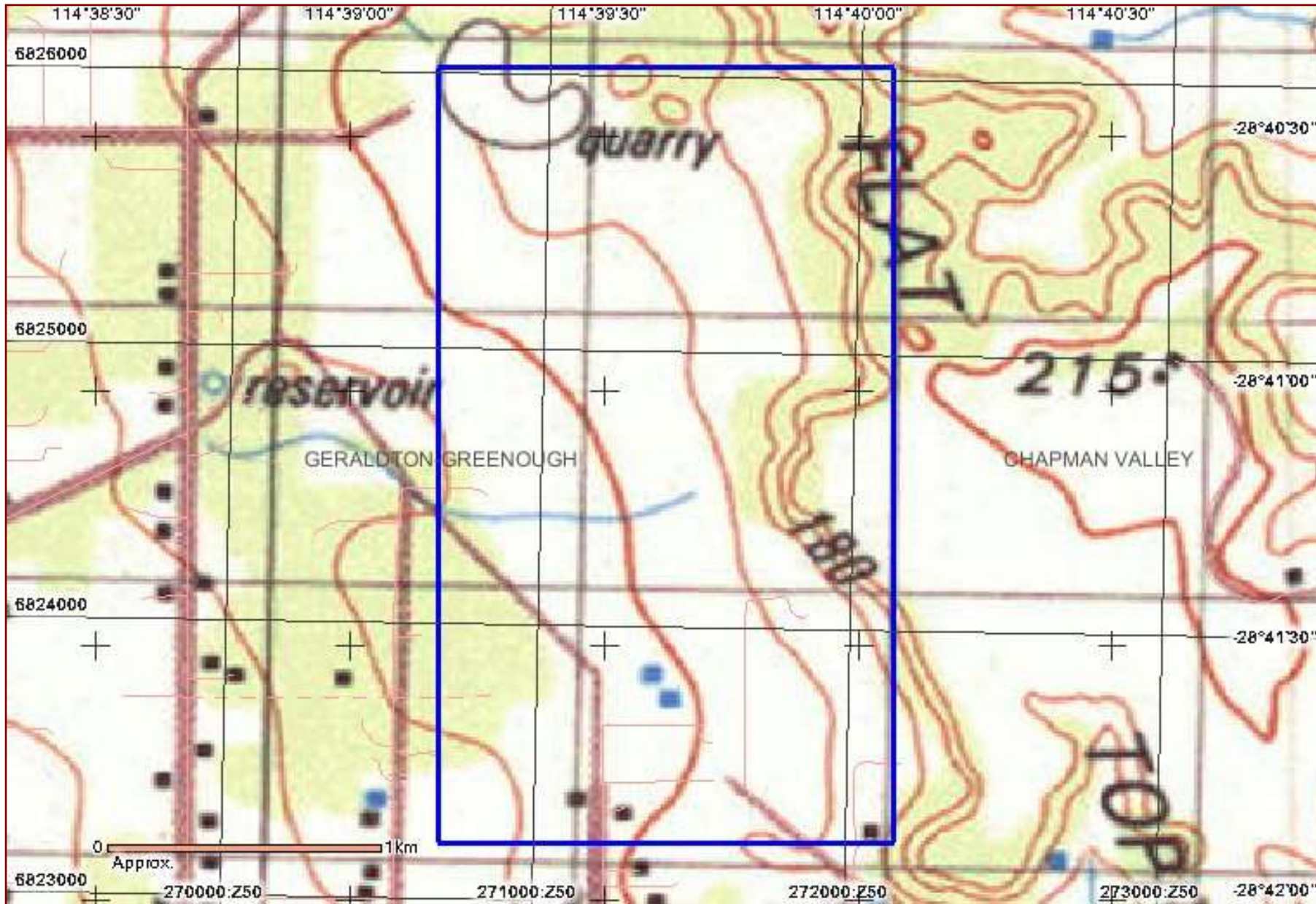
Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



List of Other Heritage Places with Map

No results



Legend

- Selected Heritage Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

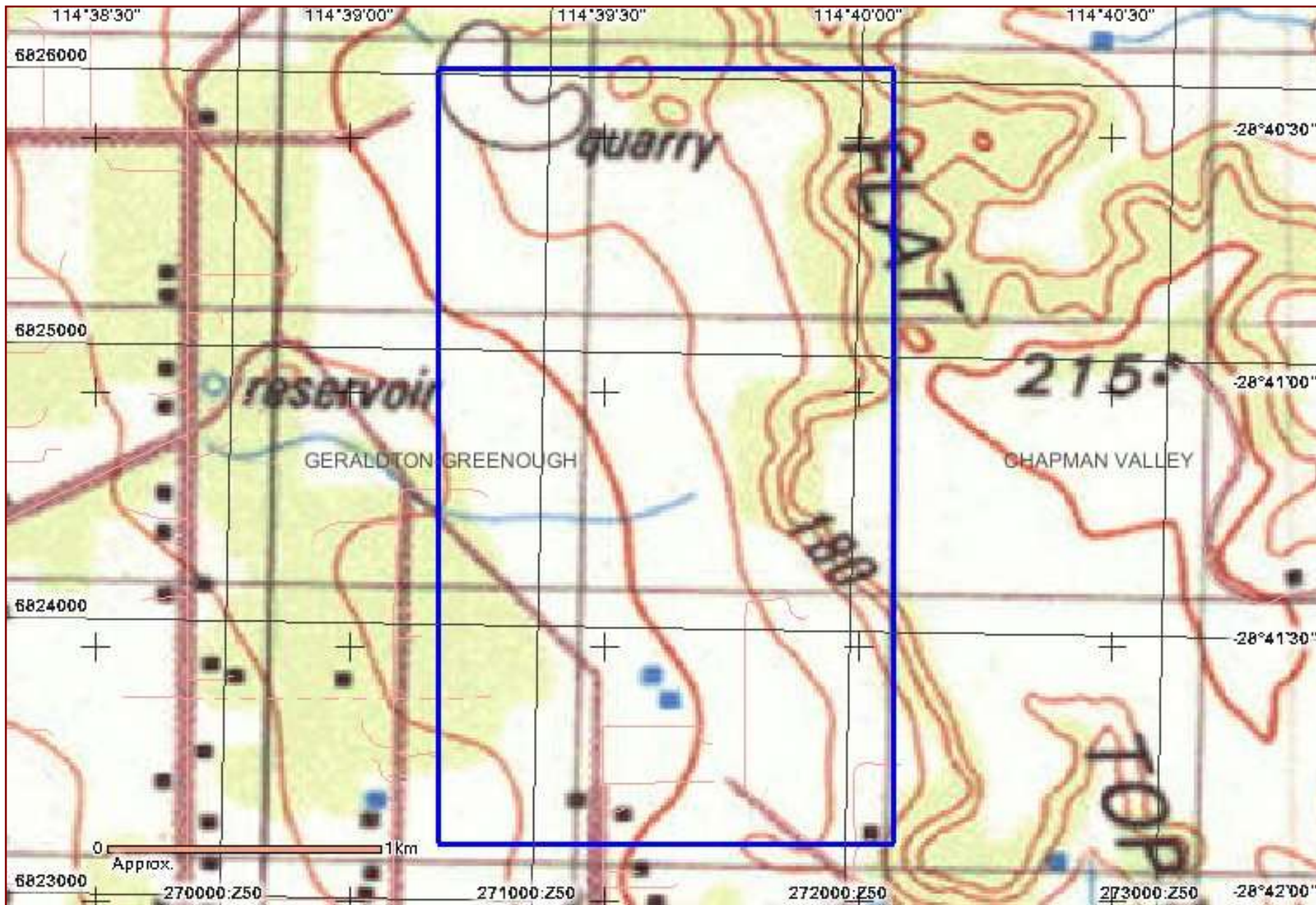
Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



Map Showing Registered Aboriginal Sites and Other Heritage Places



Legend

- Selected Heritage Sites
- Registered Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>

APPENDIX F - UXO Search Results and FESA Confirmation

IN REPLY, PLEASE QUOTE
605-05-01

GHD
76 Forrest Street
GERALDTON WA 6530

FESA Unexploded Ordnance Services
Telephone: (08) 9331 7218
Facsimile: (08) 9331 5928
E-mail: aarnold@fesa.wa.gov.au
ABN: 39 563 851 304

Attention: Ms C Miller

Dear Cathee

UNEXPLODED ORDNANCE RECONNAISSANCE OF LOTS 80 & 81 HACKETTS ROAD, WAGGRAKINE - GERALDTON

Further to the Unexploded Ordnance field reconnaissance carried out by FESA UXO Services on the 14th September 2006, on Lots 80 & 81 Hackett's Road, Geraldton.

As witnessed, a limited field investigation with the support of an electro magnetic Metal detector was carried out by myself over several areas of interest within the area of Lots 80 & 81 Hackett's Road. Those sites that I chose for the limited investigations I considered to be the most likely affected areas if the Department of Defence had in fact, fired explosive munitions onto the property during training exercises in WW11. The sites consisted of elevated features that would have represented good targets for artillery or infantry training exercises, however, after conducting the limited investigative searching, no such evidence (fragmentation from exploded munitions, actual artillery projectiles, mortars or other produce) was located to support this theory. Whilst several items of small arms munitions (a spent 410 shot gun cartridge, .22 calibre cartridge case and a .303 calibre projectile) were found, these were not of military origins, but from normal farm culling/shooting activities. Whilst .303 calibre projectiles would normally be associated with infantry training from the WW11 period, many ex service Lee Enfield .303 Rifles and ammunition stocks were released by the Commonwealth and widely used by farmers and other individuals in the post WW11 period, prior to more stringent licensing and gun controls introduced in the 60s and 70s. Had a quantity of these projectiles been found during the limited search, it would be reasonable to assume that infantry units may have conducted small arms training in the area. This may still be the case however, but as this type of munition is not considered UXO (ball ammunition in small arms manufacture does not contain explosives) no further searching will be required.

After careful consideration, I have now come to the conclusion that this particular region of the Red Peak Artillery Range as identified in the WA UXO Register of former Department of Defence Training Areas – WW11 (Site C-303, N126) poses a minimal risk as far as UXO Contamination is concerned. In this regard, no further searching for UXO is recommended prior to the development of this site. It would appear that the training activities as mentioned in the war Diaries from which the details of the Red Peak area were first identified, are that the risk areas lie more to the east of Lots 80 & 81, in the area stretching between Mount Fairfax, Red Peak and Wokatherra/Yetna on the eastern side of the Moresby Flat Topped Range.

Please be advised that this Office will make recommendations to the Department of Planning and Infrastructure (Geraldton Office) to apply a "UXO Advice Note" only to any referral received for the proposed development of Lots 80 & 81 Hackett's Road, Waggrakine, advising that the risk of UXO contamination is considered to be absolute minimal and that no further searching for UXO is necessary, nor required prior to the proposed development of the site. This "Advice note" will then be reflected in the WAPC Reference: Approval Subject to Conditions, and will be worded similar to the following:

The Fire and Emergency Services Authority of Western Australia (FESA) advises that historical research has revealed that during the past 100 years, former elements of the Australian Defence Forces may have conducted training and/or operational activities within or close to the area of the proposed subdivision. It is possible that as a result of these activities, the subject area may contain unexploded ordnance (UXO). Whilst it is considered that the possible risk from UXO on the land subject to this approval is minimal, an absolute guarantee that the area is free from UXO cannot be given. Should, during subdivisional works, or at any other time, a form or suspected form of UXO be located, FESA has advised that the following process should be initiated:

- 1. Do not disturb the site of the known or suspected UXO;*
- 2. Without disturbing the immediate vicinity, clearly mark the site of the UXO;*
- 3. Notify FESA of the circumstances/situation as quickly as possible; and*
- 4. Maintain a presence near the site until advised to the contrary by a member of FESA, the Western Australian Police Service or Defence Forces.*

Further advice on this issue may be obtained by contacting the Unexploded Ordnance Unit, Fire and Emergency Services Authority of Western Australia

Having said that and despite the sample searching conducted, no absolute guarantee can be given by this Office that Lots 80 & 81 are in fact, completely free of UXO. In the unlikely event that you and your Company locate a UXO or suspect UXO during your research site investigations, please follow the above process and let me know ASAP.

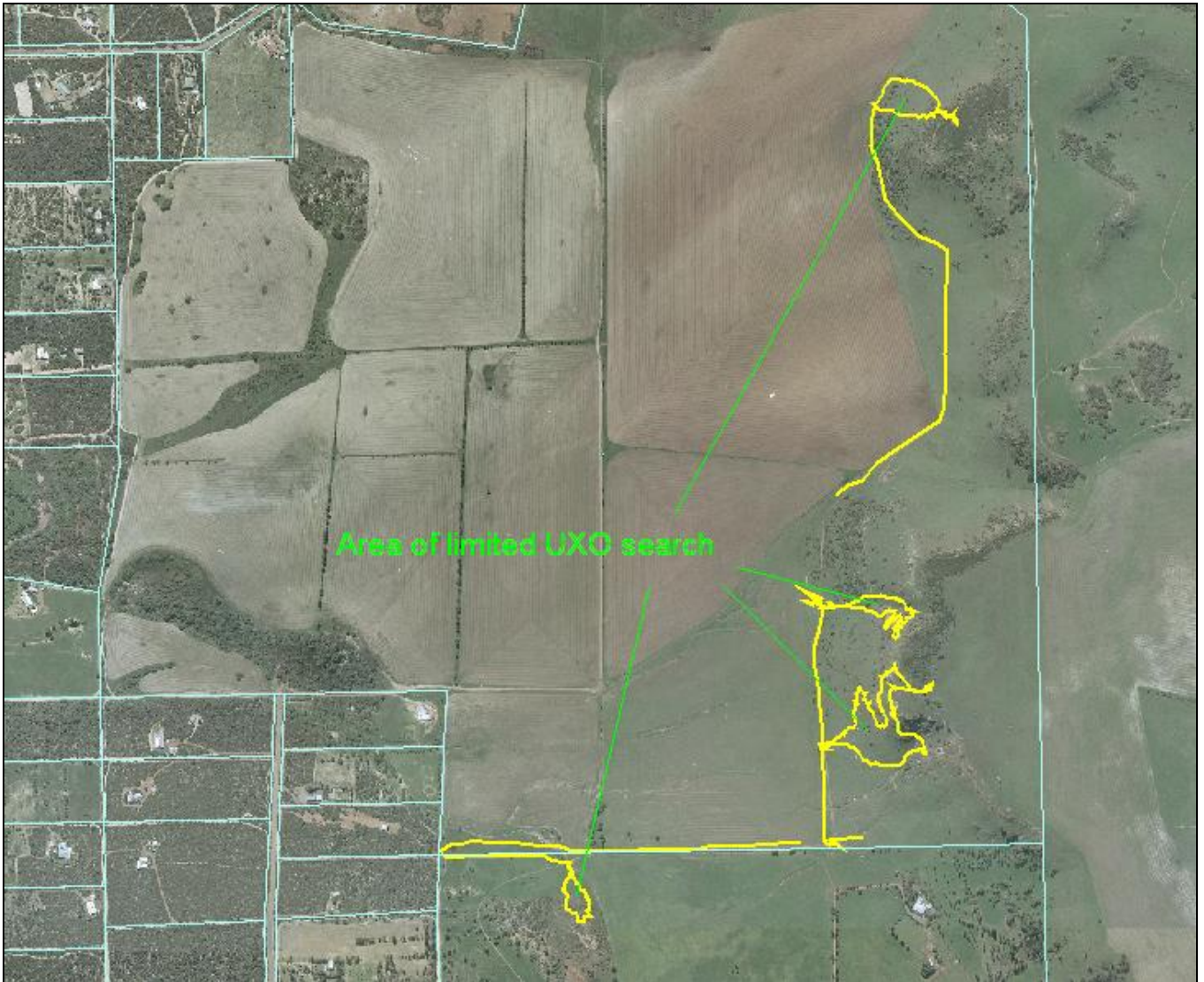
I have included a map on the following page showing the GPS track of most of the vehicle path, and the four search areas investigated for your records.

Again, I thank you for your company whilst on site and look forward to working with you again in the future as I am sure that the occasion will arise where GHD will be involved with other developments within potential UXO sites.

Yours sincerely

Andrew Arnold
FESA UXO LIAISON OFFICER
19 September 2006

**UXO Reconnaissance including limited detector search of several elevated areas
Lots 80 & 81 Hackett's Road, Waggrakine - Geraldton
Conducted by FESA UXO Services on the 14th September 2006**



Items of interest found



View looking south west over Lots 80-81 from top of ridge

Andrew Arnold
FESA UXO Liaison Officer

APPENDIX G - Draft Structure Plan Provisions

Appendix F – Proposed Local Structure Plan Provisions

1 – Public Open Space Management Plan

1-1 The preparation of a Public Open Space (POS) Management Plan is required for the areas reserved for Public Open Space across the proposed development area, including the areas of existing vegetation retained in POS and the section of the Moresby Ranges outside the development area, within Lots 80 and 81 Hackett Road, Waggrakine. Implementation of the Plan shall be required as a condition of subdivision in the event that a subdivision application for urban development of Lots 80 and 81 Hackett Road, Waggrakine is approved by the Western Australian Planning Commission.

1-2: The POS Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission on advice of the City of Geraldton Greenough, the Environmental Protection Authority, and the Department of Environment and Conservation.

1-3: The POS Management Plan shall address:

- (1) minimisation of clearing and vegetation disturbance during construction,
- (2) access control (during construction and post-construction),
- (3) revegetation species and establishment,
- (4) weed control,
- (5) dieback control and management,
- (6) stormwater management,
- (7) ongoing maintenance and management of the vegetated areas,
- (8) protection of wetlands,
- (9) fire management, and
- (10) interface management.

APPENDIX 6

Traffic Report (Riley Consulting, December 2013)

HUMPHREY LAND DEVELOPMENT
MORIESBY HEIGHTS
STRUCTURE PLAN TRAFFIC REPORT

December 2013



PO BOX Z5578

Perth WA 6831

0413 607 779 Mobile

Issued on	16-12-2013	Amendments	Date
Version	V5	V4 Bus route amended	Aug 13
Reference	644	V5 distribution amended (CGG)	Dec 2013

CONTENTS

- 1.0 EXECUTIVE SUMMARY
- 2.0 THE SITE AND SURROUNDING ROAD NETWORK
- 3.0 TRAFFIC GENERATION AND DISTRIBUTION
- 4.0 DEVELOPMENT TRAFFIC IMPACTS
- 5.0 ACCESS
- 6.0 THE INTERNAL ROAD NETWORK
- 7.0 PEDESTRIANS, CYCLISTS AND PUBLIC TRANSPORT
- 8.0 DEVELOPMENT STAGING

1.0 EXECUTIVE SUMMARY

Riley Consulting has been commissioned by Sutcliffe Road Joint Venture to consider the traffic and transport impacts of developing 1,800 residential lots at land known as Moresby Heights. The key findings of the traffic overview are:

- The site can be expected to generate 16,200 vehicle movements per day of which about 11,300 vehicles per day can be expected to access the external road network.
- Traffic increases to the external road network would indicate that North West Coastal Highway south of Chapman Valley Road will require duplication (MRWA).
- The intersection of North West Coastal Highway / Cooper Street is probably sufficient in its current layout (subject to detail planning) but it is recommended that full standard left turn and right turn lanes be provided.
- The intersection of North West Coastal Highway / Tramway Road will require a full standard right turn lane. Priority control is shown to operate with excellent Levels of Service. However, this matter should be reviewed when Oakagee is developed.
- The creation of four-way intersections on Tramway Road may need to be addressed with traffic management. There may be a need to upgrade other external roads as a result of the development proposal, which should be considered at the time of subdivision.
- Local roads providing access through to Chapman Valley Road can accommodate the forecast traffic volumes, but some may require upgrading to provide kerbs and a wider carriageway.

2.0 THE SITE AND SURROUNDING ROAD NETWORK

Moresby Heights is an existing rural site located approximately 10 kilometres north east of Geraldton town centre. The location of the subject site is shown in Figure 1.

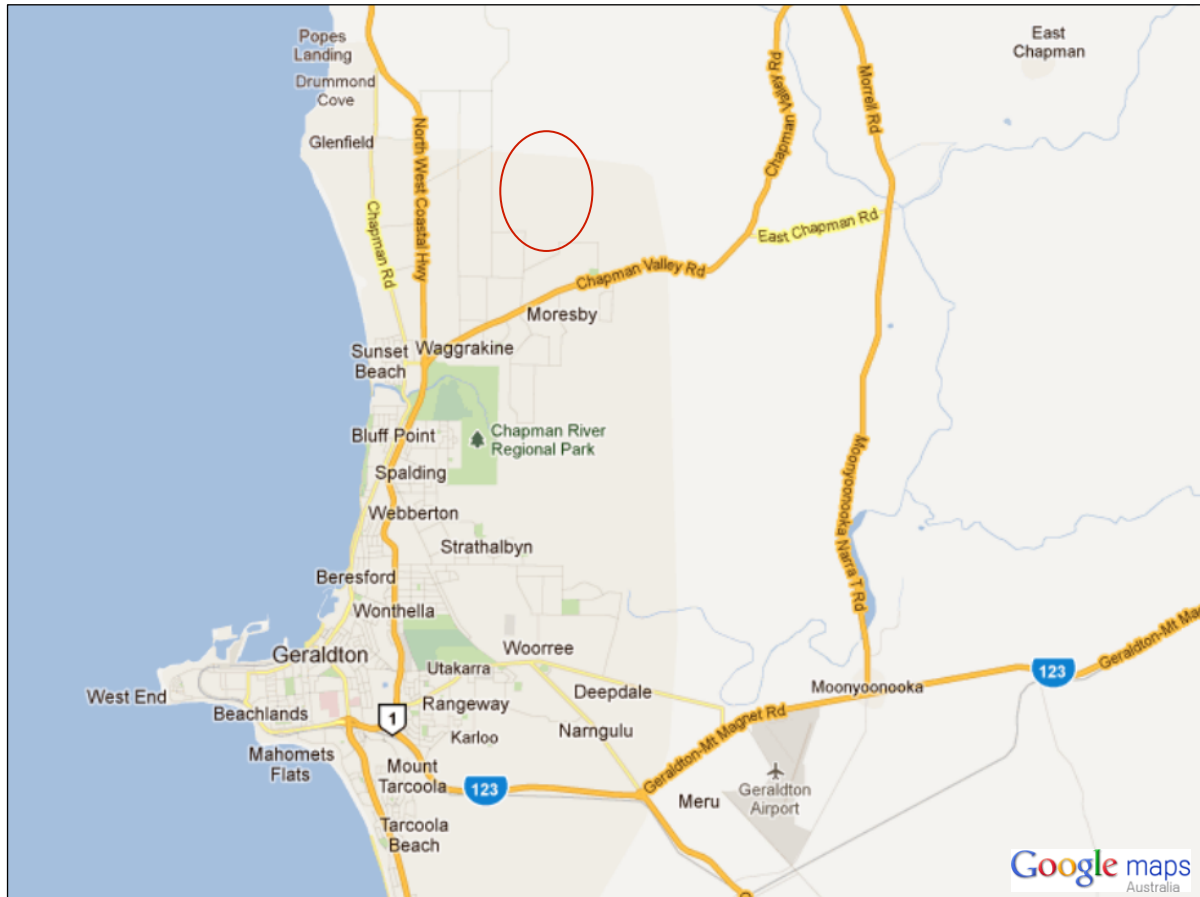


Figure 1 Site Location

Roads expected to be affected by the development of the site are considered below.

2.1 North West Coastal Highway

The North West Coastal Highway is a primary distributor road falling under the control of Main Roads Western Australia (MRWA). It provides significant regional access between Geraldton and mining activity to the north. It will also provide a strategic link to the future Oakagee port to the north of Geraldton.

The highway is constructed as a two-lane single carriageway road for the majority of its length. Through the urban area of Geraldton it has been widened to provide four traffic lanes. MRWA traffic data indicates 11,840 vehicles per day (vpd) north of Hosken Road reducing slightly to 10,800vpd north of Webberton Road. To the north of Chapman Valley

Road the volume decreases significantly to 2,945vpd (south of Drummond Cove Road). The traffic data was recorded in 2010.

2.2 Chapman Valley Road

Chapman Valley Road is a district level road linking the North West Coastal Highway to East Chapman and Nabawa to the east. It is constructed as a single carriageway two-lane road with a pavement of about 7.2 metres between North West Coastal Highway and Sutcliffe Road and typically about 6.1 metres to the east of Sutcliffe Road. The road reservation is 20m.

The posted speed limit is 60kph between North West Coastal Highway and Webber Road (approximately). Further east the posted speed is 90kph. The road is currently operating as a neighbourhood connector based on approved new intersection spacing, however, it should be considered as a district distributor road.

Traffic data on the MRWA website shows a volume of 7,848vpd (2012) to the east of North West Coastal Highway. Further east by David Road, the volume reduces to 6,707vpd.

The intersection of Chapman Valley Road / North West Coastal Highway is controlled by a roundabout with a merge lane for the left turn from Chapman Valley Road.

2.3 Hackett Road

Hackett Road is a local access street and is constructed with a 6.5 metre wide pavement. It has a posted speed of 70kph and is fronted by rural residential type lots. It is rural in nature with no kerbs and has no footpaths. To the north of Stephen Road is a tight bend that restricts forward visibility. The use of this road would require that this issue is rectified.

Traffic data provided by the City indicates 320 vehicles per day.

2.4 Arnold Road / Bore Road

Arnold Road runs north-south and at its southern end continues as Bore Road through to Sutcliffe Road. It has a standard 6.5 metre wide road pavement. It is rural in nature with no kerbs and has no footpaths.

No traffic data is available for Arnold Road or Bore Road, but based on the current level of residential construction, it is estimated to carry less than 150 vehicles per day.

2.5 Sutcliffe Road

Sutcliffe Road is a local access street providing a north-south connection through new residential development north of Chapman Valley Road. Between Chapman Valley Road and Bore Street it is constructed with a 7.2 metre wide pavement. To the north of Bore Road it has a 6.5 metre wide road pavement. It is rural in nature with no kerbs and has no footpaths.

Traffic data provided by the City shows 455 vehicles per day.

2.6 Tramway Road

Tramway Road is constructed with a 7.5 metre wide road pavement and provides a straight link between David Road and North West Coastal Highway. A Government reserves lies between the subject site and Tramway Road. Connection of the site to Tramway Road will result in a new four-way intersection being located on David Road. Subject to future traffic demands, this may require some form of traffic management.

No traffic data is available for Tramway Road, but based on the current level of residential construction, it is estimated to carry less than 200 vehicles per day. It has a posted speed of 80kph.

Its intersection with the North West Coastal Highway operates with yield conditions for traffic on Tramway Road. A left turn deceleration lane is provided on North West Coastal Highway, but no right turn deceleration lane is provided. Good visibility is provided at this intersection.

2.7 Cooper Street

Cooper Street lies to the very north of the subject land and is constructed with a standard 7.2 metre wide road pavement to the west of David Road. To the east of David Road the pavement reduces to 6.2 metres. It is rural in nature and has no footpaths.

At its western end Cooper Street joins Beatie Road where access is achieved to the North West Coastal Highway. At this intersection a left turn deceleration lane has been provided, but no right turn deceleration lane. Given there is a tight bend to the south of this intersection, the lack of a right turn lane would be a road safety issue (MRWA).

No traffic data is available for Cooper Street, but based on the current level of residential construction, it is estimated to carry less than 300 vehicles per day.

Figure 2 shows the site concept plan.



Figure 2 Site Concept Plan

3.0 TRAFFIC GENERATION AND DISTRIBUTION

The development of residential land at Moresby Heights will provide for the growing population forecast for Geraldton.

Reference to trip generation source documents suggest that the trip generation of a typical household can vary from 5 trips to 11 trips per day. Traffic analysis of developments to the south of Geraldton identified a residential trip rate of 9 trips per dwelling per day based on local traffic counts. The trip rate is based on typical R20 density which is attractive to families. Moresby Heights would generate a similar level of traffic from the larger lot sizes provided. However, the development will also include some higher density lots that can be expected to generate less traffic.

Whilst Moresby Heights will provide some higher density dwellings, this traffic report is based on the more typical 9 trips per lot and should, therefore, provide a more robust assessment.

The concept plan indicates a yield of 1,800 residential lots and on the basis of 9 trips per lot can be expected to generate (1,800 x 9) 16,200 vehicle movements per day.

Moresby Heights will provide a primary school and local shopping facilities, which will retain traffic within the developable area. A traffic model has been built to consider the distribution of the traffic generation of the development over the local and district road network.

The model is based on the Education Department's assessment of 0.35 pupils per household and normal trip rates for local commercial facilities.

3.1 Distribution

By the time the site is fully developed, it can be expected that the Oakagee industrial area will be functional. The model has assumed that employment will be available in Oakagee. The model assigns education trips based on 0.55 trips per lot to primary schools and 0.25 trips per lot to secondary schools. Local commercial activity is based upon a rough rule of thumb of 2m² of retail / commercial floor space per lot¹.

¹ This is an approximation to allocate internal trip capture.

Table 1 shows the distribution assumptions by trip purpose used in the model to assign traffic onto the external road network. The distribution is shown by compass direction with south being Geraldton CBD and the highway commercial areas and west is the locality of Sunset Beach etc.

Table 1 Moresby Heights Distribution

Purpose ¹	North	East	South	West
Work Trips @ 29%	10%	5%	70%	15%
Home based Other @ 36%	10%	0%	75%	15%
Home Based Evening @ 21%	10%	0%	75%	15%
Non Home Based 14%	10%	5%	70%	15%

¹ Trip purpose is based on the Perth Metropolitan Travel Survey 1986, factored to exclude education trips.

In aggregate the distribution is equal to 90% of traffic heading south as discussed with the City of Geraldton officers.

Figure 3 shows the forecast daily volumes.

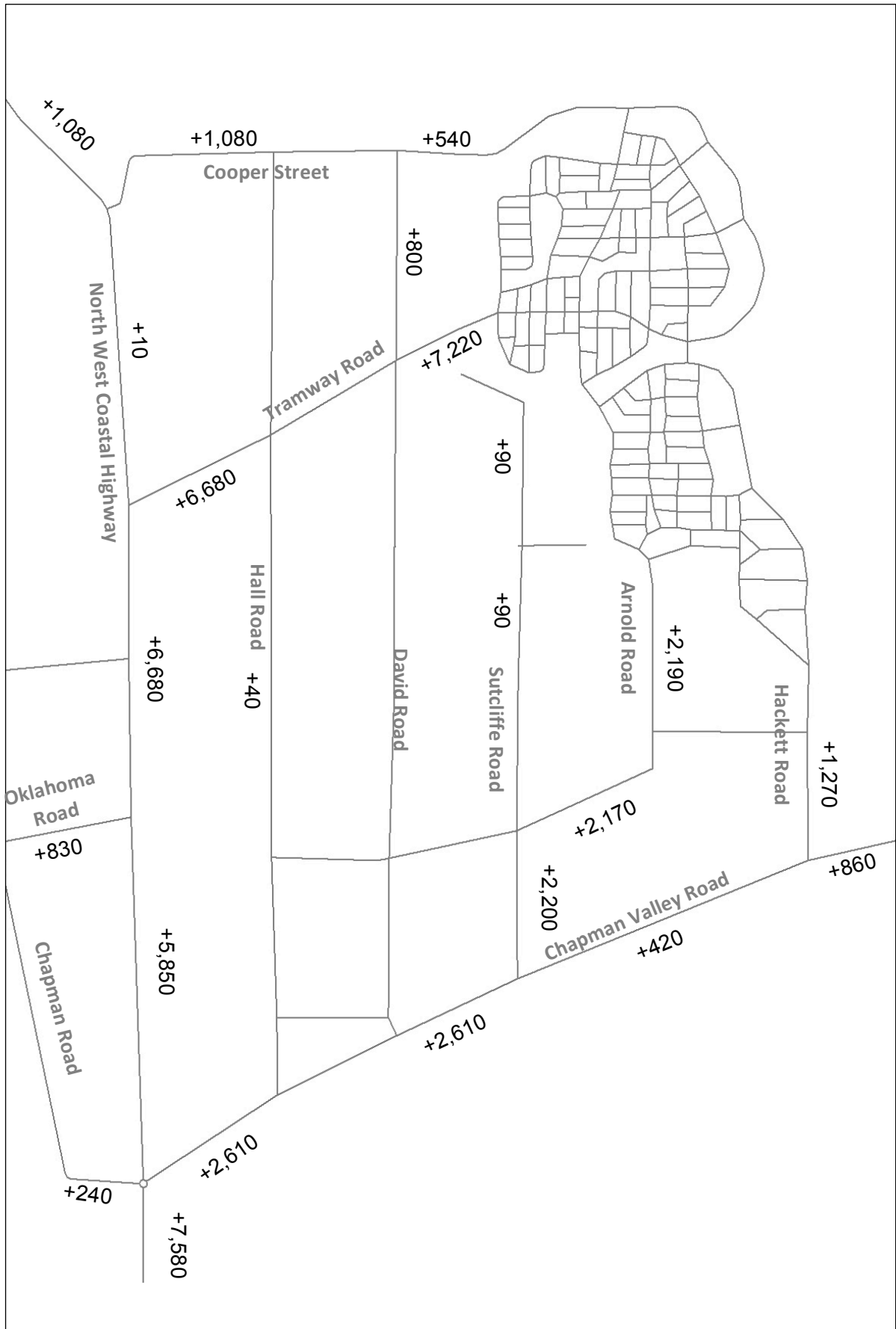


Figure 3 Forecast Traffic Volumes on External Roads

4.0 DEVELOPMENT TRAFFIC IMPACTS

Table 2 shows the potential impacts to the road network in terms of Levels of Service (LoS).

Table 2 Daily Traffic Volumes and Development Increase Impacts to LoS

Road	Daily Flow	LoS	Development	LoS
North West Coastal Highway north	2,740	B	+1,080	C
North West Coastal Highway	2,740	B	+6,680	D
North West Coastal Highway south	11,840	D	+7,580	F
Chapman Valley Road east	750	A	+860	A
Chapman Valley Road west	7,848	D	+2,550	D
Sutcliffe Road	455	A	+2,200	A
Tramway Road	@200	A	+6,680	C
Cooper Street	@300	A	+1,080	A

The LoS is based on Appendix A

Table 2 indicates that acceptable Levels of Service can be maintained on all roads except North West Coastal Highway to the south of Chapman Valley Road. These roads are considered in more detail below:

4.1 North West Coastal Highway

The North West Coastal Highway is the primary road through Geraldton and based on Table 1, would be expected to operate with a Level of Service D at the present time to the south of the subject land. With full development, the Level of Service would decrease to F and from an operational perspective the highway would fail to operate in an acceptable manner. Duplication of the highway to a four-lane divided road would be required (MRWA). With the future development of Oakagee port and the industrial land areas proposed by Landcorp, the need to upgrade North West Coastal Highway will not be solely as a result of proposed residential development. Indeed, the primary driver will be to provide good access between Oakagee Port and the Webberton / Nargulu industrial areas.

North West Coastal Highway will require four lanes south of Chapman Valley Road.

North of Chapman Valley Road the existing single carriageway would continue to operate in an acceptable manner. However, this does not take into account any future increase as a result of the Oakagee port development.

4.2 Chapman Valley Road

Chapman Valley Road west can be seen to maintain Level of Service D with the full development of Moresby Heights. The forecast volume is 10,750 vehicles per day and it can be expected that side road traffic will experience delays entering this flow during peak periods without assistance. Based on the Road Reserves Review document², Chapman Valley Road could be considered to require upgrading to provide a four-lane divided road. However, it is commonly accepted that a single carriageway road can be expected to continue to operate in an acceptable manner with 13,000 vehicles³. Widening to a four-lane road would not therefore, be considered to be warranted. Further, the provision of a four-lane carriageway will have a significant impact upon the North West Coastal Highway intersection layout.

To the east of Hackett Road the future volumes are low and will not require any works to the existing road.

4.3 Sutcliffe Road

Based on current traffic flows, Sutcliffe Road would be expected to continue to operate in an appropriate manner. It would need to be classified as a neighbourhood connector, which is an appropriate designation for a connecting road.

The increase in traffic flows using Sutcliffe Road can be expected to impact Chapman Valley Road and a roundabout to control the intersection could be considered.

4.4 Tramway Road

Tramway Road could have a forecast volume of just under 9,000 vehicles per day and would fall into the category of a district distributor (integrator arterial under LN). From a capacity perspective the volume can be accommodated.

The forecast volume may require turn treatments to be implemented at the North West Coastal Highway. The provision of a right turn lane as a minimum can be expected. Subject

² Ministry for Planning 1982

³ James Street in Guildford passes 26,000vpd as a two-lane boulevard style road.

to modelling, a roundabout or traffic signals may need to be contemplated. However, given the high use of the highway by large trucks, such treatments may be considered inappropriate and alternative links may need to be encouraged.

4.5 Cooper Street

The indicative increase to Cooper Street is manageable and would suggest that a local distributor road classification be adopted (neighbourhood connector under LN). The increase passing through its intersection with North West Coastal Highway is anticipated to be accommodated (subject to detail review). Minor works at this intersection may however, be required.

Some external road upgrading may be required to support the subdivision of the subject land.

5.0 ACCESS

Access to Moresby Heights will be provided initially from Hackett Road and Sutcliffe Road. An extension to Tramway Road is proposed and will become the focal entry point to the estate. Ultimately a northern connection to Cooper Road will also be achieved.

Analysis of the critical intersections is provided to assess the likely operation of these access points and to determine whether upgrading will be required to accommodate the proposed development.

5.1 North West Coastal Highway / Chapman Valley Road

This is an existing roundabout controlled intersection with a merging slip lane for Chapman Valley Road westbound. Figure 4 shows the layout of the existing intersection taken from Google Maps.



Figure 4 North West Coastal Highway / Chapman Valley Road Intersection

Analysis of the future operation of the roundabout at North West Coastal Highway / Chapman Valley Road has been undertaken using SIDRA. Tables 3 and 4 show the summary of the analysis attached as Appendix B for the AM and PM peak periods

respectively. It should be noted that the analysis includes the geometric delay of the intersection. The actual yield line delays are less than indicated.

Table 3 North West Coastal Highway / Chapman Valley Road AM Peak

Approach	V/C	Delay	LoS
Existing			
NWCH south	21%	8s	A
Chapman Valley Road west	20%	4s	A
NWCH north	11%	4s	A
Chapman Valley Road east	9%	10s	A
With Proposed Development			
NWCH south	32%	9s	A
Chapman Valley Road west	29%	4s	A
NWCH north	43%	5s	A
Chapman Valley Road east	10%	10s	A

Where V/C = volume of capacity
 Delay is average delay per vehicle
 LoS = Level of Service

Table 4 North West Coastal Highway / Chapman Valley Road PM Peak

Approach	V/C	Delay	LoS
Existing			
NWCH South	28%	8s	A
Chapman Valley Road west	12%	4s	A
NWCH North	7%	4s	A
Chapman Valley Road east	6%	10s	A
With Proposed Development			
NWCH South	60%	7s	A
Chapman Valley Road west	16%	4s	A
NWCH North	22%	5s	A
Chapman Valley Road east	12%	13s	A

Where V/C = volume of capacity
 Delay is average delay per vehicle
 LoS = Level of Service

Analysis indicates that the existing roundabout at North West Coastal Highway / Chapman Valley Road can be expected to operate at Level of Service A with the full development of Moresby Heights.

Regional traffic growth has not been applied to the North West Coastal Highway as growth is normally reliant upon development in the locality. It can be expected that Moresby Heights will be a contributing factor to regional traffic growth on the Highway. Also at the time of writing this report, the future of Oakagee port was unknown. The development of Oakagee port could have significant impacts upon the operation of the North West Coastal Highway. This report should be used by MRWA in assessing the future impact of Oakagee.

5.2 Tramway Road intersection

Tramway Road has an existing intersection to the North West Coastal Highway as shown in Figure 5.



Figure 5 North West Coastal Highway / Tramway Road

A full left turn deceleration lane is provided, but surprisingly no right turn lane is provided. A right turn lane would be recommended to be provided to this intersection if used as access to Moresby Heights.

Analysis of the intersection has been undertaken using Sidra to assess the impact of the full development of Moresby Heights in the AM and PM peak periods. The analysis is attached as Appendix C and summarised in Table 5 for the AM and PM peak hours.

Table 5 North West Coastal Highway / Tramway Road with Development

Approach	V/C	Delay	LoS
AM Peak Hour			
NWCH south	16%	6s	A
Tramway Road	44%	10s	A
NWCH north	8%	1s	A
PM Peak Hour			
NWCH south	35%	7s	A
Tramway Road	18%	10s	A
NWCH north	5%	2s	A

Where V/C – volume of capacity
 Delay is average delay per vehicle
 LoS – Level of Service

Analysis indicates that the existing intersection of North West Coastal Highway / Tramway Road can be expected to operate at Level of Service A with the full development of Moresby Heights. The analysis includes the provision of a full standard right turn lane which is recommended in the interest of road safety regardless of development traffic flows.

5.3 North West Coastal Highway / Cooper Road

Located to the north of Moresby Heights is Cooper Road. Modelling indicates that this link will be used by traffic to access locations north of Geraldton. It can be expected that traffic passing through this intersection will be associated with the future port and industrial areas at Oakagee. It can be seen from the traffic demands that Cooper Road can be expected to attract less than 2,000 vehicles per day.

The layout of the North West Coastal Highway / Cooper Road intersection is shown in Figure 6.

It has been shown that Tramway Road has an attraction of over 6,000vpd and is expected to operate with Level of Service A during peak periods. With a significantly lower volume of traffic passing through the intersection of North West Coastal Highway / Cooper Road, Level of Service A will occur. Analysis of the intersection is not required.



Figure 6 North West Coastal Highway / Cooper Road

Although analysis is not required, it is recommended that the intersection be provided with full standard deceleration lanes for traffic turning left and right at the intersection.

All intersections with North West Coastal Highway should be provided with full right turn and left turn deceleration lanes.

5.4 Local Road Network

Traffic volume increases to the local road network are to be managed so that existing roads operate in a manner suited to their function. *Liveable Neighbourhood* guidelines have been used to assess the possible impact to these roads.

There are intersections on existing local roads that will be affected by increases to current traffic volumes. Of significance will be the intersections of Tramway Road with David Road north and Hall Road. It is recommended that median islands be provided to David Road and Hall Road to highlight the intersection. The side road volumes would be unlikely to warrant roundabout control.

6.0 THE INTERNAL ROAD NETWORK

The traffic model has been used to determine the anticipated daily traffic flows on local streets. Figures 7 through 10 show the modelled forecast flows.

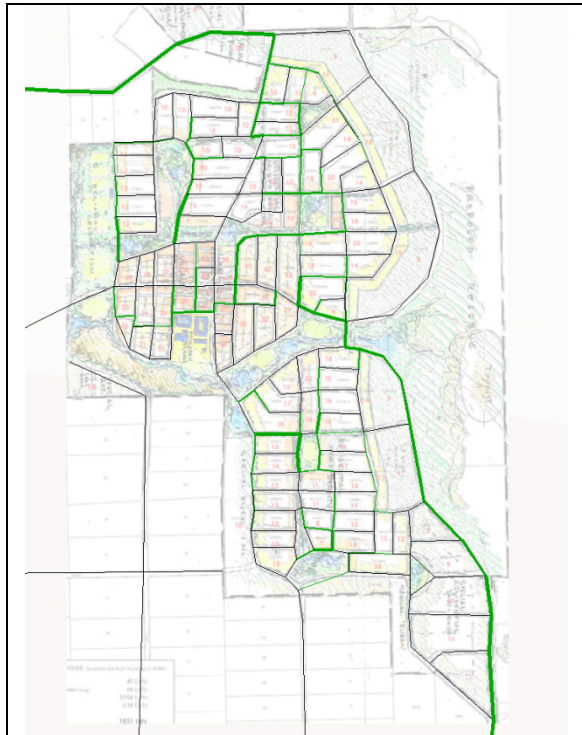


Figure 7 Roads less than 1,000vpd

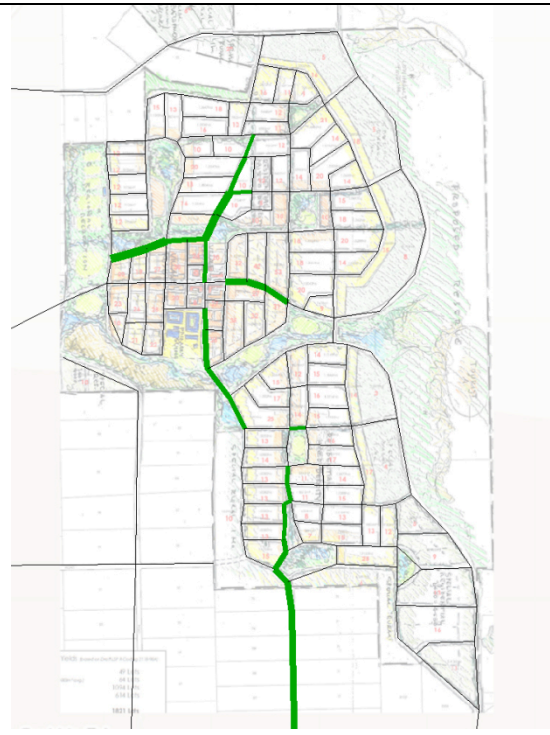


Figure 8 Roads 1,000-3,000vpd

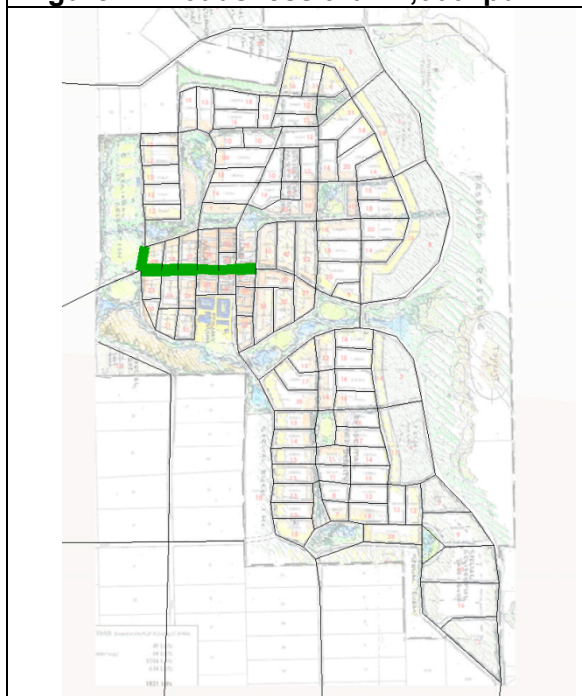


Figure 9 Roads 3,000 – 6,000vpd

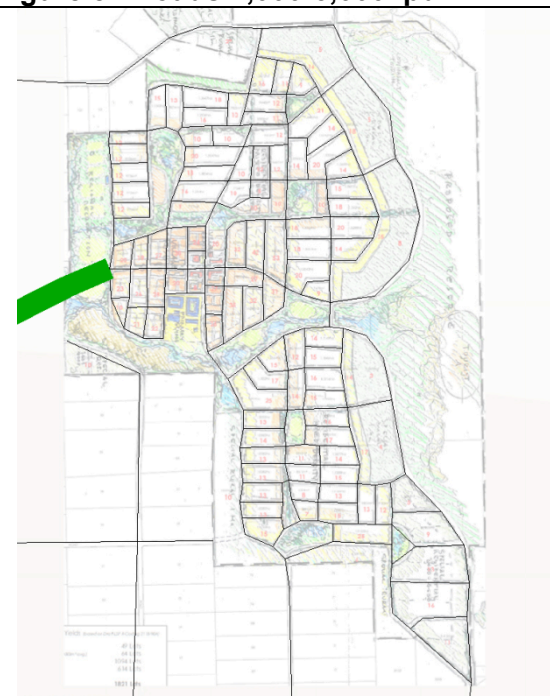


Figure 10 Roads greater than 6,000vpd

The forecast traffic flows provide a basis to develop an internal road hierarchy. Table 6 reproduces the advice on road types recommended by *Liveable Neighbourhoods*.

Table 6 *Liveable Neighbourhoods Road Hierarchy*

Indicative Daily Traffic Flow*	Designation	Street Characteristics
< 1,000 vpd	Access Street	Narrower access streets (5.5 to 6m) may be appropriate in locations further away from centres and activity where traffic flows are less than 1,000 vpd and a low on-street parking demand exists.
1,000 vpd to 3,000 vpd	Higher Order Access Street	Wider access streets (7 to 7.5m) cater for higher traffic volumes and are located closer to neighbourhood centres.
3,000 vpd to 7,000 vpd	Neighbourhood Connectors	Generally 2-lane undivided. These are 'special' streets and their design needs to have regard to context, function and adjacent land uses.
7,000 vpd to 20,000 vpd	District Distributor Type B	Typically will have 1 clear lane of travel in each direction and a parking / manoeuvring lane.
15,000 vpd to 35,000 vpd	District Distributor Type A	Typically have service roads and development frontage with ample on-street parking to support a mixture of land uses. Direct vehicle access from adjoining property should be limited where no service roads are provided.

* Function of streets needs to be considered as well as traffic volume.

The road hierarchy considers those streets that have a connective function and assigns an appropriate classification based on volume and continuity of movement.

Figure 11 shows the suggested road hierarchy for Moresby Heights.

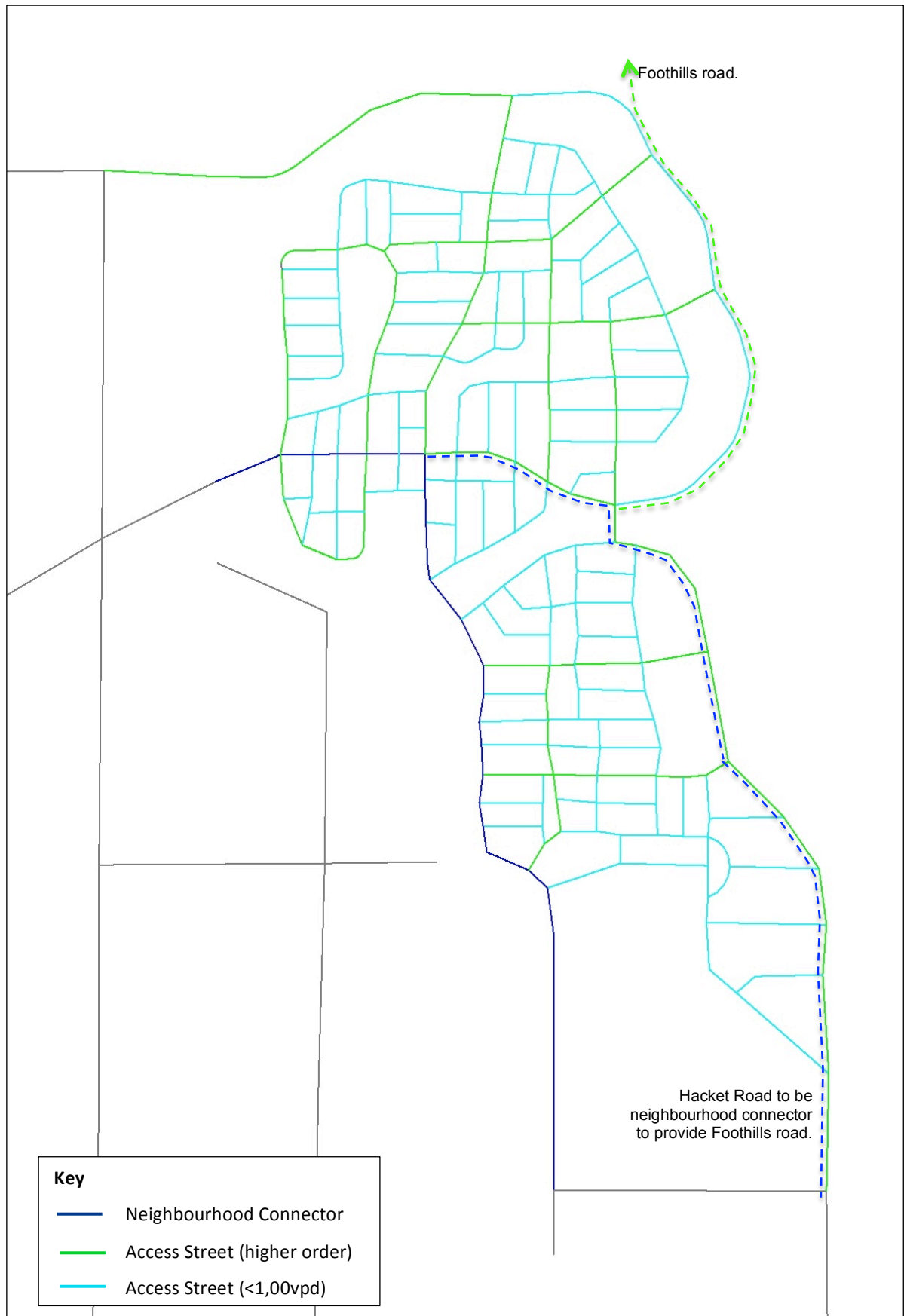


Figure 11 Moresby Heights Road Hierarchy

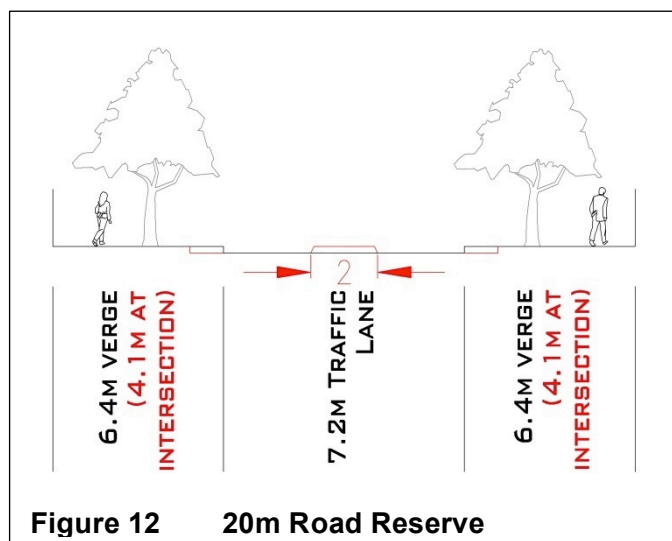
The following section provides guidance on the suggested hierarchy with regard to reserves and cross-sections. The cross-sections indicated are the minimum widths recommended for the various street types. The philosophy of providing constrained streets is to encourage a slower speed environment. However, wider reservation widths may be used to suit the character of the development and increase the opportunity for landscaping and frontage activity.

6.1 Neighbourhood Connectors

Liveable Neighbourhoods provides the following comment on neighbourhood connectors:

Neighbourhood connectors link neighbourhoods and towns, are carefully designed to calm traffic, limit noise and facilitate pedestrian use. They have frequent local street connections. They should not attract substantial long distance through traffic, but provide for safe and convenient local travel to and from arterial routes, usually at signal controlled intersections.

Roads shown blue in Figure 11 are considered as neighbourhood connectors as they provide the primary access to the structure plan area. Daily traffic flows on these roads are well within the 7,000 vehicles per day recommended. These streets can be provided with a standard 7.2 metre carriageway, which is suited to bus movements. A footpath to both sides of the street is required, although one side may be designated as a shared path. Figure 12 shows a suitable cross-section with localised widening at intersections.

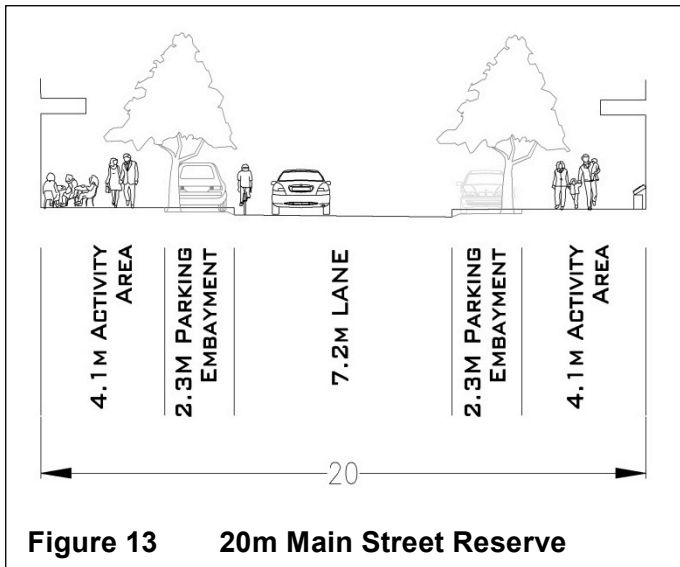


At intersections, median islands of 2.0 metres width would be desirable to provide safer pedestrian crossing points and to highlight the intersection. A residual verge width of 4.1 metres will occur where such medians are provided.

A minimum 20.0 metre cross-section is recommended for neighbourhood connectors

6.2 Main Street

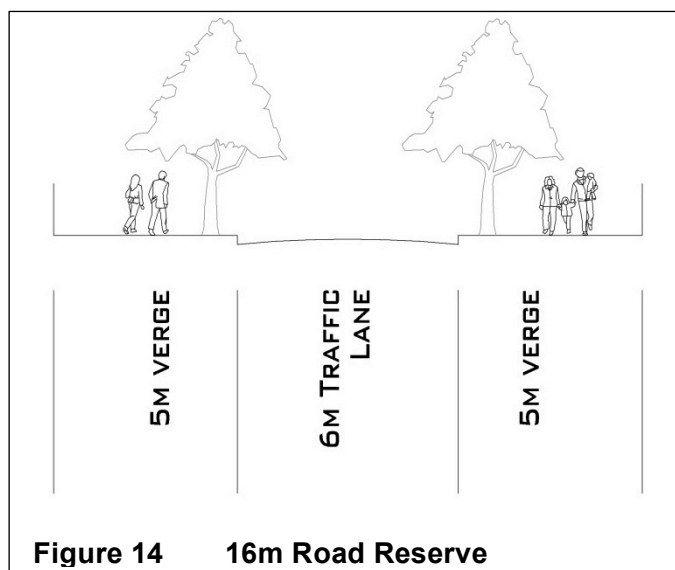
Within the main street area a 20 metre road reservation is still appropriate and can provide



for on-street parking embayments of 2.3 metres and a 7.2 metre wide carriageway. Residual verges of 4.1 metres are sufficient to allow street trees and al-fresco opportunity. Figure 13 shows a suitable cross section.

6.3 Access Streets

Access streets are the main residential streets within the development and provide direct lot access. A typical access street would be provided with a 6.0 metre to 7.0 metre carriageway depending on bus routes and Local Government requirements. It is recommended however, that the minimum carriageway width be provided to encourage a slower speed environment. Unfortunately many streets with 7.0+ metre carriageways and low density lots frequently experience traffic speeds well in excess of the posted 50kph limit. A reduced carriageway width will assist in achieving a more appropriate 40kph typical travel speed.



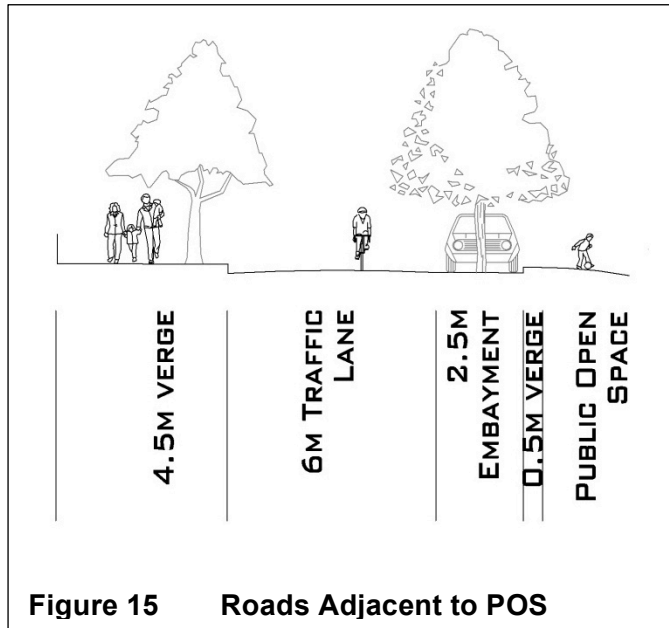
Access streets with daily traffic flows less than 1,000 vehicles are suited to a 6.0 metre carriageway and two residual 5.0 metre verges. There should be no need to provide medians in these low volume streets. Should a wider carriageway be required of 7.0 metres (not recommended) then residual verges of 4.5 metres would be provided and can accommodate standard

residential utilities. Figure 14 shows an appropriate cross-section.

A minimum 16.0 metre cross-section is recommended for access streets.

6.4 Roads Adjacent to Open Space

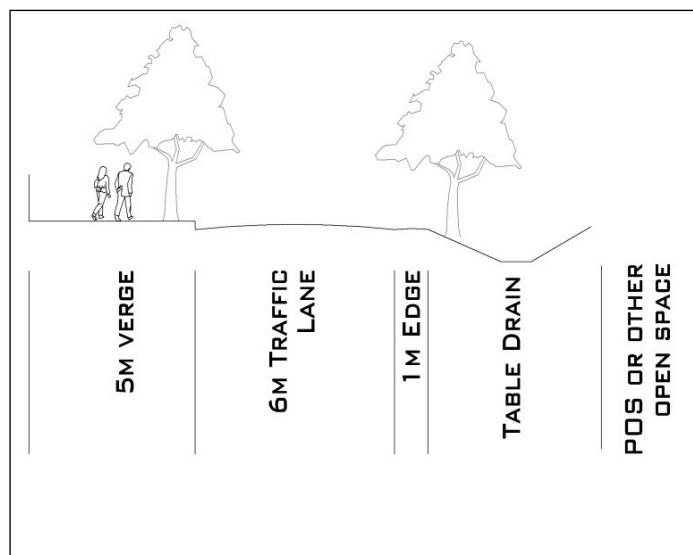
Where the road reservation abuts POS, bushland, golf courses etc, there is limited need to provide a verge. The verge may be reduced where parking and/or services are not required



and should be considered at the time of subdivision. A minimum verge of 0.75 metres is advised by current road planning standards to accommodate street furniture. Footpaths do not need to be adjacent to the road where POS is provided, but must be provided in a safe and appropriate manner. Figure 15 shows an example of a reduced road reservation adjacent to open space.

6.5 Roads with Table Drains

The rural nature of the site lends itself to providing on-street drainage using table drains.



Where such features are used, a wider road reservation would be required to accommodate the drain. Figure 15 shows a cross-section for a local access street with a table drain. The resultant road reservation will depend upon the drain requirements. The table drain does not need to be adjacent to open space as indicated by Figure 15. A table drain can be used adjacent to lots, but attention to driveway cross-overs will be required. Further, a

Figure 16 Roads With Table Drains

table drain may also be provided within a median.

6.6 Four-way Intersections

Within the structure plan area daily traffic volumes are shown to be low and the use of four-way intersections is appropriate. Figure 17 shows an extract from *Liveable Neighbourhoods* on the preferred treatment of four-way intersections.

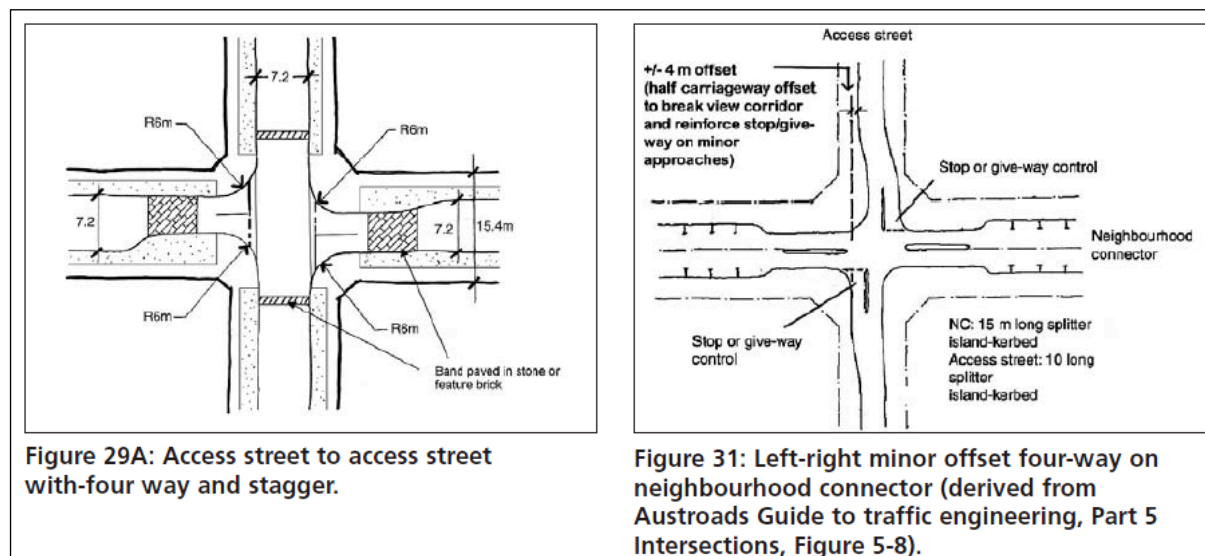


Figure 17 Liveable Neighbourhoods Four-way Intersections

Liveable Neighbourhoods suggests that four-way intersections are an appropriate treatment at the meeting of two access streets and where daily flows through the intersection are less than 2,000vpd. Approach legs should be limited to a maximum length of 160 metres with some form of speed reducing feature where the length is greater than 80 metres.

Access streets meeting neighbourhood connectors and some arterial street are considered acceptable, but will generally require a treatment as indicated in Figure 17. However, introducing four-way priority intersections on arterial streets is not recommended.

6.7 Corner Treatments

To reduce the opportunity for speeding it is recommended that corner radii advised by *Liveable Neighbourhoods* be used within the subdivision. The recommended radii are:

- 6.0 metres - access street / access street intersections
- 9.0 metres - access street / neighbourhood connector

Where larger vehicles are expected, such as buses accessing the school, larger radii may be required and should be considered at subdivision stage.

All streets are of relatively short lengths and high traffic speeds would not be expected. Further, the narrower carriageway widths proposed in low traffic residential streets will assist in reducing the attraction for speeding making a safer environment for local children.

No specific traffic management features are considered to be required within Moresby Heights.

7.0 PEDESTRIANS, CYCLISTS AND PUBLIC TRANSPORT

The structure plan provides for a primary school to the south of the main street and this is within a pleasant walking distance for the majority of households. The main street will provide for local facilities and should be provided with footpaths to both sides of the street.

Current planning guidelines suggest that all streets should be provided with a footpath where ever possible. Where traffic flows exceed 1,000 vehicles per day, a footpath to both sides of the road should be provided. Figure 18 shows those streets where a footpath is required to both sides.

7.1 Cycling

Cycling would be safe on the majority of local streets where traffic flows are less than 1,000 vehicles per day. On the neighbourhood connectors shared paths should be provided to provide a safe alternative to on-road cycling.

Off-street cycle routes are desirable to provide recreational cycling opportunities in the region.

7.2 Public Transport

The rural locality of Moresby Heights is likely to make the provision of public transport unviable. However, planning for a long term bus service should be considered. Figure 19 shows a long term route for buses and a 7.2 metre wide carriageway should be provided to these streets.

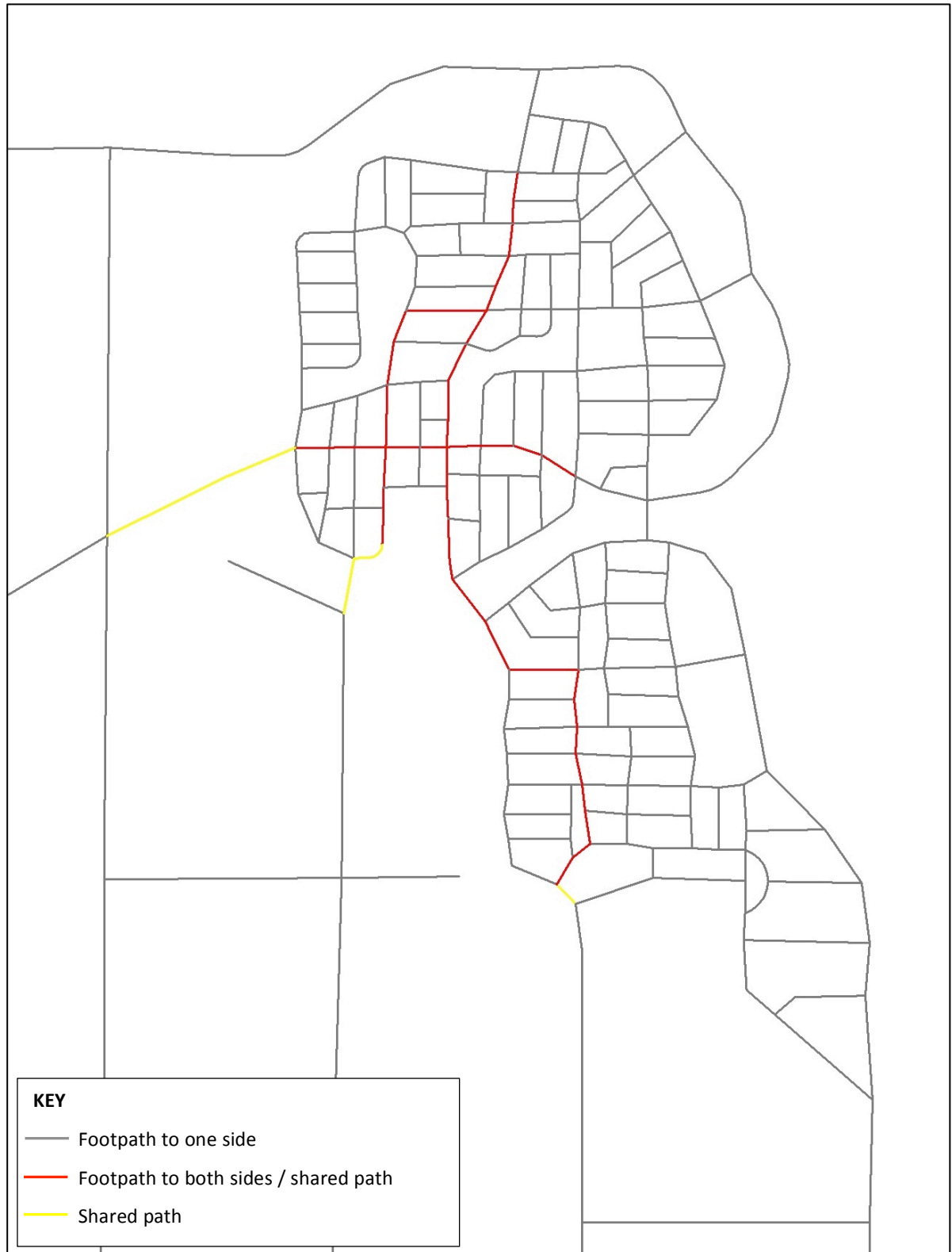


Figure 18 Footpaths and Cycle Paths

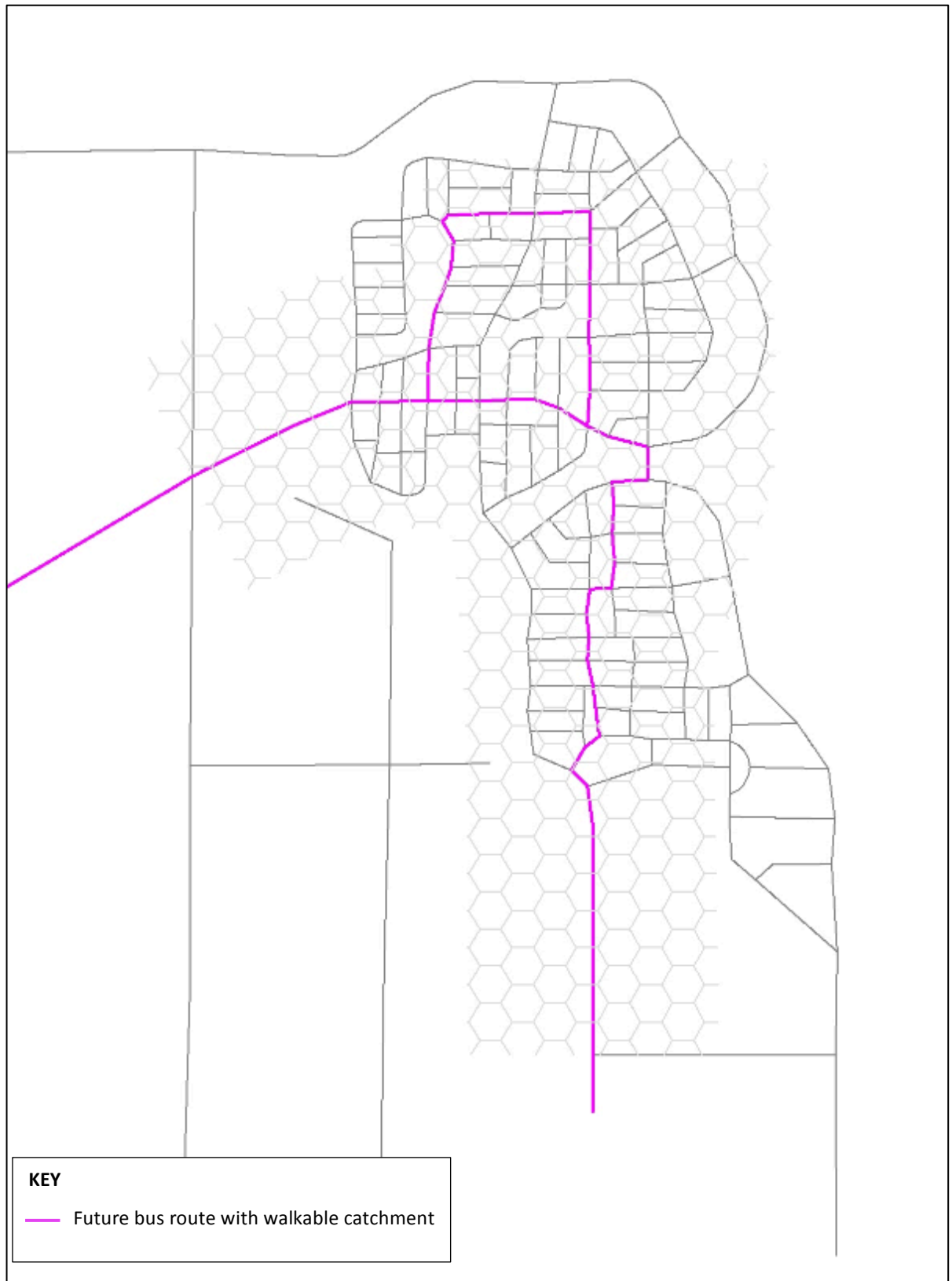


Figure 19 Roads for Future Bus Services

8.0 DEVELOPMENT STAGING

The development of Moresby Heights will occur in stages and access to existing residential streets will be required. As development progresses, the traffic demands on existing streets will increase until such time that the streets start to operate outside of their function.

It is expected that development will commence in the south and continue to the north with initial access being from Hackett Road. As a rural residential street with a carriageway of 6.5 metres, there is ample capacity to cater for quite high traffic volumes. However, from a residential amenity perspective, *Liveable Neighbourhoods* recommends limiting such streets to 3,000 vehicles per day.

Hackett Road currently has a volume of about 320vpd and obviously any increase will be noticeable. Ultimately this road is forecast to carry over 1,000vpd and can be expected to operate with a very good residential amenity.

Based on the residential trip rate of 9 trips per dwelling per day, it can be calculated that a permissible increase is 2,700 vehicles per day, which would equate to the construction of $(2700 / 9)$ 300 dwellings.

Additional access should be provided after the development of 300 lots.

Secondary access to the site can be provided from Arnold Road / Sutcliffe Road, which currently carries about 300vpd. In the long term it is expected that Sutcliffe Road will carry about 2,400vpd and will operate with good residential amenity. Again maintaining the residential amenity with a daily volume below 3,000vpd would allow the development of $(2,700 / 9)$, an additional 300 lots.

Utilisation of Hackett Road and Arnold Road / Sutcliffe Road will permit the development of just over 600 lots.

However, some interim traffic management measures may be required to limit the attraction to Sutcliffe Road as this street may provide a more convenient access to Chapman Valley Road.

A higher level of development may be achieved if local facilities such as a primary school and shops occur in the early stages of development. Such facilities will reduce the level of traffic leaving the subject land. However, such land uses may not be warranted with the development of only 600 lots.

8.1 Development of Tramway Road

Primary access to the site will occur through Tramway Road and planning for its construction will need to be commenced with early stages of development. The construction of Tramway Road can be expected to be required to support development beyond 600 lots.

Tramway Road will be required when development reaches 600 lots.

It can be expected that the existing intersection of Tramway Road / North West Coastal Highway will operate in an appropriate manner. However, with the possible future development of Oakagee port and associated industrial land, it is recommended that conditions on the North West Coastal Highway be reviewed at the time that Tramway Road is developed.

APPENDIX A

Table 1 Levels of Service by Road Type

LOS	Single Carriageway ¹	2-Lane Boulevard ²	Dual Carriageway (4-Lanes) ³	Dual Carriageway (4-lane Clearway) ³
A	2,400vpd	2,600vpd	24,000vpd	27,000vpd
B	4,800vpd	5,300vpd	28,000vpd	31,500vpd
C	7,900vpd	8,700vpd	32,000vpd	36,000vpd
D	13,500vpd	15,000vpd	36,000vpd	40,500vpd
E	22,900vpd	25,200vpd ⁴	40,000vpd	45,000vpd
F	>22,900vpd	>25,200vpd ⁴	>40,000vpd	>45,000vpd

¹ Based on Table 3.9 Austroads - Guide to Traffic Engineering Practice Part 2

² Based on single carriageway +10% (supported by Table 3.1 Austroads - Guide to Traffic Engineering Practice Part 3) – Boulevard or division by medians.

³ Based on RRR Table 3.5 - mid-block service flow rates (SF.) for urban arterial roads with interrupted flow. Using 60/40 peak split.

⁴ Note James Street Guildford passes 28,000vpd.

APPENDIX B

NORTH WEST COASTAL HIGHWAY / CHAPMAN VALLEY ROAD INTERSECTION OPERATION

North West Coastal Highway / Chapman Valley Road AM Peak Hour Existing Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c			Vehicles	Distance			
South: North West Coastal Highway South											
1	L	102	0.0	0.212	3.6	LOS A	1.6	11.0	0.18	0.31	52.9
2	T	48	0.0	0.212	2.8	LOS A	1.6	11.0	0.18	0.23	53.6
3	R	211	0.0	0.212	11.2	LOS A	1.6	11.0	0.18	0.70	47.2
Approach		361	0.0	0.212	7.9	LOS A	1.6	11.0	0.18	0.53	49.3
East: Chapman Valley Road											
4	L	372	0.0	0.200	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	11	0.0	0.036	3.3	LOS A	0.2	1.6	0.35	0.30	51.4
6	R	42	0.0	0.036	11.7	LOS A	0.2	1.6	0.35	0.65	46.4
Approach		424	0.0	0.200	4.0	LOS A	0.2	1.6	0.04	0.34	54.0
North: North West Coastal Highway North											
7	L	15	0.0	0.108	4.5	LOS A	0.7	5.1	0.43	0.43	51.5
8	T	134	0.0	0.108	3.8	LOS A	0.7	5.1	0.43	0.37	51.8
9	R	1	0.0	0.105	12.1	LOS A	0.7	5.1	0.43	0.90	47.8
Approach		149	0.0	0.108	3.9	LOS A	0.7	5.1	0.43	0.38	51.8
West: Chapman Valley Road West											
10	L	1	0.0	0.081	4.4	LOS A	0.6	3.9	0.41	0.41	50.5
11	T	25	0.0	0.083	3.6	LOS A	0.6	3.9	0.41	0.35	50.7
12	R	91	0.0	0.083	12.0	LOS A	0.6	3.9	0.41	0.68	46.3
Approach		117	0.0	0.083	10.1	LOS A	0.6	3.9	0.41	0.61	47.1
All Vehicles		1052	0.0	0.212	6.0	LOS A	1.6	11.0	0.19	0.44	51.1

North West Coastal Highway / Chapman Valley Road AM Peak Hour Future with Moresby Heights no regional growth Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c			Vehicles	Distance			
South: North West Coastal Highway South											
1	L	102	0.0	0.323	3.7	LOS A	2.9	20.4	0.26	0.32	52.0
2	T	48	0.0	0.323	2.9	LOS A	2.9	20.4	0.26	0.26	52.5
3	R	389	0.0	0.323	11.3	LOS A	2.9	20.4	0.26	0.65	46.8
Approach		540	0.0	0.323	9.1	LOS A	2.9	20.4	0.26	0.55	48.0
East: Chapman Valley Road											
4	L	542	0.0	0.292	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	28	0.0	0.066	5.0	LOS A	0.5	3.8	0.67	0.51	48.3
6	R	42	0.0	0.066	13.4	LOS A	0.5	3.8	0.67	0.73	46.2
Approach		613	0.0	0.292	4.0	LOS A	0.5	3.8	0.08	0.34	54.0
North: North West Coastal Highway North											
7	L	15	0.0	0.433	6.1	LOS A	3.9	27.4	0.69	0.57	49.7
8	T	521	0.0	0.437	5.3	LOS A	3.9	27.4	0.69	0.52	49.7
9	R	1	0.0	0.526	13.7	LOS A	3.9	27.4	0.69	0.90	47.2
Approach		537	0.0	0.437	5.3	LOS A	3.9	27.4	0.69	0.52	49.7
West: Chapman Valley Road West											
10	L	1	0.0	0.096	5.2	LOS A	0.7	5.1	0.54	0.50	49.3
11	T	33	0.0	0.099	4.4	LOS A	0.7	5.1	0.54	0.44	49.3
12	R	91	0.0	0.099	12.8	LOS A	0.7	5.1	0.54	0.72	46.0
Approach		124	0.0	0.099	10.5	LOS A	0.7	5.1	0.54	0.64	46.8
All Vehicles		1814	0.0	0.437	6.3	LOS A	3.9	27.4	0.34	0.48	50.2

**North West Coastal Highway / Chapman Valley Road
PM Peak Hour Existing Roundabout**

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
							veh	m			
South: North West Coastal Highway South											
1	L	82	0.0	0.284	3.5	LOS A	2.2	15.5	0.15	0.30	53.2
2	T	101	0.0	0.284	2.8	LOS A	2.2	15.5	0.15	0.22	54.0
3	R	316	0.0	0.284	11.2	LOS A	2.2	15.5	0.15	0.70	47.2
Approach		499	0.0	0.284	8.2	LOS A	2.2	15.5	0.15	0.54	49.2
East: Chapman Valley Road											
4	L	229	0.0	0.124	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	11	0.0	0.023	3.0	LOS A	0.1	1.0	0.26	0.26	52.6
6	R	25	0.0	0.023	11.4	LOS A	0.1	1.0	0.26	0.67	46.9
Approach		265	0.0	0.124	3.9	LOS A	0.1	1.0	0.04	0.34	54.1
North: North West Coastal Highway North											
7	L	8	0.0	0.070	4.7	LOS A	0.5	3.3	0.46	0.45	51.3
8	T	83	0.0	0.069	4.0	LOS A	0.5	3.3	0.46	0.39	51.5
9	R	1	0.0	0.070	12.3	LOS A	0.5	3.3	0.46	0.88	47.7
Approach		93	0.0	0.069	4.1	LOS A	0.5	3.3	0.46	0.40	51.5
West: Chapman Valley Road West											
10	L	1	0.0	0.058	4.9	LOS A	0.4	2.9	0.49	0.46	49.8
11	T	21	0.0	0.059	4.2	LOS A	0.4	2.9	0.49	0.41	49.9
12	R	55	0.0	0.059	12.5	LOS A	0.4	2.9	0.49	0.70	46.2
Approach		77	0.0	0.059	10.1	LOS A	0.4	2.9	0.49	0.62	47.1
All Vehicles		934	0.0	0.284	6.8	LOS A	2.2	15.5	0.18	0.47	50.4

**North West Coastal Highway / Chapman Valley Road
PM Peak Hour
Future with Moresby Heights no regional growth Roundabout**

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
							veh	m			
South: North West Coastal Highway South											
1	L	82	0.0	0.599	3.7	LOS A	7.3	51.1	0.27	0.32	52.2
2	T	488	0.0	0.599	2.9	LOS A	7.3	51.1	0.27	0.26	52.8
3	R	486	0.0	0.599	11.3	LOS A	7.3	51.1	0.27	0.72	47.2
Approach		1057	0.0	0.599	6.8	LOS A	7.3	51.1	0.27	0.48	49.9
East: Chapman Valley Road											
4	L	303	0.0	0.163	3.2	NA ⁹	NA ⁹	NA ⁹	NA ⁹	0.30	55.2
5	T	18	0.0	0.032	3.6	LOS A	0.2	1.6	0.43	0.35	50.8
6	R	25	0.0	0.032	12.0	LOS A	0.2	1.6	0.43	0.70	46.7
Approach		346	0.0	0.163	3.8	LOS A	0.2	1.6	0.05	0.34	54.2
North: North West Coastal Highway North											
7	L	8	0.0	0.222	5.9	LOS A	1.8	12.5	0.64	0.56	50.0
8	T	249	0.0	0.221	5.2	LOS A	1.8	12.5	0.64	0.51	50.0
9	R	1	0.0	0.211	13.6	LOS A	1.8	12.5	0.64	0.90	47.2
Approach		259	0.0	0.221	5.2	LOS A	1.8	12.5	0.64	0.51	50.0
West: Chapman Valley Road West											
10	L	1	0.0	0.117	9.4	LOS A	1.1	7.6	0.85	0.73	47.0
11	T	39	0.0	0.117	8.7	LOS A	1.1	7.6	0.85	0.71	46.5
12	R	55	0.0	0.117	17.0	LOS B	1.1	7.6	0.85	0.80	43.6
Approach		95	0.0	0.117	13.5	LOS B	1.1	7.6	0.85	0.77	44.7
All Vehicles		1757	0.0	0.599	6.4	LOS A	7.3	51.1	0.31	0.47	50.3

APPENDIX C

North West Coastal Highway / Tramway Road

North West Coastal Highway / Tramway Road Full Development AM Peak Hour Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
South: NWCH South											
2	T	94	0.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	191	0.0	0.156	9.0	LOS A	0.8	5.9	0.30	0.65	47.6
Approach		284	0.0	0.156	6.0	LOS A	0.8	5.9	0.20	0.43	51.1
East: Tramway Road											
4	L	445	0.0	0.438	9.5	LOS A	3.0	20.7	0.39	0.67	47.3
6	R	37	0.0	0.081	13.6	LOS A	0.4	2.6	0.55	0.80	43.7
Approach		482	0.0	0.438	9.8	LOS A	3.0	20.7	0.40	0.68	47.0
North: NWCH North											
7	L	16	0.0	0.009	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	156	0.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		172	0.0	0.080	0.8	LOS A	0.0	0.0	0.00	0.06	58.8
All Vehicles		938	0.0	0.438	7.0	NA	3.0	20.7	0.27	0.49	50.0

North West Coastal Highway / Tramway Road Full Development PM Peak Hour Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
South: NWCH South											
2	T	133	0.0	0.068	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	445	0.0	0.350	9.0	LOS A	2.3	16.1	0.31	0.64	47.5
Approach		578	0.0	0.350	6.9	LOS A	2.3	16.1	0.24	0.49	49.9
East: Tramway Road											
4	L	191	0.0	0.178	8.8	LOS A	0.9	6.3	0.24	0.64	47.9
6	R	16	0.0	0.053	18.4	LOS B	0.2	1.6	0.68	0.89	39.8
Approach		206	0.0	0.178	9.5	LOS B	0.9	6.3	0.28	0.65	47.2
North: NWCH North											
7	L	37	0.0	0.020	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	95	0.0	0.049	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		132	0.0	0.049	2.3	LOS A	0.0	0.0	0.00	0.19	56.4
All Vehicles		916	0.0	0.350	6.8	NA	2.3	16.1	0.21	0.49	50.1

APPENDIX 7

**Preliminary Engineering Servicing Report
(Including Local Water Management Strategy, Aecom, December 2012)**

Preliminary Engineering Services Report

Moresby Heights Development



Preliminary Engineering Services Report

Moresby Heights Development

Prepared for

Sutcliffe Road Joint Venture

Prepared by

AECOM Australia Pty Ltd

Unit 8/273 Foreshore Drive, Geraldton WA 6530, PO Box 263, Geraldton WA 6531, Australia

T +61 8 9920 4800 F +61 8 9921 7265 www.aecom.com

ABN 20 093 846 925

19 December 2012

60225287

AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document Preliminary Engineering Services Report
 Ref 60225287
 Date 19 December 2012
 Prepared by Karan Bhalla
 Reviewed by Joseph Reilly

Revision History


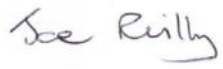
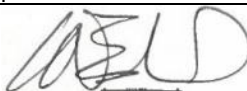
Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	26-Mar-2012	Information	Chris Lee Geraldton Manager	 pp.
B	07-May-2012	Submission	Chris Edwards Manager - Geraldton Office	 p.
C	19-Dec-2012	Submission	Chris Edwards Manager - Geraldton Office	

Table of Contents

Executive Summary	i
1.0 Introduction	1
2.0 Geotechnical Investigations	2
2.1 Introduction	2
2.2 Geological Information	2
2.3 Potential Geotechnical Issues	3
2.4 Possible Site Classifications	4
2.5 Acid Sulphate Soils (ASS)	4
2.6 Geotechnical Recommendations	5
3.0 Water and Waste Water	6
3.1 Water	6
3.2 Waste Water	6
3.3 Internal Waste Water Reticulation	7
4.0 Power	8
5.0 Gas	9
5.1 WA Gas Network	9
5.2 Origin Energy	9
6.0 Telecommunications	10
6.1 Telstra	10
6.2 NBN Co.	10
7.0 Construction	11
7.1 Roads	11
7.2 Earthworks	11
7.3 Staged Construction	11
7.4 Tourist Site	12
8.0 Local Water Management Strategy	13
Appendix A	
Moresby Heights Conceptual Sketch	A
Appendix B	
Western Power Feasibility Study	B
Appendix C	
Moresby Heights Staging Plan	C
Appendix D	
Local Water Management Strategy	D
Appendix E	
Dial Before You Dig	E

Executive Summary

AECOM Australia Pty Ltd has been engaged by the Sutcliffe Road Joint Venture to provide Civil Engineering Consulting services to assist with the planning of the proposed residential development in Moresby Heights, Waggrakine. This revised Preliminary Engineering Services Report (PESR) is provided based upon the current concept sketch plan (plan no: 2118-68B-01 dated 18 May 2011, attached in Appendix A) and the draft Local Structure Plan received from CLE, the development concept staging plan (attached in Appendix C), and from liaison with the various authorities and service providers. The PESR provides an understanding of the capacity and availability of infrastructure services to the proposed development and the viability of constructing the earthworks, roads and stormwater concept designs within the sites constraints. Information available from Dial Before You Dig (Refer to Appendix E), a Western Power feasibility Study, and discussions held with the relevant service providers have been used to compile this report.

The desktop geotechnical investigation shows that there are two major geological systems that are expected within the site which are the Moresby System (Mo) and the Spearwood System (Sp). The Moresby System's dominant unit (MoCf) is described as colluvial on the foot slopes comprising of silty sand over mottled sandy clay. The Spearwood System is described as being equivalent to the Pleistocene Tamala Limestone, which covers the north western and south-eastern corners of the site. The site has two small identified locations where Acid Sulphate Soils may be present and as such there is an associated risk of low to moderate and moderate to high. Where excavation in these areas is likely to exceed 3 m appropriate risk measure are to be exercised. The geotechnical materials identified in this desktop study may have potential issues in construction such as bearing capacity, reactive soils, excavatability, groundwater and limits of reuse which will require an appropriate management response. It is recommended that further geotechnical site investigations are to be undertaken to further resolve this.

The Water Corporation is yet to complete a water plan for this development, but will commence this process once there is approval of the proposed structure plan. Currently Water Corporation advises that the source of water is likely from the Allanooka Borefield which supplies much of Geraldton. Additional water reservoir tanks may be required.

With regards to wastewater the installation of septic tanks in precincts 1 and 2 is believed to be appropriate as they are rural residential developments. For all urban areas wastewater will need mains reticulation and treatment. There is an option for the waste water to be treated in a privately owned wastewater treatment plant. It is suggested that the waste reticulation network will be gravity fed due to the site topography, but some sections may require a pressure system, however this will be confirmed at detail design stage.

Western Power was commissioned to undertake a feasibility study to assess the capacity for the provision of power. The report indicated that the current Kalbarri feeder off the Geraldton substation feeder may have non-firm distribution capacity (guaranteed power supply may not be available) to connect stages 1 and 3. Shortfalls in availability of supply of power are usually resolved through the upgrading of infrastructure; the requirements will be confirmed and resolved upon a formal application for subdivision power.

As this development is greater than a 100 lots regardless of the staged construction NBN Co. are responsible for providing the telecommunication infrastructure. NBN Co shall provide the fibre infrastructure at no costs to the developer however the developer is responsible for the design of the pit and pipe infrastructure in accordance with the NBN Co specifications and standards.

There are currently two options for provision of a reticulated gas service which could be provided through WA Gas Networks or a stand-alone system through Origin Energy. In both options, a capital cost contribution will be required from the Developer for the installation of a gas reticulation network. At a detailed stage both options can be formally investigated to assess the cost-effectiveness.

The proposed road sections and layouts are documented in the Transport Assessment conducted by Riley Traffic Consulting, with design development and construction standards to be informed by the City of Greater Geraldton's land development standards and guidelines.

The Local Water Management Strategy is based on an infiltration approach for conveyance of the stormwater and disposal on site. This is achieved by the means of swales, perforated pits, soakwells and infiltration basins. The stormwater storage requirements of minor and major events are achievable within the site's road reserves and drainage basins. The flood management as per DoW guidelines will require a habitable floor level of 0.5 m above the peak levels of the infiltration basin and these levels will be determined during detailed design of the basins.

1.0 Introduction

This report includes an investigation of the existing services and their servicing requirements, a Local Water Management Strategy and preliminary requirements for the roads and earthworks required to support development of the proposed Moresby Heights residential estate.

The proposed site is located 11 km north of the Geraldton Town Centre and incorporates Lots 80 and 81 at Hackett Road Waggrakine. It is proposed that the lot yield be in the ranges of 1,500 to 2,000 lots. Based on the proposed plans there are 1,673 lots identified which do not include lot allocations for the proposed Moresby Heights town centre, rather an allowance of a 3.5 ha area is incorporated in which will be subject to market use requirements that will drive the final lot yields of this area.

2.0 Geotechnical Investigations

2.1 Introduction

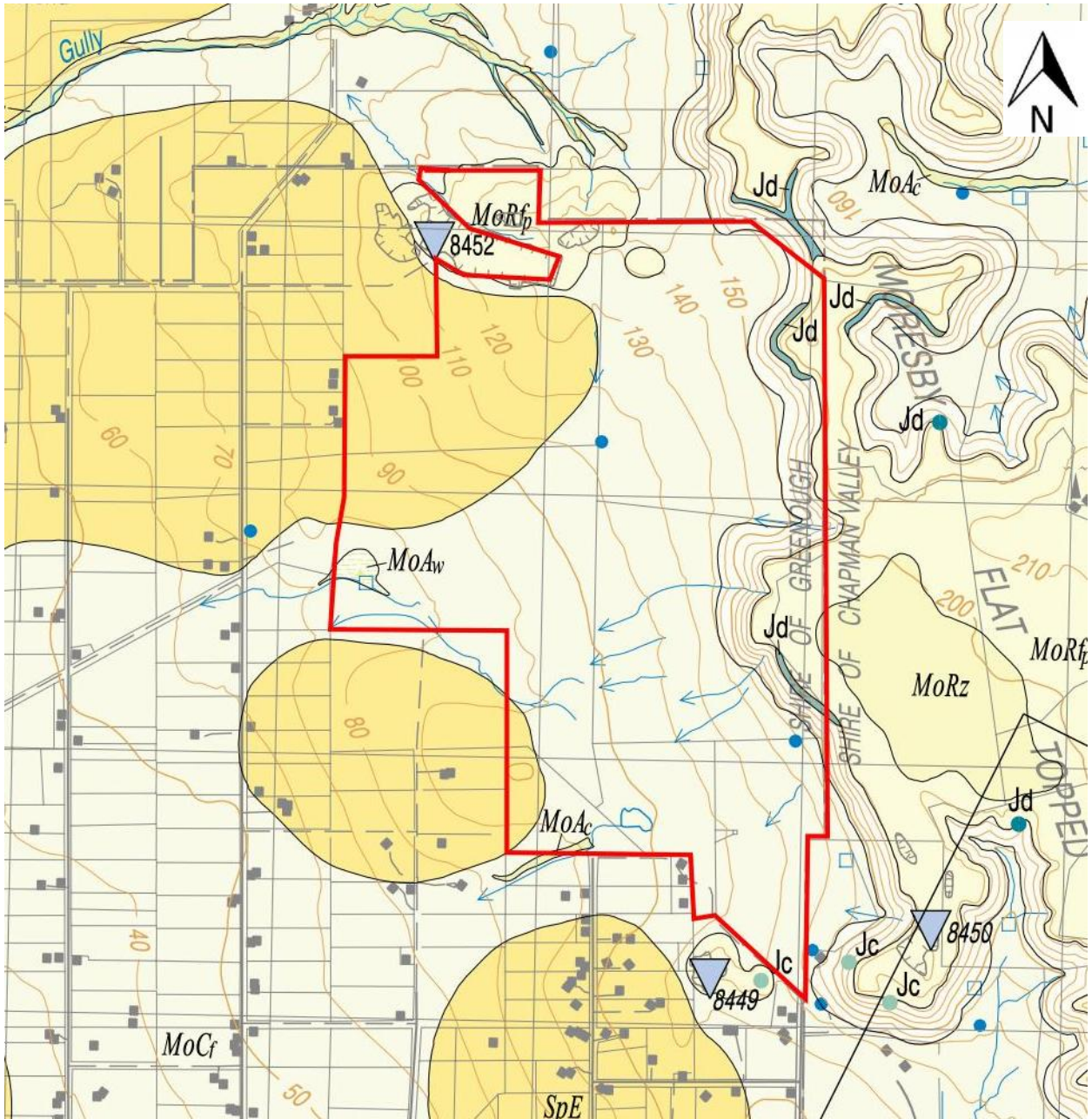
A desktop study of publicly available information relating to the geological, geotechnical and Acid Sulphate Soils (ASS) aspects of the site was completed. No nearby geotechnical site investigation data was available.

2.2 Geological Information

The 1:50,000 Series maps (Howatharra sheet) issued by the Geological Survey of Western Australia indicates that the site is predominantly underlain by the Moresby (Mo) and the Spearwood (Sp) System. An enlarged portion of the map showing the proposed site is shown in Figure 1. The two major geological systems that are expected within the site are:

- the Moresby System (Mo)
- the Spearwood System (Sp)

Figure 1 Geological Survey Map



Legend:

Mo: Moresby System

Sp: Spearwood System

Figure 1

Site Geology

Moresby LSP Development

Moresby System (Mo)

The soil materials of the Moresby System (Mo) that covers the majority of the site is derived from the weathering and erosion of the underlying dominantly siliciclastic Jurassic rocks (Jc, Jd, Jy). The Moresby System is a relict plateau with associated foot slopes and side slopes. Weathered rock debris, gravel, and boulders dominate on the proximal slopes. On the more distal slopes, the colluviums grades to gravelly silty sand, as this may be indurated and mottled. These deposits rest on weathered bedrock and ranges from a residual soil of mottled sandy clay to highly weathered silty sandstone.

The most dominant unit of the Moresby System within the site is MoCf, which can be described as colluvial on the foot slopes and comprises of silty sand over mottled sandy clay. It includes mass wasting deposits on the colluvial slopes ranging in thickness from 1 m to more than 8 m. It comprises approximately 1-2 m of colluviums with loose sandy soil over mottled red to strong brown and grey gravelly silty medium sand with ferruginous nodules of up to 20 mm. These are underlain by residual soil of mottled sandy clay to highly weathered silty sandstone.

The other units that are part of the Moresby System within the site are as follows:

- MoRfp
This is described as residual materials containing ferruginous pisolitic duricrust over mottled soil (weathered bedrock), existing in the north west corner, a small area in the south east corner and near the eastern end (on the plateau) of the site.
- MoAw
This is described as alluvial, swamp and waterlogged organic soil which lies over silty sandy clay and exists in a small area near the western end of the site.
- MoAc
This is described as alluvial, stream channel; includes bed and banks; seasonally active; silty sandy clay, slope deposits, and weathered bedrock. This exists in a small area in the south west corner of the site.
- MoCt
This is described as colluvial, talus slope to escarpment with weathered rock debris, gravel and boulders. It is located on the slope of the plateau in the east side of the site.

Within the abovementioned slope, the Jd material may also exist as part of the Cadda formation comprising of outcrops of shale, siltstone, sandstone and shelly sandy limestone.

Spearwood System (Sp)

The Spearwood System (Sp) is described as being equivalent to the Pleistocene Tamala Limestone, which covers the north western and south-eastern corners of the site. The system is composed of residual sand overlying calcarenite in a series of deflated dunes with extensive exposures of limestone in relict coastal cliffs.

In terms of industrial use, the sand could be worked into smaller pits for use in the building industry and the calcarenite is a potential source of rock for land reclamation. The SpE is the unit of the Spearwood System that covers the site. The dominant exposed regolith was deposited as calcareous dune sand, but has weathered by surface leaching and groundwater precipitation to form yellow and red residual quartz sand (SpE). This is described as eolian with deflated dunes of residual quartz sand over calcarenite which rises on colluvial slopes-formed as a weathered residuum over limestone in some areas. The SpE overlies the MoCf and the thickness of the SpE unit could not be determined solely based on the geological map.

2.3 Potential Geotechnical Issues

Based on the desktop study used to construct the geological information provided above, the potential geotechnical issues that may impact the proposed development are identified as follows:

- Bearing Capacity-
The existence of surface loose sandy soil may result in an insufficient shallow foundation bearing capacity and excessive settlement. However, this may be improved by surface compaction or excavation followed by compaction in lifts.

- Reactive Soils-

The existence of residual clays within the Moresby System, if shown to have high plasticity, may result in ground upheaves and settlements due to moisture condition variations. Investigation needs to be undertaken to assess this.

- Excavatability-

Majority of the in-situ soils should be excavatable using standard earthmoving equipment without significant difficulties. The potential existence of shallow calcarenite within the SpE materials may result in additional efforts during excavation, and therefore the use of more powerful excavators or ripping may be required.

The existence of exposed rocks / outcrops (Jd materials) on the slope of the plateau to the eastern end of the site may result in difficulties during excavation. However, it is worth noting that this area is proposed as an area for 'open space' and so no developments are expected within this area.

- Groundwater in Excavations-

There is no evidence of groundwater conditions near the site area from the available data reviewed in the execution of this study.

- Reuse of Materials as Fills-

The geological map identified the presence of sandy clay within the MoCf materials and so the plasticity of these materials needs to be verified prior to using the material as potential structural fill.

The above mentioned issues would need to be confirmed following a geotechnical site investigation.

2.4 Possible Site Classifications

Based on the available information gathered from the relevant geological map, the site classification is considered likely to be as follows:

- Classes "M" to "H"- where it is underlain by MoCf
- Class "S"- where it is underlain by SpE

It should be noted that the actual site classification is heavily dependent on the shallow surface materials and should be based on site-specific geotechnical investigations.

2.5 Acid Sulphate Soils (ASS)

The Acid Sulphate Soils Risk Map supplied by the Department of Environment and Conservation and Landgate, as shown in Figure 2 indicates the potential ASS risks (within 3 m depth from the natural surface) which can be summarised as:

- *No Known Risk to Low Risk* - for the majority of the site;
- *Moderate to High Risk* - near the western end of the site (less than 2.5 hectare),
The provided structure plan of the development proposes a 'public open space' for this area;
- *Low to Moderate Risk* - in the south west corner of the site (less than 0.3 hectare),
The structure plan proposes large lot special rural development in this area.

As the ASS risk maps were not precise in terms of the spatial location of boundaries, it is important to consider the existence of areas with ASS potential within the vicinity of the site boundary. It is also worth noting that an area within 80 m distance from the northern boundary of the site has been identified as having *Low to Moderate Risk* of ASS.

For any areas where the disturbance is expected to exceed 3 m depth from the natural surface, it is recommended that a specific ASS risk assessment is undertaken, possibly with field investigations.

Figure 2 Acid Sulphate Soils Risk Map

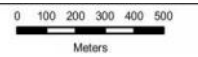
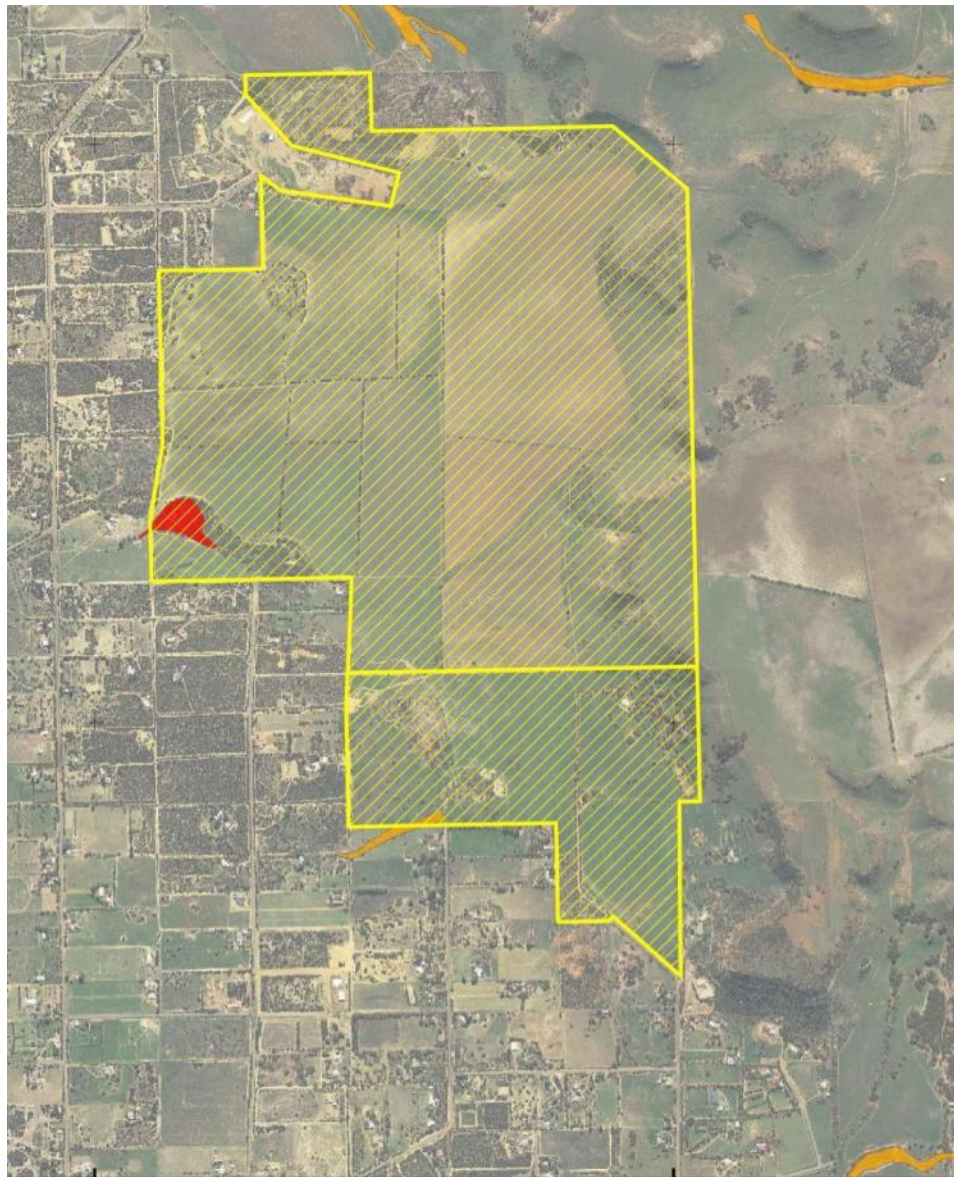


Figure 2

Acid Sulfate Soil (ASS) Risk Map

Moresby LSP Development

2.6 Geotechnical Recommendations

Further geotechnical site investigations, amongst others, will be undertaken at subdivision stage to:

- assess the thickness, material type, strength and stiffness characteristics of the in situ soils for shallow foundation and retaining system (if required)
- confirm the site classification in accordance with AS2870-1996
- verify the excavatability of the soil (in particular the SpE where there could be a potential for existence of limestone at depth)
- assess the engineering properties for the potential fill materials.

The site slopes by more than 80 m from east to west (over a distance of 1.7 km), and the proposed development will involve normal cut-and-fill earthworks expected of a site with this slope. It is important to ensure that the site investigation is carried out to the depth appropriate for the finish design level. See Figure 3.

In addition, an environmental site investigation may also be carried out to verify the ASS classification of the site that was discussed above.

Figure 3 Recommended Geotechnical Testing Locations



Figure 3

Oblique View of the Site (Aerial Photograph from Google)

Moresby LSP Development

3.0 Water and Waste Water

3.1 Water

The Water Corporation (WC) has not yet commenced water planning for this development area. Planning in this area would only be triggered upon approval of the proposed structure plans. However Water Corporation's Planning Department has identified that the subject site can source water from the Allanooka Borefield. Further advice can be provided once the Water Corporation has completed its planning phase which is expected to be completed two to three years after the approval of the structure plan and shall only be triggered upon approval of the proposed structure plans.

There is existing water services adjoining the development, specifically:

- On Arnold Road crossing into site and exiting the site onto Waggrakine Road;
- On Hackett Road and ending at the site boundary;
- On Sutcliffe Road and ending at the site boundary;
- On Cooper Street ending at the site boundary.

These existing water services may be sufficient to supply the lower lot yield special rural development but further detailed design and investigation is required to confirm this.

3.2 Waste Water

The Water Corporation advises that under the Draft Geraldton Greater Structure Plan, Moresby Heights is identified as a development investigation area, however Water Corporation have not conducted detailed planning for the waste water services in the area and this will only commence once a formal structure plan is presented with a confirmed zoning of the area between Moresby Heights and the North West Coastal Highway.

As per the concept staging plan Stage 1 of this development comprises of precinct 1 and 2 which are residential R5 lot areas and range in size between 2000 m² and 4000 m²; septic tanks are likely to be used for these lots. For the other precincts, no formal waste water planning has been completed by the Water Corporation and the development is limited in means of transporting the waste water via a reticulation system to the treatment facility located > 2 km from site. Aqueonics, a supplier of alternative waste water treatment facilities, could cater for this solution by supplying an alternating Aerobic/Anaerobic Trickling Filter system.

Preliminary discussions have been held with the City of Greater Geraldton (CGG) and the Water Corporation with regard to owning and operating the waste water treatment plant. The Shire of Mullewa amalgamated with the CGG and as a result of this merger the city has inherited a treatment facility which is a standalone facility from the Water Corporation network zone. The CGG have not had previous experience in owning and operating a treatment facility however welcome the idea of exploring such serviceability avenues. CGG confirm that should they be elected as the preferred service provider by the developer, discharge licences and alternative service authority approvals are achievable. In addition CGG will require a formal submission detailing the proposal so to assess the viability for the CGG to undertake such a role and be the custodian of this alternative treatment facility.

Water Corporation as a service provider requires a number of staged approvals. Advice from the Water Corporation's planning division indicates that, firstly the Department of Water (DoW) is to be engaged for the process of planning prior to engagement with Water Corporation. In this instance DoW shall review the licence to discharge the effluent from the treatment facility to be provided by Aqueonics. Once Aqueonics has a discharge licence, Water Corporation are to be engaged and should it be proposed that Water Corporation be the alternative service provider, an alternative water supplies guide is to be adhered to comprising of a seven step guide for which developers are required to abide by:

- 1) Develop an 'Alternative Water Supply Plan';
- 2) Determine Feasibility of Concept;
- 3) Develop a Business case;
- 4) Secure a Service Provider;
- 5) Secure appropriate Clearances and Approvals;

- 6) Develop your Detailed Design;
- 7) Double Check Everything and Implement.

It has also been advised by the Water Corporation that the process of planning and approving itself as the alternative service provider will take an approximate 18 to 24 months.

3.3 Internal Waste Water Reticulation

The waste reticulation network within the development is likely to be gravity fed based on the topography of the site. The Contour plan provided by CLE shows that the land has a gradual fall from the east to the west with an approximate gradient of 3.5% (from AHD 130 m to AHD 85 m). There are sections of the development that may require the waste water to be conveyed in a pressurised system however this would need to be confirmed upon detailed design stage.

4.0 Power

To assess the capacity for the provision of power to the proposed Moresby Heights Estate, Western Power was commissioned to undertake a feasibility study (Refer to Appendix B). The study incorporated the future expected development in an assessment incorporating the potential staging and loading requirements and an estimated load consumption of 3.3 MVA over three stages assumed to be constructed over a three year period.

A conceptual staging plan was provided to Western Power for the feasibility study where it has been assumed that it will take approximately three years to construct stages 1 – 3 with an estimated construction program starting mid 2012 and finishing in 2014. The basis of this timeline assumption is driven by the Electricity Distribution Regulations which is Western Power's policy to assess a supply capacity for a proposed subdivision works that are scheduled within three years of the date of the feasibility study application. The completed feasibility report is an assessment on the serviceability of stages 1 (mid 2012), 2 (2013) and 3(2014).

Western Power's feasibility report indicates that the current Kalbarri feeder off the Geraldton substation feeder may have non-firm distribution network capacity to connect stages 1-3, however this cannot be guaranteed until a formal application is made confirming the requirements. As a service provider they will be responsible for providing sufficient power supply when applications are made, with the main impact to the developer being that of the timing in providing future network upgrades as required. It is likely, therefore, that there is capacity to service the site and, once an agreement is made with the service provider, the supply is made firm.

Western Power's feasibility report can be found in Appendix B.

5.0 Gas

Provision of a reticulated gas service to the development is an option available at the discretion of the developer with two possible service providers available, WA Gas Network and Origin Energy.

5.1 WA Gas Network

WA Gas Networks advised that the development site is at a considerable distance from the existing gas infrastructure. Potential gas pipe routes lengths could be 2.3 km to 4.1 km, and further investigation into the most suitable route would need to be undertaken when the structure plan is approved. A capital cost contribution from the developer would be required in order to service the proposed development.

WA Gas Network asset management team advised that they cannot conduct modelling of the gas route for supply to the development until firmed details of the development are provided. Thus no costs can be estimated for the supply of gas from WA Gas Network at this stage.

5.2 Origin Energy

Origin Energy is another service provider capable of providing gas reticulation to the development. LP gas could be distributed from a central storage tank located within the development. Origin Energy could supply and maintain the LP gas reticulation and storage equipment and the developer would most likely enter into an exclusive contract with Origin Energy. It is likely that a contribution from the developer will also be required in order to provide a gas service to the development through Origin Energy.

Origin Energy require firm development details of the lot yields for the residential, business, commercial and hospitality lots in order to carry out pricing of the supply.

6.0 Telecommunications

6.1 Telstra

Telstra advised that developments of greater than 100 lots are within the footprint of NBN Co. responsibility. For developments of less than 100 lots, under the Infrastructure Provider of Last Resort (IPOLAR) agreements Telstra shall be responsible for providing the infrastructure. Although some of the stages may have less than 100 lots this does not exempt NBN Co. from their responsibility or allow Telstra to provide such infrastructure as the overall development is considered rather than a staged development.

6.2 NBN Co.

NBN Co. has confirmed their fibre footprint includes a development of this nature and can approve the application for fibre infrastructure. Should the construction phase commence NBN Co. require a minimum of three month's notice prior to construction/civil works to allow adequate time for installation of fibre.

Under the NBN Co. Developer Agreement, NBN Co. shall provide the fibre infrastructure at no costs to the developer however the developer is responsible for the design of the pit and pipe infrastructure and the excavation/trench works in accordance with the NBN Co. specifications and standards (New Developments: Deployment of the NBN Co. Conduit and Pit Network – Guidelines for Developers). NBN Co. Advise that the costs to the developer for the pit and pipe installation is limited to the development site boundary and not to the NBN Co main node for connection.

7.0 Construction

7.1 Roads

Example road sections for the development are detailed in the Transport Assessment report for the project conducted by Riley Traffic Consulting. These provide minimum reserve widths for a range of road types, based on WAPC's Liveable neighbourhoods, and will be refined in consultation with the City of Greater Geraldton at subdivision stage.

The proposed example road cross-sections as provided by Riley Traffic Consulting as part of the Transport Assessment and are summarised as follows:

- The main trunk from Hackett Street shall extend into the development with a minimum road reserve of 20 m comprising of a minimum of 4.1 m activity area (footpath and shop use) on both sides of the road reserve, 2.3 m on street parking on both side of the traffic lane and a 7.2 m carriageway.
- Access streets within the medium density areas shall have a minimum 16 m road reserve comprising of a 5 m verge on either side of the traffic lanes, with a 6 m carriageway, or if a 7 m carriageway is required, the verges can be reduced to 4.5 m.
- Access streets along the reserve are proposed to have a minimum road reserve of 13.5 m comprising of a 5 m verge, 6 m carriageway, 1 m edge to table drain (swale) and a 1.5 m swale.
- Access streets along the POS area is a minimum 13.5 m reserve comprising of a 4.5 m verge on the side away from the POS, a 6 m carriageway, a 2.5 m embankment and a 0.5 m verge onto the POS.
- The main trunk into the medium density area shall be an 18 m road reserve comprising of a 10.8 m verge split on both sides of the traffic lanes and a 7.2 m carriageway. This road is an extension of Cooper Street.

All internal roads in the low and medium density residential areas and the town centre are to be constructed with the inclusion of kerbing and asphalt concrete surfacing. In special rural residential areas the roads are required to have a minimum of two coat bitumen or emulsion sprayed seal surface without kerbing and unsealed shoulders with table drains/swales on the verges. The detailed design of these roads is subject to local standards. The road reserves are required to have adequate service corridors as required by service authorities and in line with the Main Roads Code of Practice for service corridor allocations.

7.2 Earthworks

The Contour plan provided by CLE shows that the land has a gradual fall from the east to the west with an approximate gradient of 3.5 % (from AHD 130 m to AHD 85 m). Based on the gradual fall of 3.5 % most of the lots may not require further earthworks rather the earthworks shall be largely confined to the road reserve for grading of the road, trench works, service crossing, etc. In the mixed density areas (low, medium and town centre) with smaller lot areas there may be a requirement for retaining walls to maintain a levelled lot configuration. It is anticipated most of these excavation volumes can be balanced without importing fill material to the rest of the site.

7.3 Staged Construction

The proposed development staging plan (refer to Appendix C) has been developed around the possibility of servicing the larger yield lots in Stage 1 (Precinct 1 and 2) by connecting to the existing adjoining services and reducing initial costs by commencing in areas that will require less construction works.

This staging is suitable in principal as the existing water and power services adjoining Stage 1 lots may have capacity to services some of the lots. It is likely these lots could be developed without the requirement for sewer reticulation as septic tanks may be acceptable.

- Stage 1 (Precinct 1 and 2) special residential;
- Stage 2 (Precinct 13) low density;
- Stage 3, 4 and 5 (Precinct 12) low density;
- Remaining precincts to be staged upon market demand.

Stage 2 is likely to require sewer reticulation. If an onsite treatment plant is selected as being the preferred option of treatment the most suitable location would be south of Stage 2. When precinct 7 and 8 are to commence a second sewer treatment facility located south of precinct 8 may be required. Once the treatment facilities are in place they should be able to cater for all the other precincts. Attractive and odourless sewerage treatment plant options are currently available that will blend into the urban landscape and not be an eyesore to residents. Should an alternative treatment facility not be pursued or be granted clearance, Water Corporation requirements shall govern the staged plan. Construction of the sewer reticulation assets would be a high capital cost infrastructure and may include a major pump station and a lengthy pressure main.

7.4 Tourist Site

The structure plan provides an approximate location of the two proposed tourism sites within the proposed reserve to the Eastern side of Lot 80 and 81 Hackett Road (Refer to Appendix A).

The low impact tourism site located to the North East has a topographic grading of approximately 6.25 % from the road bounding the special rural lots which is the nearest entry location. This topography allows for a reasonably graded road design with minimal earthworks in this location.

The tourism site located towards the eastern edge (Tourism A) has a topographic grading of approximately 23 % from the outer road along the special rural lots. This creates a steep, but acceptable, grade for the road construction going to the tourism site. The road reserve construction will likely require substantial earthworks and retained road verges. Appropriate design and landscaping can address the potential for scarring of the topography and can be used to enhance the sites potential as a tourism feature.

8.0 Local Water Management Strategy

It is a WAPC requirement that a Local Water Management Strategy (LWMS) is provided for this development. The LWMS ensures best management practice for stormwater by considering the governing guidelines and policy documents such as the Better Urban Water Management (DoW, 2008) and Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions (DoW, 2008). This document is a management strategy that integrates the land and water planning and ensures implementation of water sensitive urban design and planning to manage the total water cycle (Refer to Appendix D).

This site had undergone some infiltration testing in 6 locations spread within the development area. This testing was conducted by Blacktop Materials Engineering in December 2011 recorded infiltration rates between 4.8 m per day to 42.3 m per day. The infiltration rates indicate that an effective approach to disposal to stormwater could be by means of swales, soakwells, perforated pits and drainage basins.

The objective of the stormwater management strategy within the LWMS is to convey and mitigate impacts on property during peak rainfall events.

The systems are proposed for a one year Average Rainfall Intensity (ARI) stormwater event and include for management of stormwater at source through the use of rainwater tanks and roofs connected to soakwells within each lot. The road runoffs would also be required to be infiltrated as close to the source as possible via roadside swales, perforated manholes or soakwells.

The five year ARI road runoff will be infiltrated as close to source as practical using water sensitive urban design (WSUD) draining into adjacent stormwater integrated POS areas. Roadside swales will provide initial treatment of stormwater and promote infiltration at source prior to conveyance (only in particular sections of the development) and the flood storage will be within unfenced, landscaped, shallow-sided basins.

For a 100 year ARI event, the POS areas can be utilised to store and soak away the runoff while maintaining the City of Greater Geraldton (CGG) design requirements of a 300 mm freeboard to the roads.

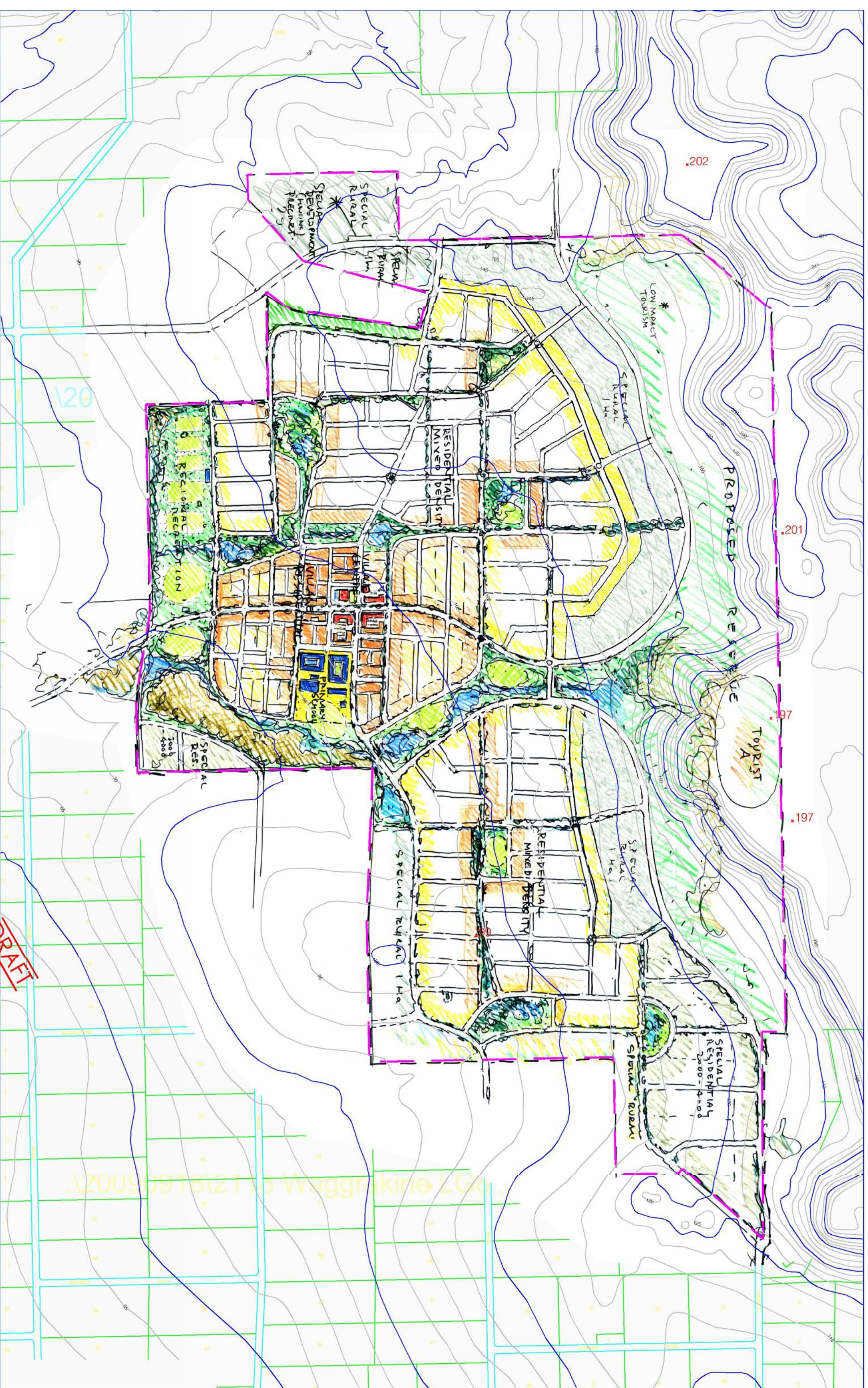
The attached LWMS utilises available existing groundwater data. A more detailed assessment or monitoring programme of groundwater levels to ensure that this is more than 3.0 m below ground level will be required to support the more detailed planning and subdivision to follow.

The flood management as per DoW guidelines requires a habitable floor level of 0.5 m above the peak flood levels in the infiltration basins. These levels will be determined during detailed design of the basins.

Following the LWMS at a later stage of planning an Urban Water Management Plan (UWMP) is required and as such will progress the concept design of the drainage system to a detail design level. This report shall follow the DoW publication *Urban Water Management: Guidelines for preparing plans and complying with subdivision conditions* for guidance on the preparation of UWMP.

Appendix A

Moresby Heights Conceptual Sketch



CONCEPT SKETCH

Lots 80 & 81 Hackett Road
 Moresby Heights, Waggrakine

City of Geraldton-Greenough

DRAFT

Waggrakine LG 21/10/2009

plan no: 2118-688-01

scale: 1:10,000 @ A3

date: 11.05.2011



**CHAPMAN
 LAMBERT
 EVERITT**

Appendix B

Western Power Feasibility Study



Feasibility Study

Project Name: Residential subdivision

DQM NO: NF010030

Customer Name: Karan Bhalla (AECOM)

Proposed Load: ~3.3MVA (St 1-3)

Anticipated Connection Date: Mid 2012 - 2014

1. Introduction

Western Power (WP) has been requested to conduct a feasibility study for the connection residential subdivision (~3.3MVA) at a location in Moresby Heights north of Geraldton. Figure 1 below shows the location of the proposed new load and the surrounding distribution network.

Load staging and timing details: Table 1

Stage	Total Load (kVA)	Timing (Year)
1	455.6 KVA	Mid 2012
2	680 KVA	2013
3	2176 kVA	2014

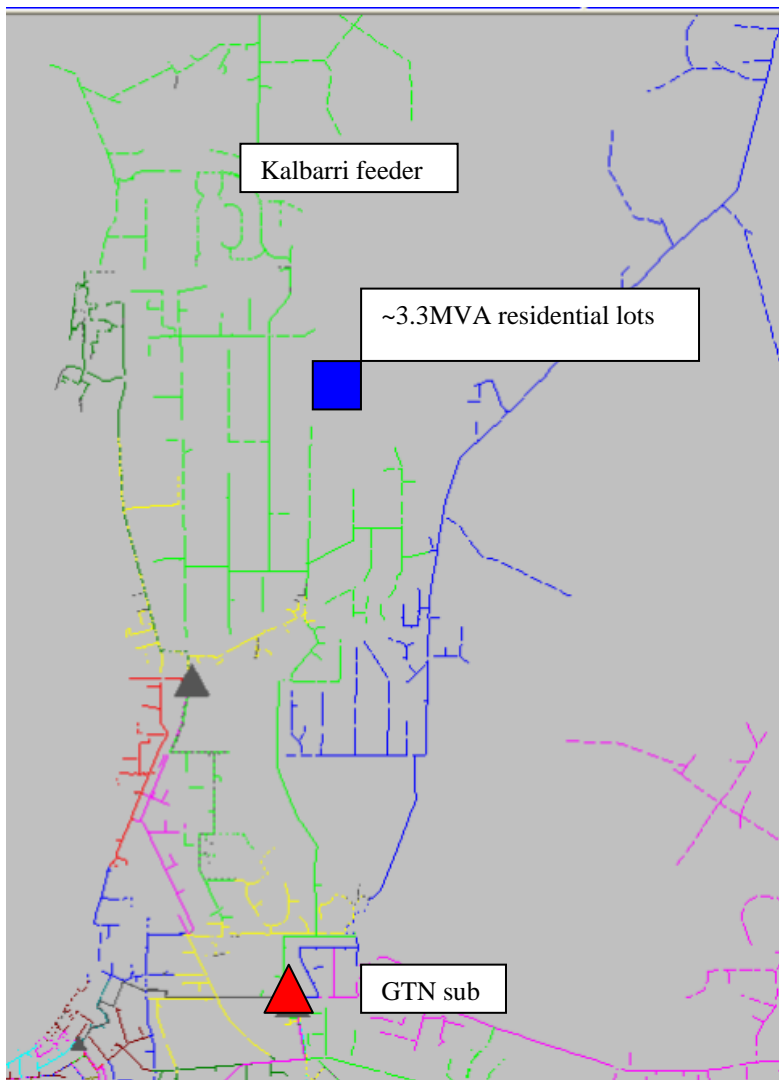


Figure 1 – Location of the proposed residential subdivision (~3.3MVA)

2. Study Details and conclusion

Load staging and timing details were provided in Table 1.

Clause 8 (5) of the Electricity Distribution Regulations 1997 states that “an access application may only be made for the provision of distribution access services which the applicant wishes the corporation to commence to provide within 3 years of the date of the access application.” Accordingly only the relevant stages could be considered for connection depending on when the firm application for connection is made.

Currently the Kalbarri feeder off Geraldton substation services the area under consideration and may have the non-firm distribution network capacity to connect this subdivision’s relevant stages depending on when the firm application for connection is made. It is not possible to say how many stages (and load kVA) can be connected without knowing of the date of firm application. The transmission line and substation capacity however, is non-firm.

HVOH or HVUG connection onto the feeder from customer connection point is required in keeping with design connection standards.

Note that the details in this feasibility study are only **indicative** and **non-binding**. Western Power can neither reserve capacity nor guarantee supply to this development without a formal request being lodged.

Due to the dynamic nature of the transmission and distribution network, if the new development were to proceed, detailed studies would be required at the time of the firm application for connection to determine the final network and design requirements.

To provide a firm connection proposal and cost, a formal application with load staging and timing details to be provided to Western Power, in accordance with WP current connection policies.

Appendix: Customer Completed Feasibility Request Form



Electricity Networks Corporation ABN 13 340 492 361

Part A - Application type

Feasibility Enquiry Feasibility Study

Applicant details - for tax invoice

Title (e.g. Mr, Mrs)	Mr	Surname	Bhalla
Given name(s)	Karan		
Company or business name	AECOM		
	ABN	200 938 469 25	
Postal address	PO Box 263		
Suburb or town	Geraldton	Post code	6531
Email (optional)	karan.bhalla@aecom.com		
Mobile (optional)		Telephone	(08) 9920 4810
Fax (optional)	(08) 9921 7265		
Western Power reference number (if applicable)			

Part B - Land use

Residential	<input checked="" type="checkbox"/>	Commercial/Industrial	<input checked="" type="checkbox"/>	Special Rural	<input checked="" type="checkbox"/>
Other (please describe)					
Number of lots	1673	Number of stages	16	Number of lots per stage	n/a
Approximate commencement date for each stage.	TBA				
Comments					

Part C - Project details

Please attached Stage Plan with this document.

Project name	Moresby Heights
Your project reference number	60225287

Part D - Site address/location plan

Please attach a location plan or concept plan with this document.


Site address	Lot 80 & 81 Hackett Road	
Suburb or town	Moresby Heights	Post code: 6530
Nearest cross street	Sutcliffe Road	
Map number	Map 1	
Grid reference	A3	From street directory

Part E - Proposed loading

ADMD per lot	3.1 kVA - residential, 650KVA - Stage 16, 650KVA - Primary School
Comments	Please see attached WWTP power requirements. It is proposed that there will be 2 such WWTP to service the LSP. Refer to the attached preliminary yield staging plan for lot details.

Part F - Approval

On signing this form as the duly authorised representative, the signatory accepts liability for payment of \$315.00 (inc GST) for a Feasibility Enquiry or \$775.00 (inc GST) for a Feasibility Study. Please refer to 'Terms & Conditions'.

Name	Karan Bhalla		
Mobile (optional)		Telephone	(08) 9920 4010
Signature		Date	08 / 11 / 2011

Estimated Electrical Cost for a 5,000KL/D K-Series Alternating Aerobic/Anaerobic Fixed Film Media WWTP

Process Location	Equipment Description	Average	Operation	Comments
Flow Equalization	Grinder Pump No. 1	4.4 kW	Three operates per cycle	
	Grinder Pump No. 2	4.4 kW		
	Grinder Pump No. 3	4.4 kW		
	Grinder Pump No. 4	4.4 kW		
	Level Float No. 1	Signal Only		
	Level Float No. 2	Signal Only		
	Level Float No. 3	Signal Only		
	Level Float No. 4	Signal Only		
Head Box	Level Float	Signal Only		
Aerobic Towers	Recirc Pump No. 1A & B	17.6 kW	Continuous operation	2 pumps for each tower
	Recirc Pump No. 2A & B	17.6 kW	Continuous operation	2 pumps for each tower
	Recirc Pump No. 3A & B	17.6 kW	Continuous operation	2 pumps for each tower
	Recirc Pump #1 Flow Switch	Signal Only		2 pumps for each tower
	Recirc Pump #2 Flow Switch	Signal Only		2 pumps for each tower
	Recirc Pump #3 Flow Switch	Signal Only		2 pumps for each tower
Anaerobic Reactor	Level Float No. 1	Signal Only		
Sludge Holding	Decant Pump	0.2 kW	Intermittent use	
Dosing Tank 1 Soda Ash	Mixer	2 kW	Continuous	
	Dosing Pump	0.75 kW	Continuous	
Dosing Tank Alum	Mixer	2 kW	Continuous	
	Dosing Pump	0.75 kW	Continuous	
Air System	Air Blower No. 1	11 kW	Three operate per cycle	Inc Acoustic Enclosure
	Air Blower No. 2	11 kW		
	Air Blower No. 3	11 kW		
	Air Blower No. 4	11 kW		
	Pressure Switch	Signal Only		
	Sludge Lift Actuated Valves	Actuation	3 No	
	Reactor Flushing Valves	Actuation	3 No	
Equalisation Diffuser Control	Actuation	1 No		
UV Disinfection System	UV Unit No. 1	0.5 kW	Only one operates per cycle	
	UV Unit No. 2	0.5 kW		
Bio Blower	Odour Control System	0.8 kW	Continuous operation	Including cabinet
Flow Metering System	Flow Meter	Signal Only		
Control Panel	General & Control	1.5 kW	Continuous operation	Including PLC
Exhaust Fan		0.4 kW		
Lighting and Outlets	General	0.6 kW	Intermittent use	
Sand Filter	Filter feed	3 kW		
Control Room	Heating and A/C Unit	2.7 kW	Intermittent use	
Max power consumption Kw		143	25% above peak period demand	
Average power consumption Kw		109		
Kilowatt hours per day		2610		
Kilowatt hours per year		952562		
Mwhr/year		953		

SUBJECT: Preliminary Yield Estimates to inform Preliminary Staging Plan

DATE: 13-October-2011

SOURCE: CLE

AUTHOR: Phillida Rodic

The site rezoning has quoted an overall yield estimate of 1500 – 2000 lots.

The following yield estimates by precinct (**refer Plan 2218-60A-01**) have been prepared using a range of general assumptions applied to land area for the purposes of informing a staging plan to support service planning. They are not based on detailed design or an approved plan, and should be seen as very preliminary, and subject to change. They have been formulated to be somewhat conservative.

Precinct No.	Development Type	Approx. Yield Estimate
1	Special Residential (2000-4000m ²) ⁱ	30
2	Special Residential (2000-4000m ²)	37
3	Special Residential (2000-4000m ²)	10
	<i>SPECIAL RESIDENTIAL SUBTOTAL</i>	<i>77</i>
4	Rural Residential (1ha +) ⁱⁱ	7
5	Rural Residential (1ha +)	8
6	Rural Residential (1ha +)	17
	<i>RURAL RESIDENTIAL SUBTOTAL</i>	<i>32</i>
7	Low Density Residential (R20) ⁱⁱⁱ	254
8	Low Density Residential (R20)	239
9	Low Density Residential (R20)	118
10	Low Density Residential (R20)	219
11	Low Density Residential (R20)	208
12	Low Density Residential (R20)	321
13	Low Density Residential (R20)	100
	<i>LOW DENSITY SUBTOTAL</i>	<i>1459</i>
14	Medium Density ^{iv}	66
15	Medium Density	39
	<i>MEDIUM DENSITY SUBTOTAL</i>	<i>105</i>
16	Town Centre ^v	Nil
TOTAL		1673

ⁱ Assumes 10% GA for Roads, POS, drainage, average lot size 3000m²

ⁱⁱ Assumes 10% GA for Roads, POS, drainage, average lot size 1.5ha

ⁱⁱⁱ Assumes 10% GA for POS, 27.5% for roads & drainage, average lot size 700m²

^{iv} Assumes 10% GA for POS, 32.5% for roads & drainage, average lot size 400m²

^v No yield assumed, but potential to include medium or high density if market for mixed use / town centre product is identified.



Notes

Residential ADMD calculator

The After Diversity Maximum Demand (ADMD) calculator determines the minimum power requirements for a proposed subdivision.

ADMD calculator

Please use the calculator below to determine the ADMD value of a lot.

Listed suburb ADMD calculator
 • If a suburb is not listed please use the unlisted suburb ADMD calculator

Suburb: Albany
 Proposed lot use: Single to Quadruplex
 Lot value: Median
 ADMD: [blank]

Unlisted suburb ADMD calculator

Lot value: 500000
 Lot use: More than 10 units
 ADMD: 3.1 kVA

Maximum refers to high value lots within the suburb

Note: where electrical design calculations show the house or units require higher loads, these will override the ADMD calculator values.

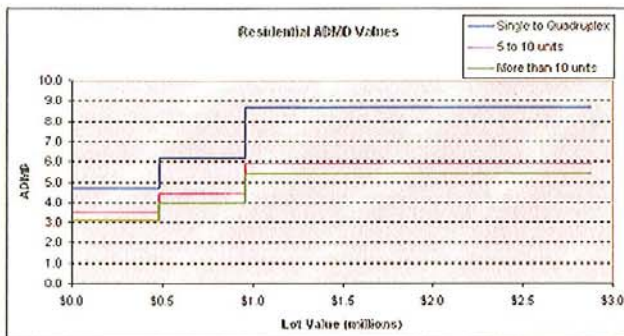
How the ADMD values are obtained

ADMD values are based on undeveloped land prices. They do not include the cost of a dwelling.

The ADMDs increase in step increments. These increments are at two and four times the median lot value for the Perth metropolitan and Mandurah areas. The median property price is obtained quarterly from Landgate's Vacant Land Sales Analysis.

The ADMD calculator reduces anticipated load requirements for higher density developments. There are three ranges available: single residential to quadruplex; 5 to 10 units and over 10 units per lot.

Lot Price	Single to Quadruplex	Less than 10 units	More than 10 Units
\$512,000 or less	4.7 kVA	3.5 kVA	3.1 kVA
\$512,001 to \$1,024,000	5.2 kVA	4.4 kVA	4.0 kVA
Above \$1,024,000	3.7 kVA	5.9 kVA	5.4 kVA





Apply same for school

Small commercial subdivisions

The electrical infrastructure in new commercial subdivisions is designed according to lot size, unless the developer specifies that it must cater for a higher load. The design load for commercial subdivisions is 200kVA/ hectare. Charges for electrical infrastructure vary, as they are based on the individual requirements of each request.

Before purchasing a lot in a new commercial subdivision, a decision must be made as to whether the design load value can supply the electricity required by the business. If three-phase power or heavy duty supply is required, the network may need to be upgraded at your cost.

To find out if three-phase power is available in your area, contact 13 10 87 or email enquiry@westernpower.com.au.

How to apply

Type of subdivision	Action	Costs
For one to four freehold or all strata lots, with a connection to the distribution network at 33kV or less	Complete the online design and quotation application form with assistance from an electrical contractor	We will send you a quote.
For one to four freehold or all strata lots, with a connection to the distribution network at 66kV or more	Complete the transmission load application form with assistance from an electrical contractor	
Five or more freehold title lots (residential and commercial)	Must be designed by a developer's consultant to our specifications	

Note: An electrical contractor/consultant may need to be engaged to complete these forms. Find an electrical contractor/consultant.

Other costs

Type of fee	Service	Cost
Part payment arrangement fee	Charged for changes made by the customer to the normal payment scheme offered	\$550 (inc GST)
Project cancellation fee	Charged if the customer cancels or changes the job before construction starts and/or if any design costs are incurred	\$550 (inc GST) plus design costs
Administration fee	An administration fee may also be charged if the job is cancelled or changes are made after construction starts and/or any costs are incurred prior to cancellation or scope change	\$550 plus costs incurred (GST inc on admin only)

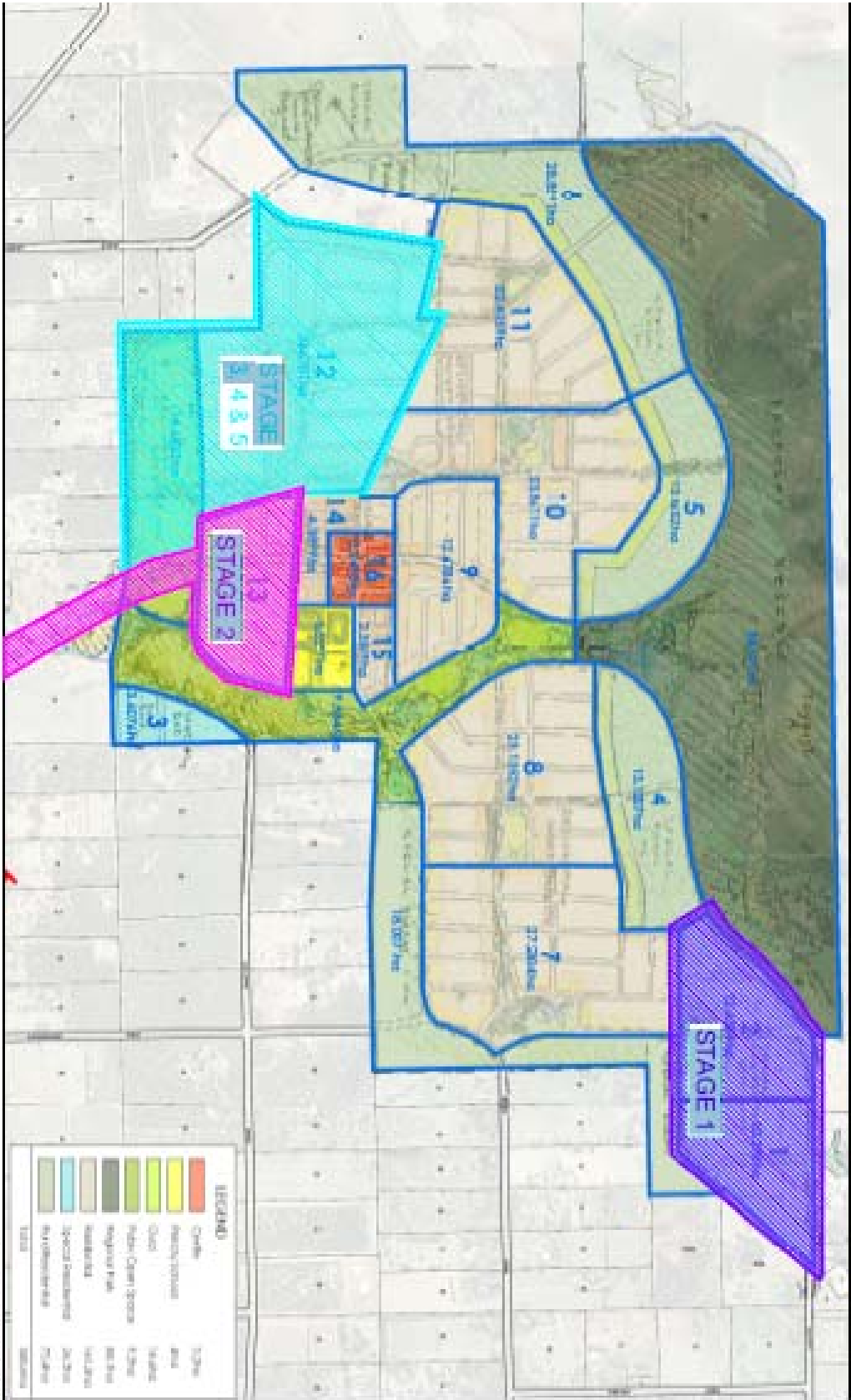
Who is your electricity retailer?

We transport electricity through the network, but do not sell it. You buy electricity from an electricity retailer that manages your account and sends your electricity bill.

- If you use less than 50MWh annually (that's about 137 units a day or \$3000 worth of electricity a year), your electricity retailer is Synergy. Visit www.synergyenergy.com.au or phone 13 13 53.
- If you use more than 50MWh a year, you may choose your electricity retailer and negotiate your tariff. The Office of Energy provides a list of electricity retailers.

For more information

Contact our customer services centre on 13 10 87 or email enquiry@westernpower.com.au.



MAPLE STREET ROAD BRUNSWICK
 (MORNINGTON PENINSULA)

LOT 803, SITHKETT ROAD
 MORNINGTON PENINSULA
 CONCEPT STAGING PLAN

AEDM



Your Ref: 60225287
Our Ref: NF010030
Enquiries: Customer Contact Centre
Telephone 13 10 87
Fax: 9225 2073

Western Power
Connections Manager
Locked Bag 2520
PERTH, WA 6001
Electricity Networks Corporation
ABN 18 540 492 861

13 December 2011

Aecom
PO Box 263
GERALDTON WA 6531

Attention: Mr Karan Bhalla

Dear Karan,

**MORESBY HEIGHTS
WESTERN POWER REF: NF010030, WAPC No: NA**

In response to your request for a Feasibility Study, I am pleased to provide you with the attached report.

Our Tax Invoice will be sent to you in due course. The amount due includes the standard fee of \$775.00.

DISCLAIMER

- This information is based on information available today.
- Western Power cannot reserve any capacity to accommodate the proposed development unless a quotation is offered and accepted.
- Western Power accepts no responsibility for any consequences resulting from decisions made on the basis of information provided in this response.

ANY QUESTIONS?

If you have any questions, please telephone our Customer Contact Centre on 13 10 87 during business hours.

Yours faithfully,

Customer Services Officer

For Connections Administration

enc: Terms and Conditions

FEASIBILITY STUDY TERMS AND CONDITIONS

1. Terms and Conditions

These terms and conditions shall form part of the contract unless specifically excluded in writing by an authorised representative of Western Power.

2. Consequential Loss

Damages shall be limited to damages for direct and foreseeable loss attributable to breach or default under this Agreement. The rights of either party to damages for indirect or consequential loss are hereby excluded. Neither party shall be liable to the other for any loss of profit suffered by a party to this Agreement or any other person.

3. Modification

A purported modification, variation or amendment of this Agreement including the scope of works or any waiver of any rights of any party or any approval or consent shall have no effect unless in writing and signed by the party to be charged, and may attract a subsequent fee.

4. Application of Acts and By-Law

Nothing contained in these Terms and Conditions shall in any way limit the operation or effect of the Electricity Corporation Act 1994, Energy Corporations (Powers) Act 1994, Energy Corporations (Transitional and Consequential Provisions) Act 1994, or any Regulations, By-Laws or Orders made pursuant thereto.

5. Ownership of Works

The whole of the electricity extension that forms the works carried out in accordance with the proposal is the property of Western Power and Western Power has the right to connect additional customers to any part of the extension.

6. Indicative Estimate

This indicative estimate of the cost of electrical distribution [and transmission] works is ONLY AN INDICATIVE ESTIMATE.

7. Assumptions

Western Power has calculated the indicative estimate on the basis of a "desktop study" only which includes information readily available at the time and certain assumptions regarding the project and costs. The information and assumptions may turn out to be incorrect or incomplete.

8. Fluctuations

Construction costs, including materials and labour, are subject to fluctuation and may change significantly over time. The final quoted cost may be higher or lower. In some cases final quoted costs are SIGNIFICANTLY HIGHER than indicative estimates.

9. Liability

Western Power has calculated the indicative estimate in good faith however Western Power, to the extent permitted by law, accepts no liability for any errors or omissions or for any discrepancy between the indicative estimate and the final quoted cost, if any.

Appendix C

Moresby Heights Staging Plan

Appendix D

Local Water Management Strategy

Moresby Heights

Local Water Management Strategy



Moresby Heights

Local Water Management Strategy

Prepared for

Sutcliffe Road Joint Venture

Prepared by

AECOM Australia Pty Ltd

Unit 8/273 Foreshore Drive, Geraldton WA 6530, PO Box 263, Geraldton WA 6531, Australia

T +61 8 9920 4800 F +61 8 9921 7265 www.aecom.com

ABN 20 093 846 925

12 December 2012

60225287-RPCI-0001_D

AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document Moresby Heights

Ref 60225287-RPCI-0001_D

Date 12 December 2012

Prepared by Karan Bhalla, Natalie Horsfield & Martin Boshoff

Reviewed by Ross Perrigo

Revision History


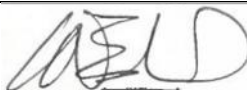
Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	26-Mar-2012	Issued to Client	Chris Lee Office Manager - Geraldton	<i>See Rully</i> pp.
B	17-Jul-2012	Issued to Client	Chris Edwards Office Manager - Geraldton	<i>See Rully</i> pp.
C	09-Nov-2012	Issued to Client	Chris Edwards Office Manager - Geraldton	
D	12-Dec-2012	Issued to Client	Chris Edwards Office Manager - Geraldton	

Table of Contents

1.0	Introduction	1
1.1	Background	1
1.2	Guidelines and Policies	1
1.3	Total Water Cycle Management	1
1.4	Previous Studies	3
1.5	Limitations	3
	Proposed Development	4
1.6	Concept Plan	4
1.7	Proposed POS Areas	4
2.0	Design Criteria	5
2.1	Objectives	5
2.2	Topography	5
2.3	Climate	5
2.4	Vegetation and Land Use	7
2.5	Contaminated Land	7
2.6	Geotechnical	7
	2.6.1 Geology	7
	2.6.2 Soil Infiltration	7
	2.6.3 Acid Sulfate Soils	8
2.7	Wetlands	11
2.8	Surface Water and Drainage	11
2.9	Groundwater	11
3.0	Water Use Sustainability Initiatives	14
3.1	Water Supply	14
3.2	Waste Water	14
3.3	Irrigation	14
4.0	Stormwater Management Strategy	15
4.1	Conceptual Stormwater System Design	15
4.2	Preliminary Sizing of Infiltration Basins	16
4.3	Potential for Additional On-site Disposal of Stormwater	17
5.0	Groundwater Management Strategy	18
6.0	Urban Water Management Plans	19
7.0	Roles and Responsibilities	20
8.0	References	21
	Appendix A	A
	Concept Sketch	A
	Appendix B	B
	Environmental Assessment Report and Geotechnical Report	B
	Appendix C	C
	BME Infiltration Test Certificate	C
	Appendix D	D
	Stormwater Catchments and Event Plan	D
	Appendix E	
	PC Sump Results	A
	Appendix F	
	Acid Sulfate Investigation	D

1.0 Introduction

1.1 Background

AECOM was commissioned by Sutcliffe Road Joint Venture to develop a Local Water Management Strategy (LWMS) in support of the Local Structure Plan for Lots 80 & 81 Hackett Road, Waggrakine (the site), shown on **Figure 1**.

The site is located within the regional boundaries of the City of Greater Geraldton (CGG) and is approximately 10 km north-east of the Geraldton town centre. It covers an area of 385 ha and it is bordered by rural residential properties to the south and west, agricultural land towards the north and the Moresby Ranges to the east. The site previously had been used for cattle and sheep grazing, and has therefore been predominately cleared of native vegetation. The roads that lead to the site are Cooper Street, Sutcliffe Road, Arnold Road and Hackett Road.

The proposed Concept Plan prepared by project planning consultants Chappell Lambert Everett (**Appendix A**) includes a town centre, primary school and approximately 1,673 lots. These consist of rural residential, special residential, low density residential and medium residential lots totalling an overall development yield of between 1,500 and 2,000 lots; staged development is proposed due to the size of the site. The site is currently zoned as 'Development' under CGG Town Planning Scheme No. 5 and so is to be subject to an approved structure plan.

In accordance with the state government planning framework as outlined in *Better Urban Water Management* (BUWM) (WAPC, 2008), a LWMS is required to accompany the draft structure plan. An Urban Water Management Plans (UWMP) will be required to accompany the subsequent subdivision applications.

1.2 Guidelines and Policies

This LWMS has been prepared with consideration for the following guidelines and policy documents:

- State Planning Policy 2.9 Water Resources (WAPC, 2006)
- City of Greater Geraldton Land Development Specifications (CGG, 2011)
- Stormwater Management Manual for Western Australia (DoW, 2004-2007)
- Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions (DoW, 2008a)
- Better Urban Water Management (DoW, 2008b)
- *Liveable Neighbourhoods: a Western Australian Government sustainable cities initiative* (WAPC, 2007)

1.3 Total Water Cycle Management

This LWMS defines how development of the site will adhere to the Integrated Water Cycle Management (IWCM) described in BUWM. The IWCM 'recognises that water supply, stormwater and sewage services are interrelated components of catchment systems and therefore must be dealt with using a holistic water management approach that reflects the principles of ecological sustainability' (DoW, 2008b). State Planning Policy 2.9 Water Resources (WAPC, 2006) defines the principles of IWCM as:

- Consideration of all water resources, including wastewater, in water planning
- Integration of water and land use planning
- The sustainable and equitable use of all water sources, having consideration of the needs of all water users, including the community, industry and the environment
- Integration of human water use and natural water processes
- A whole of catchment integration of natural resource use and management

Figure 1 Location plan



FIGURE 1 - SITE LOCATION PLAN

1.4 Previous Studies

Coterra Environment (2011), under the direction of the Client, produced an Environmental Assessment Report (EAR) for the site (**Appendix B**). The purpose of the report was to facilitate the site's rezoning from Rural to Development in order to inform the Environmental Protection Authority (EPA) and the CGG of the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives.

Blacktop Consulting Engineers (BCE) completed a geotechnical investigation of the proposed subdivision in October 2012. The aim of the report was to determine that the ground type is suitable for subdivision purposes, and the material was identified as favourable for land development.

1.5 Limitations

This LWMS addresses the treatment and disposal of runoff from future road reserves. It has been assumed that CGG policy will address the control of stormwater for residential lots through the building licensing process. It is also assumed that post-development conditions will meet predevelopment conditions through the use of soakwells and/or rain water tanks within the residential lots using council policy and building codes.

Recommendations on areas to be allocated for use as stormwater attenuation are based on estimates derived from simplified calculations. Further investigations to confirm assumptions are required prior to the development of UWMPs.

The recommendations made in this LWMS have been developed using the best available data at the time of writing. Groundwater information was taken from regional data available from DoW and publicly available reports.

Proposed Development

1.6 Concept Plan

The site structure plan has been based on an early concept development plan (**Appendix A**) and provides for the urban development of the site. It caters for provision of approximately 1,600 residential lots, 100 larger Rural Residential (1 ha +) or Special Residential (2,000-4,000 m²) lots, serviced by extensive areas (over 100 ha) of public open space, a local primary school and small village centre. Precise lot yields will be determined at subdivision. Two potential tourism sites are also proposed on the eastern side of the lot.

1.7 Proposed POS Areas

The Concept Plan (**Appendix A**) shows approximately 120 ha of public open space, incorporating around 14 ha of district recreation area, nearly 100 ha of Moresby Range reserve along the east of the site, and a further 15 or so hectares of local open space within and running through the development area. Many of the local POS areas have been located at the downstream of catchments to cater for an integrated water management function as well as recreational, social and environmental purposes. These can cater for flood storage during events with an Annual Exceedance Probability (AEP) greater than 20% and would be designed in accordance with DOW guidelines and WAPC policy.

2.0 Design Criteria

2.1 Objectives

Stormwater controls adopted for the site involve integrating land and water planning, implementing Water Sensitive Urban Design (WSUD) and planning to manage the total water cycle. An appropriate level of consideration needs to be given to TWCM at each stage of the planning process.

The overall objective of this report, in accordance with the scope of work, is to prepare an LWMS that:

- Considers the principles, objectives and requirements for TWCM as outlined in *State Planning Policy 2.9 Water Resources, Liveable Neighbourhoods* (WAPC, 2007), and the *Stormwater Management Manual for WA* (DoW, 2004-2007)
- Characterises the pre-development hydrology
- Identifies appropriate methods to integrate future stormwater attenuation areas into the design of POS
- Provides a guide for the coordinated disposal of stormwater
- Protects infrastructure and assets from inundation and flooding
- Pre-development Environment

The environmental conditions of the pre-development site provide an important context for planning future water management strategies. This section describes the pre-development details.

2.2 Topography

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009). The topography across the site, as shown on the Concept Plan (**Appendix A**), rises from approximately 75 mAHD (Australian Height Datum) in the west to 210 mAHD at the highest point of the ranges on the eastern boundary. The steepest section of the site is located within 100 to 200 m of the eastern boundary, where the scarp of the Moresby Ranges descends to the foothills (Coterra Environment, 2011).

2.3 Climate

The climate of the area is Dry Warm Mediterranean, characterised by warm to hot, dry summers and mild, wet winters. Annual and monthly rainfall data from the Bureau of Meteorology station at Geraldton Airport (Site No. 008051) are presented in **Figure 2** and **Figure 3** respectively.

The long term mean annual rainfall is 444 mm (1941-2011). This average has decreased since 1988, to an average annual rainfall of 411 mm, reflecting a 7% reduction compared to the long term mean (**Figure 2**). The total rainfall distribution has also changed since 1988, with a reduction in monthly average rainfall, particularly during the winter months (**Figure 3**).

Mean maximum daily temperatures range from 19.5°C in July to 32.5°C in February. The mean annual evaporation is approximately 2,400 mm.

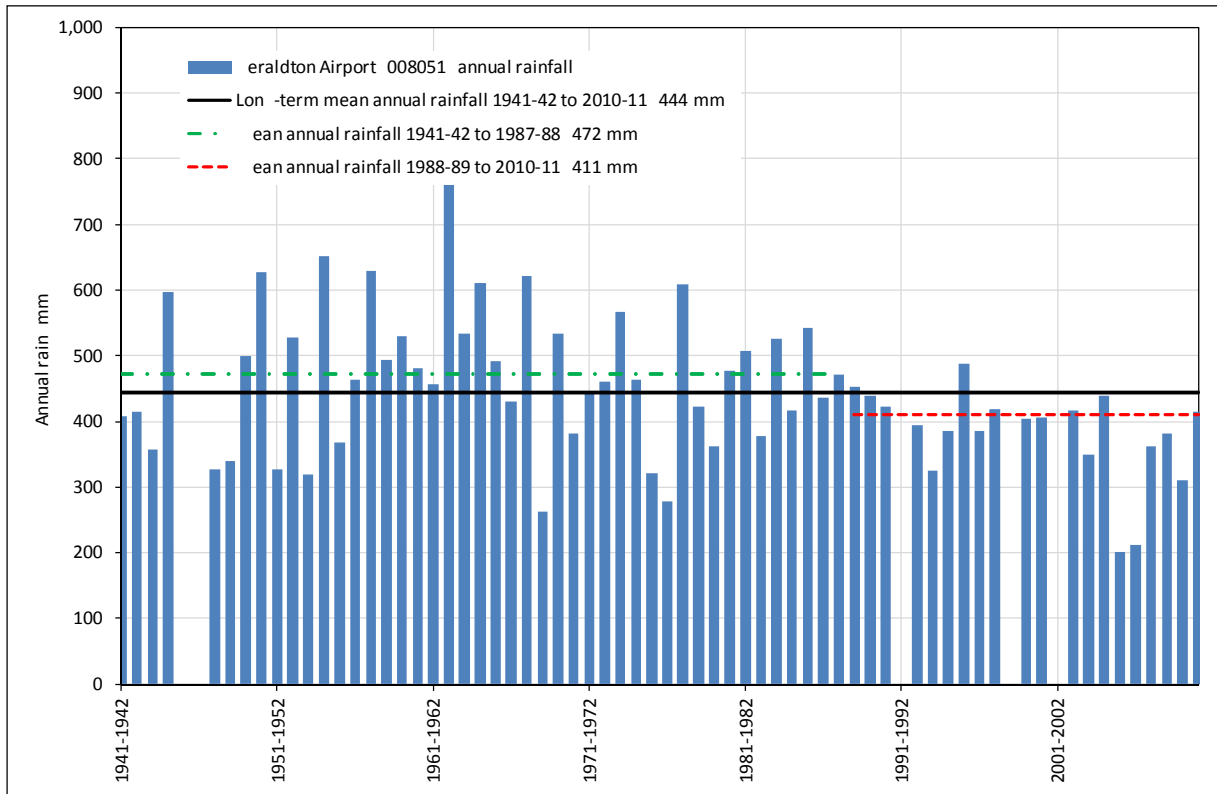


Figure 2 Annual rainfall recorded at Geraldton Airport (008051)

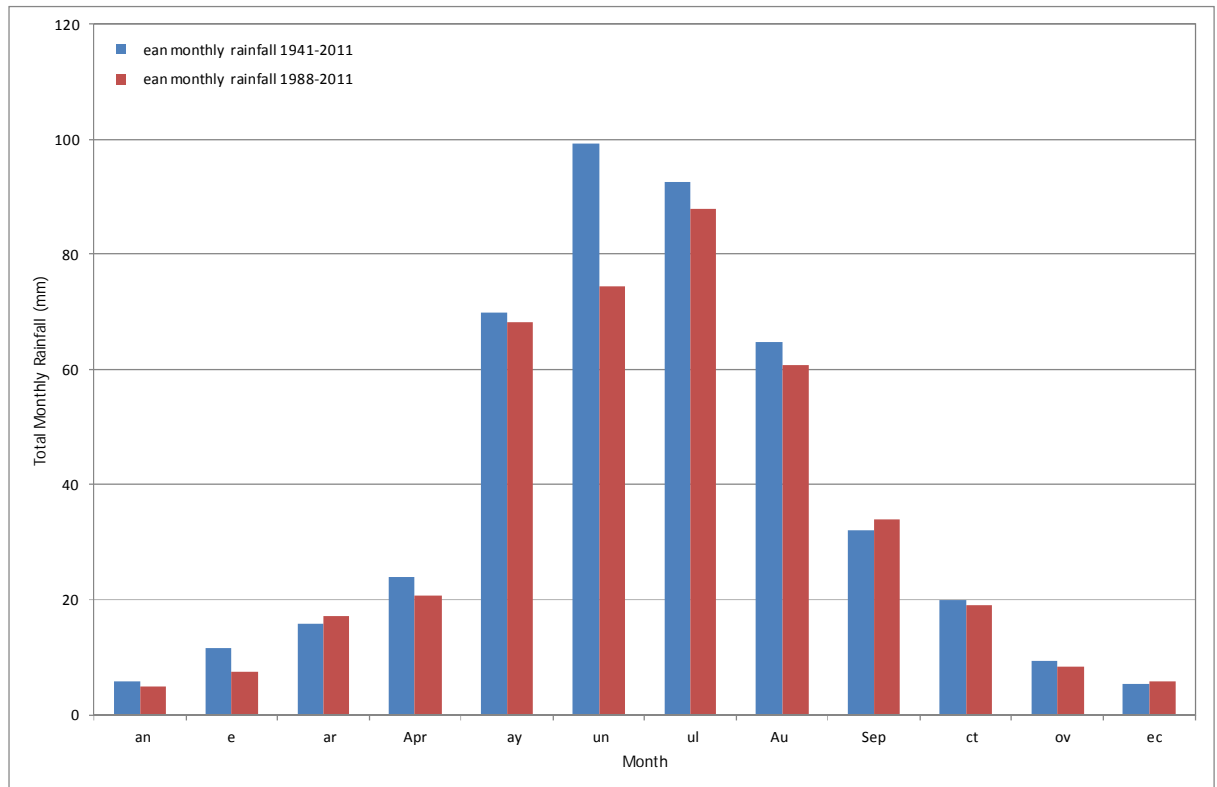


Figure 3 Mean monthly rainfall recorded at Geraldton Airport (008051)

2.4 Vegetation and Land Use

The site has previously been used for cattle and sheep grazing, and has therefore been predominately cleared of native vegetation, although some pockets still remain. These pockets have however mostly had their vegetation degraded due to weed invasion and general human use (Coterra Environment, 2011).

Coterra Environment (2011) reported that two priority flora species (*Melaleuca huttensis* and *Grevillea triloba*) were previously identified as being located within the site. No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) were found to occur within the site, but a PEC does exist within 10 km of the site on the Moresby Range. A number of Rare or Threatened fauna species were also identified as having the potential to occur within the site.

2.5 Contaminated Land

Agricultural and pastoral land use is not viewed as intensive; therefore Coterra Environment (2011) advised that it is unlikely the land across the site has become contaminated. The site is also not listed as containing potentially contaminated sites when viewed online in the Department of Environment's (DEC's) Contaminated Sites Database (DEC, 2011). The Unexploded Ordnances (UXO) Section of FESA determined that a previously identified UXO threat 2 km north-east of the site poses a minimal risk and that further searching for UXOs is unnecessary (Coterra Environment, 2011).

2.6 Geotechnical

2.6.1 Geology

As described in **Section 1.4**, a Geotechnical Investigation, including a site investigation, was undertaken by BCE (2012). The site was identified as being contained in the Geraldton Geological sheet, covering both the Moresby and Spearwood regolith-landform land systems. The report found the existence of colluvial deposits of sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled clay to highly weathered silty sandstone. Deep layers of residual yellow sand, which is generally used for the building industry, were identified in the western side of the site.

2.6.2 Soil Infiltration

Blacktop Materials Engineering (BME) was engaged to conduct infiltration testing at six locations across the site that are close to the proposed POS areas and playing fields (**Appendix C**). These tests were conducted at 300 mm below the ground surface level. The results of the testing, along with a general soil description, are summarised in **Table 1**, with the full results presented in **Appendix C**. Test sites 1-3 and 6 demonstrated higher infiltration rates than sites 4 and 5, however all rates are sufficient to allow infiltration as a means of drainage.

Table 1 Soil Infiltration Results

Test Site Location	Soil Description	Calculated Infiltration Rate (m/d)
1	Yellow Quartz Sand	27.04
2	Yellow Quartz Sand	36.03
3	Red Quartz Sand	13.13
4	Red Quartz Sand	7.58
5	Grey Silty Quartz Sand	4.80
6	Pale Orange Quartz Sand	43.20

It should be noted that these infiltration test results were taken close to the surface and less permeable soils may be encountered further down when the ground is excavated for the construction of infiltration basins. Further infiltration testing and a detailed geotechnical investigation should be conducted to inform the UWMPs and the design and treatment of proposed drainage basins.

2.6.3 Acid Sulfate Soils

2.6.3.1 Desktop Study

The acid sulfate soils (ASS) risk map for the site provided by DEC (**Figure 5**) indicates the potential ASS risks (within 3 m depth from the natural surface), which can be summarised as:

- *No Known Risk to Low Risk* - for the majority of the site;
- *Low to Moderate Risk* – an area less than 0.3 ha in the south west corner of the site. The Structure Plan (**Appendix A**) allocates this area for 'special rural' development; and
- *Moderate to High Risk* – an area less than 2.5 ha near the western boundary of the site. The Structure Plan (**Appendix A**) allocates this area for POS

The risk maps are based on 1:50,000 geological mapping and are not intended to provide the precise location of ASS, but to provide a broad scale indication of areas where ASS are most likely to exist and trigger site-specific investigations and management strategies. It is therefore important to consider the likely existence of areas with ASS potential within the site and the immediate surrounding areas.

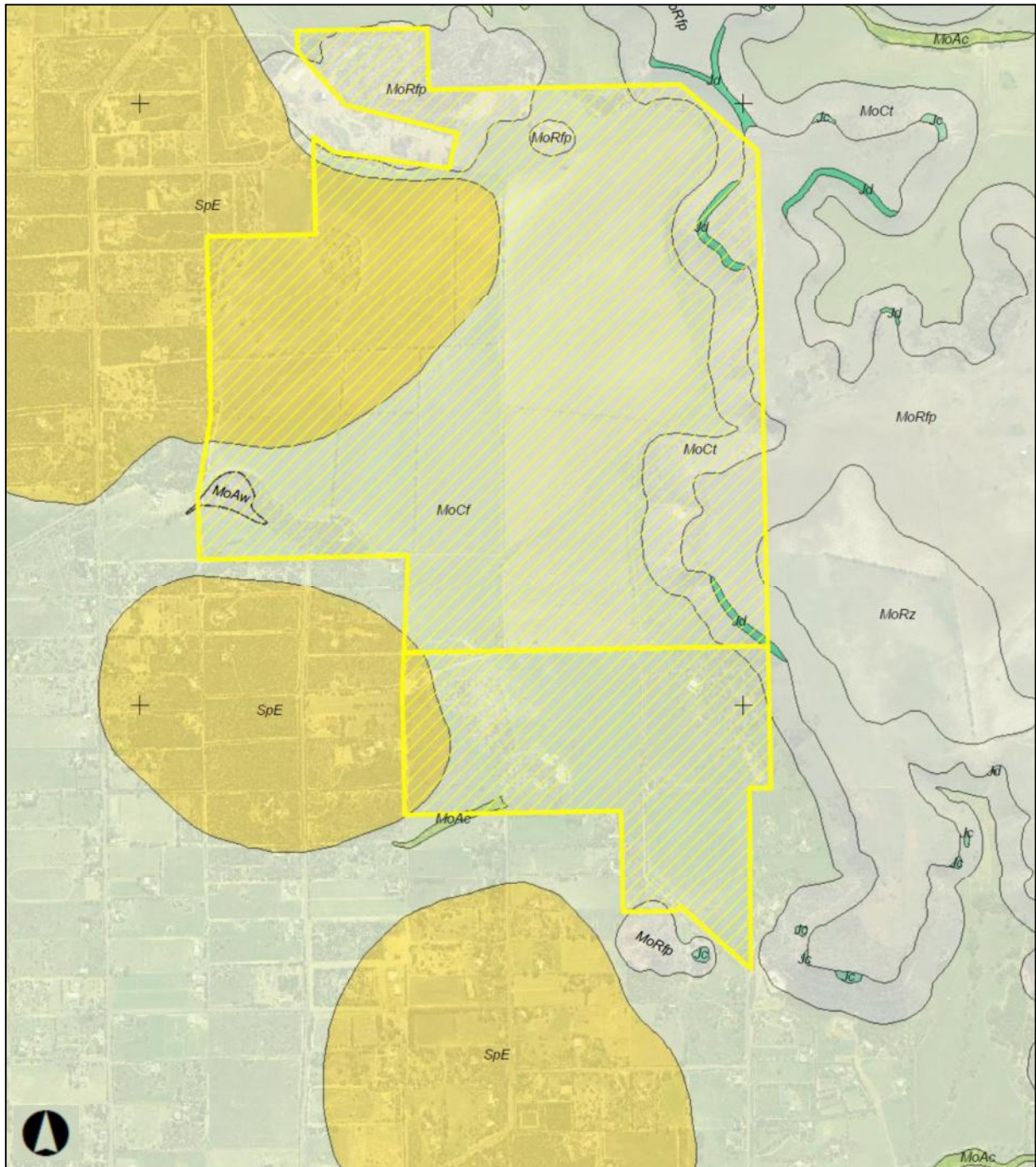


Figure 4 Geological mapping (Regolith-landform resources of the Howatharra 1:50 000 sheet)

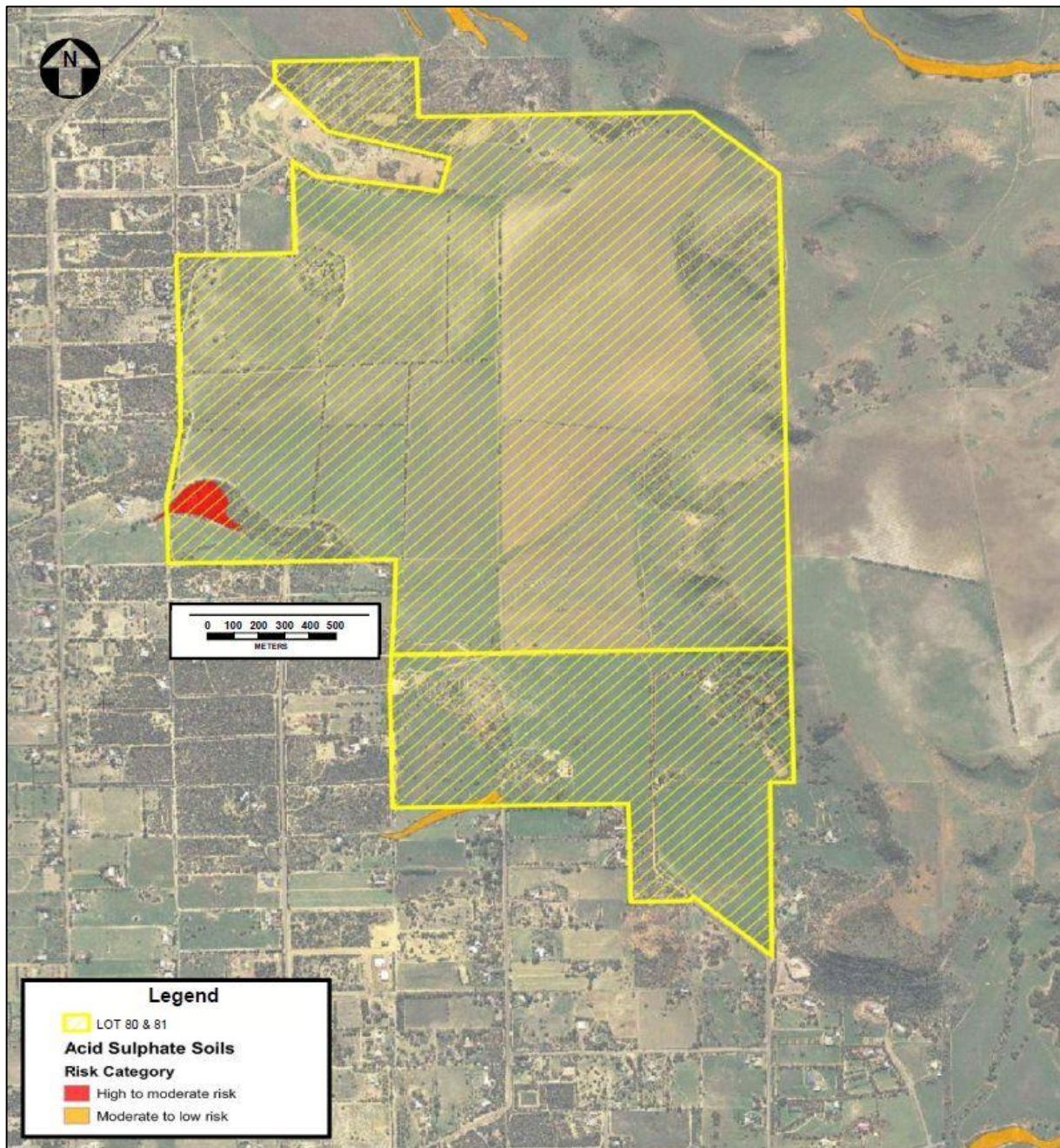


Figure 5 ASS Mapping

2.6.3.2 Acid Sulfate Site Investigation

An Acid Sulfate Investigation was commissioned and carried out by Blacktop Consulting Engineers during September 2012 in accordance with DEC guidelines. The study has found that actual or potential acid sulfate conditions are below threshold levels for which the DEC require the development of an acid sulfate management plan. These results indicate that there should not be any concern related to the disturbance of these soils during development. A copy of the report is presented in **Appendix F**.

2.7 Wetlands

Coterra Environment (2011) reports that two seasonal wetlands located within the site (**Figure 6**) are not recognised as regionally significant in the *Environment Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention. A botanical assessment (Coterra Environment, 2011) found the vegetation condition of these wetlands, located to the south-west and near the western edge of the site, to be between 'Good to Degraded' and 'Degraded'. Environmentally sensitive area mapping conducted by AECOM confirms no protected environmental reserves are present within the site.

2.8 Surface Water and Drainage

Coterra Environment (2011) report that three natural drainage lines run through the site (**Figure 6**). These drainage lines are highly modified due to vegetation clearing and appear to channel overland flow from the scarp, although they remain dry for the majority of the time and have experienced limited flows in recent years. Discussions with DoW indicated these drainage lines are not mapped in their data.

2.9 Groundwater

DoW managed groundwater bores in the immediate vicinity of the site are shown on **Figure 7**. The only data available from these on groundwater levels is a single undated reading of approximately 6 mbgl (below ground level) at bore 70111107. Data on groundwater quality across the site is limited to undated Total Dissolved Solids (TDS) measurements of 715 mg/L at bore 70111107 and 321 mg/L at bore 70111108, which are indicative of freshwater (<1500 mg/L).

The geotechnical investigation (BCE, 2012) encountered no groundwater across the 30 test pits at the site in September 2012. Test pits were excavated to a depth of 3mbgl, supporting the inference that groundwater is sufficiently deep to allow infiltration across the site.

The site is located within the proclaimed Arrowsmith Groundwater Area. DoW (2010) has prepared a groundwater allocation plan to define broad management requirements and guide the assessment of groundwater licence applications with respect to allocation entitlements (Coterra Environment, 2011).

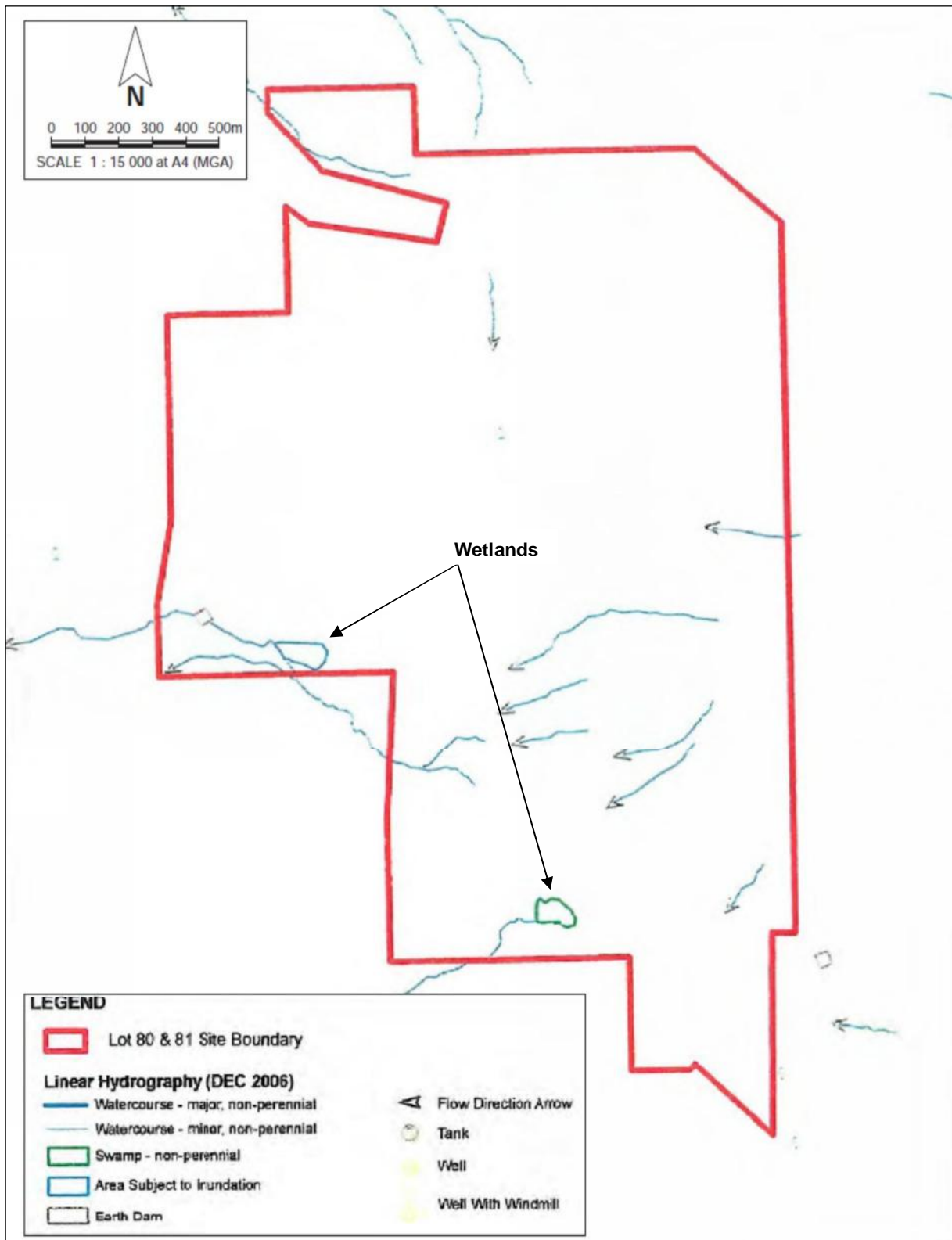


Figure 6 Wetlands and Surface Water Flow (Coterra Environment, 2011)

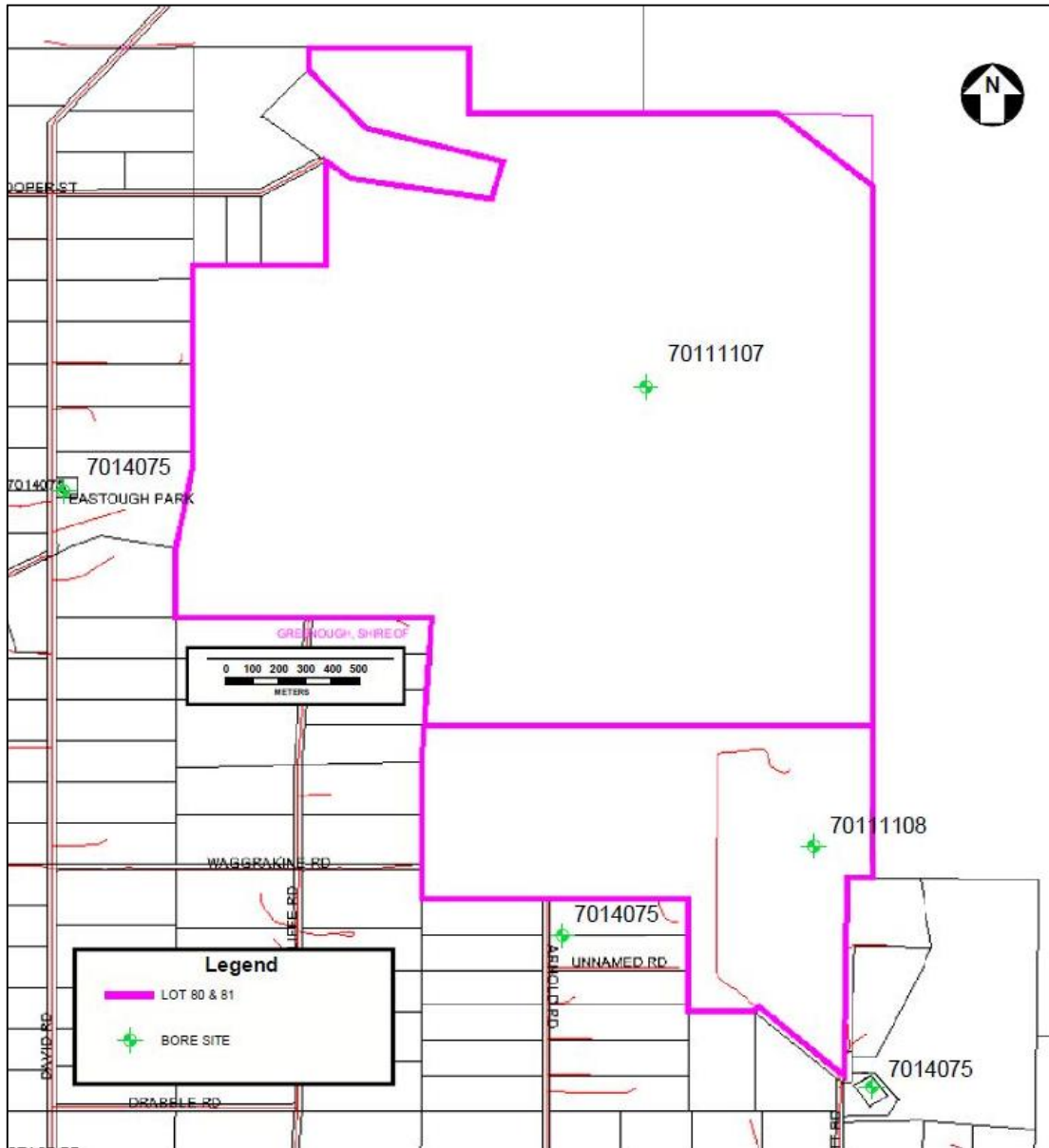


Figure 7 DoW Groundwater Bores

3.0 Water Use Sustainability Initiatives

3.1 Water Supply

The Water Corporation has not yet completed water planning for the proposed development of the site. They do however advise that water reservoir tanks and booster pumps may be required to service the development and subsequently, water design will be in accordance with the Water Corporation's design guidelines. All lots will be subject to any water conservation requirements as outlined by Water Corporation, and for water sustainability initiatives, dwellings are to be constructed as per the Building Code of Australia (BCA), which incorporates water efficient fittings and fixtures requirements.

3.2 Waste Water

It is proposed that waste water from the development could be treated in two proposed alternative waste water treatment plants (WWTPs) via an Aerobic/Anaerobic Trickling Filter that treats the effluent to an acceptable water quality level for discharge into the environment. The alternative WWTP requires licenses in place for the discharge of effluent, and these applications are in train.

3.3 Irrigation

Landscape plans and irrigation strategies will be developed in the next planning phase of the development, in consultation with the City of Greater Geraldton. Use of drought tolerant species and other water demand reduction strategies are likely to be pursued.

Two possible sources of water supply for irrigation have however been identified: extraction from nearby aquifers and treated effluent from proposed alternative WWTPs.

DoW has confirmed that there are three aquifers in the vicinity of the site with capacity within their licence limits to supply additional water to potentially service the irrigation requirements. The locations, licences and capacities of these aquifers are presented in **Table 2**. Based on a recommended POS irrigation supply rate of 7500 kL/ha/year (DoW), the site will require 181,125 kL per year of water, which could be catered for by any of the three identified aquifers.

Table 2 Licensing Database Resource Allocation Resource (DoW 12 March 2012)

Groundwater Area	Groundwater Aquifer	Allocation Limit (kL)	Licensed Allocation (kL)	Total Allocated, Committed and Requested (kL)	% Committed + Additional Allocations	Available Capacity (kL)
Gascoyne	Northampton - Fractured Rock	4,950,000	1,201,450	1,201,450	24%	3,762,000
Gascoyne	Northampton - Sedimentary	2,000,000	657,825	659,700	33%	1,340,000
Gascoyne	Northampton - Surficial	5,000,000	506,025	506,475	10%	4,500,000

The treatment and reuse of effluent from the WWTPs would be a more sustainable supply of water for irrigation than extracting clean water from the aquifers. It is also more cost effective and the preferred option.

4.0 Stormwater Management Strategy

4.1 Conceptual Stormwater System Design

Management of stormwater following the development of the site requires a suitable stormwater system that provides protection of property and infrastructure through infiltration at source as far as practicable and then safe conveyance of excess runoff from minor and major storm events. The stormwater management design outlined below is provided for assessment of the concepts and is consistent with WSUD principles. Detailed design, including basin invert levels, will be provided in the successive UWMPs.

The stormwater management system is designed using a minor (>20% AEP) and major (<20% AEP) storm approach. In rural residential areas the minor stormwater systems will consist of rainwater tanks and soakwells within lots and open swales within road reserves. The site has been planned to accommodate drainage swales within road corridors, but within medium density areas of the development, traditional pit and pipe drainage networks will be required.

The CGG requires the stormwater management strategy to manage the 1% AEP event within the site via either detention or safe conveyance as controlled overland flow to a discharge point into a natural watercourse. The major stormwater system will use the road network (for flow conveyance), and POS areas containing infiltration basins to manage major storm events that exceed the capacity of the minor system. The proposed drainage catchments and infiltration basins are shown in **Appendix D**.

Shallow infiltration testing conducted at six locations within close proximity to the proposed POS locations (**Section 2.6.2**) reported infiltration rates ranging from 4.8 m/day to 43.2 m/day. These infiltration rates indicate that this may be an effective approach for managing stormwater.

The specific principles for the 100% AEP, 20% AEP and 1% AEP events are outlined below:

100% AEP

- To retain and treat onsite the 1 hour duration 100% AEP event (e.g. roofs will be connected to soakwells and, where appropriate, to rainwater tanks)
- All stormwater will be contained within each lot through infiltration prior to conveyance
- Road runoff will be infiltrated as close to source as practical using WSUD measures including roadside swales, perforated manholes or soakwells

20% AEP

- Road runoff will be infiltrated as close to source as practical using WSUD measures including roadside swales, perforated manholes or soakwells draining into flood storage areas adjacent to POS
- Road side swales will provide initial treatment of stormwater and promote infiltration at source prior to conveyance (only in particular sections of the development)
- Flood storage will be within unfenced, landscaped, shallow-sided basins

1% AEP

- Provision via overland flow paths to enable conveyance of runoff to integrated infiltration basins that are sized for a 1% AEP storm event and are located within the POS areas
- Flood storage areas (infiltration basins) will be within unfenced, landscaped, shallow-sided basins to allow for optimum retention

Event plans for 20% AEP and 1% AEP storm events outlining the flow paths towards the POS storage areas are presented in **Appendix D**. The drawing shows the event plan for the 1 in 5 year and the 1 in 100 year plan. The flow paths shall be the same for the piped system and the swales.

Consistent with DoW guidelines, habitable floor levels will be located 0.5 m above the peak water levels in the infiltration basins. These levels will be determined during detailed design of the basins.

4.2 Preliminary Sizing of Infiltration Basins

The stormwater management system (**Appendix D**) has been designed so that the majority of catchments drain internally along natural grades to infiltration basins at low points within POS areas.

The flood storage requirement for each catchment has been calculated using the Rational Method outlined in Australian Rainfall and Runoff (Pilgrim, 1998) for the 1% AEP storm event. Land use within the catchments consists of various types of lots, POS areas, reserve areas and road reserves.

Runoff coefficients adopted for the various post-development land uses are shown in **Table 3**. For multiple zoned catchments, the relative areas of the different land uses were considered in calculating the overall runoff coefficient. **Table 4** summarises the storage volumes required within each catchment during a 1% AEP event.

Table 3 Adopted runoff coefficients for a 1% AEP event

Land Use	Runoff Coefficient
Rural Residential Lots (1 Ha+)	10%
Special Residential (2,000 – 4,000 m ²)	10%
Low Density (R20)	50%
Medium Density	70%
Town Centre	100%
School	50%
Proposed Reserve (Moresby Range Reserve)	10%
Road Reserve	100%
POS (only those areas to be occupied by basins)	100%

Table 4 Indicative catchment storage requirements during a 1% AEP event

Catchment	Indicative Storage Requirement (m ³)
1	8,300
1A	9,500
1B	4,400
2	17,500
2A	9,900
3	26,700
4	22,500
5	5,800
6	12,500
7	8,300
7A	4,800
8	4,400
9	15,500

PC Sump has been used to calculate the infiltration basin sizes required in order to store the volumes presented in **Table 4**. The basins are sized to provide storage for a 1% AEP rainfall event as per the CGG Land Development Guidelines. The results of the PC Sump analysis are presented in **Appendix E**.

The following design criteria have been used in the basin design, in accordance with the CGG Land Development Guidelines:

- All basin side batter slopes are 1 in 6
- Maximum water depth is 1.2 m
- Minimum freeboard to adjacent carriageways is 300 mm
- Minimum freeboard to Western Power pad mount sites is 1 m freeboard to within the overall development

The basins were sized with consideration for runoff inflows and infiltration outflows. As the infiltration tests discussed in **Section 2.6.2** were conducted at shallow depths (300 mmbgl), the recorded infiltration rates were adjusted to equal one third the value of the test results, with a maximum upper value of 4.8 m/d. This is to account for the possible reduction of permeability at the invert level of the basin.

As shown in the catchment drawing in **Appendix D**, the POS areas allocated in the draft structure plan is sufficient to accommodate the required areas of the basins. The final infiltration basin dimensions and locations will be documented in the UWMPs and will be dependent on final earthworks, drainage and road design levels for the development. The delineation of drainage catchments may need refining as detailed design proceeds.

4.3 Potential for Additional On-site Disposal of Stormwater

Preliminary geotechnical information suggests that storm events in excess of the 100% AEP event could potentially be treated and stored onsite successfully and eventually disposed of via infiltration. Such an approach will ensure a greater disposal of stormwater at source therefore providing a more efficient land use and infrastructure outcome, whilst in the process also limiting the impact on remnant vegetation.

Initial calculations, using the approach outlined in **Section 4.2** suggest that storm events up to a 20% AEP event could successfully be treated, stored and disposed of onsite. Achieving this is likely to reduce the estimated basin sizes as outlined in **Table 4** by between 5 and 22%. The potential reductions are summarised in **Table 5** below (note that the reductions are catchment-specific as it's a factor of the proposed land use). The ultimate feasibility of storing and disposing stormwater generated by storms up to the 20% AEP event on an individual site basis should be confirmed at detailed design stage (UWMP).

Table 5 Comparison of Basin sizes

Catchment	Indicative Basin Storage Requirement (m ³)		% Reduction
	Scenario 1: 100% AEP Storm Event Stored Onsite	Scenario 2: 20% AEP Storm Event Stored Onsite	
1	8,300	7,450	10
1A	9,500	9,020	5
1B	4,400	3,650	17
2	17,500	13,700	22
2A	9,900	8,000	19
3	26,700	21,900	18
4	22,500	20,200	10
5	5,800	5,020	13
6	12,500	10,500	16
7	8,300	6,700	19
7A	4,800	3,800	21
8	4,400	4,200	5
9	15,500	13,200	15

5.0 Groundwater Management Strategy

Groundwater information from the geotechnical information and Department of Water bores outlined in **Section 2.9**, indicates there is at least 3 m of clearance to groundwater across the site. Specific measures to manage groundwater levels, including the importation of fill material or use of subsoil drainage, are not considered to be necessary for this site. Other factors identified through detail design may lead to the requirement for fill for some lots, and this will be reported in the UWMP.

6.0 Urban Water Management Plans

The next stage of subdivision planning will require the development of UWMPs. This will include progressing conceptual drainage designs to detailed design and reviewing the assumptions made within this LWMS. The DoW publication *Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions* (DoW, 2008a) should be consulted for guidance on the preparation of UWMPs, which must comply with, or include, the following:

- Objectives and criteria stated in this LWMS
- Regulatory requirements, including required licences and approvals, the Building code of Australia and Plumbing code of Australia
- Infrastructure requirements, including stormwater drainage, and the land required to accommodate these
- Detailed designs for the major/minor stormwater management system
- Floor level heights
- Detailed geotechnical and groundwater assessments
- Recommendations for construction management, including dust and sediment control

UWMPs should be developed in liaison with the CGG to include operational and maintenance responsibilities and liabilities.

7.0 Roles and Responsibilities

Implementation of this LWMS involves defining the roles and responsibilities of the developer and local authority, which are presented in **Table 6**.

Table 6 Implementation roles and responsibilities

Implementation Action	Responsibility	
	Local Government	Developer
Preparation of UWMPs, including management of construction works, monitoring and maintenance arrangements	No Responsibility	Sutcliffe Road Joint Venture
Post construction defects liability period	No Responsibility	Sutcliffe Road Joint Venture
Stormwater management system operation and management	CGG	No Responsibility

The CGG Land Development Guidelines (2011) require that the Defects Liability Period for all drainage and associated work shall be for a duration of 12 months and is to include at least one full rain season and cannot commence prior to the date of certified Practical Completion by the CGG. These guidelines also stipulate that “It is through the monitoring of constructed basins during storm events that the predicted infiltration modelling can be verified and whether the basin is performing as per design. The Developer will be required to undertake a monitoring program over a minimum two full winter periods.” (CGG, 2011)

The developer’s responsibility post construction is likely to be a minimum of 1.5 years. While within the 1.5 year post construction period, the developer is responsible for the maintenance and operation of the stormwater management system. Once it is determined that the stormwater management system meets the performance requirements as per the design, it is anticipated that the CGG shall be the new custodian of the system and its associated assets. As the new custodian, the CGG will be responsible for the operation and maintenance of the system.

8.0 References

Blacktop Consulting Engineers 2012, *Investigation: Proposed Subdivision Development Moresby Heights Waggrakine Geotechnical Report* (Ref 12BCE226) Draft for Comment, October 2012.

Coterra Environment 2011, *Environmental Assessment Report Lots 80 & 81 Hackett Road, Waggrakine* (Ref HUMMOR01) Rev 0, June 2011.

Department of Environment and Conservation 2011, *Contaminated Sites Database*, <https://secure.dec.wa.gov.au/idelve/css/>.

Department of Water 2004-2007, *Stormwater Management Manual for Western Australia*, Department of Water, Perth.

Department of Water 2008a, *Urban Water Management Plans – Guidelines for preparing plans and for complying with subdivision conditions*, Department of Water, Perth.

Department of Water 2008b, *Better Urban Water Management*, Western Australia Planning Commission, Perth.

Department of Water 2010, *Arrowsmith groundwater allocation plan*, Water resource allocation planning series Report no 28, August 2010, Department of Water, Perth.

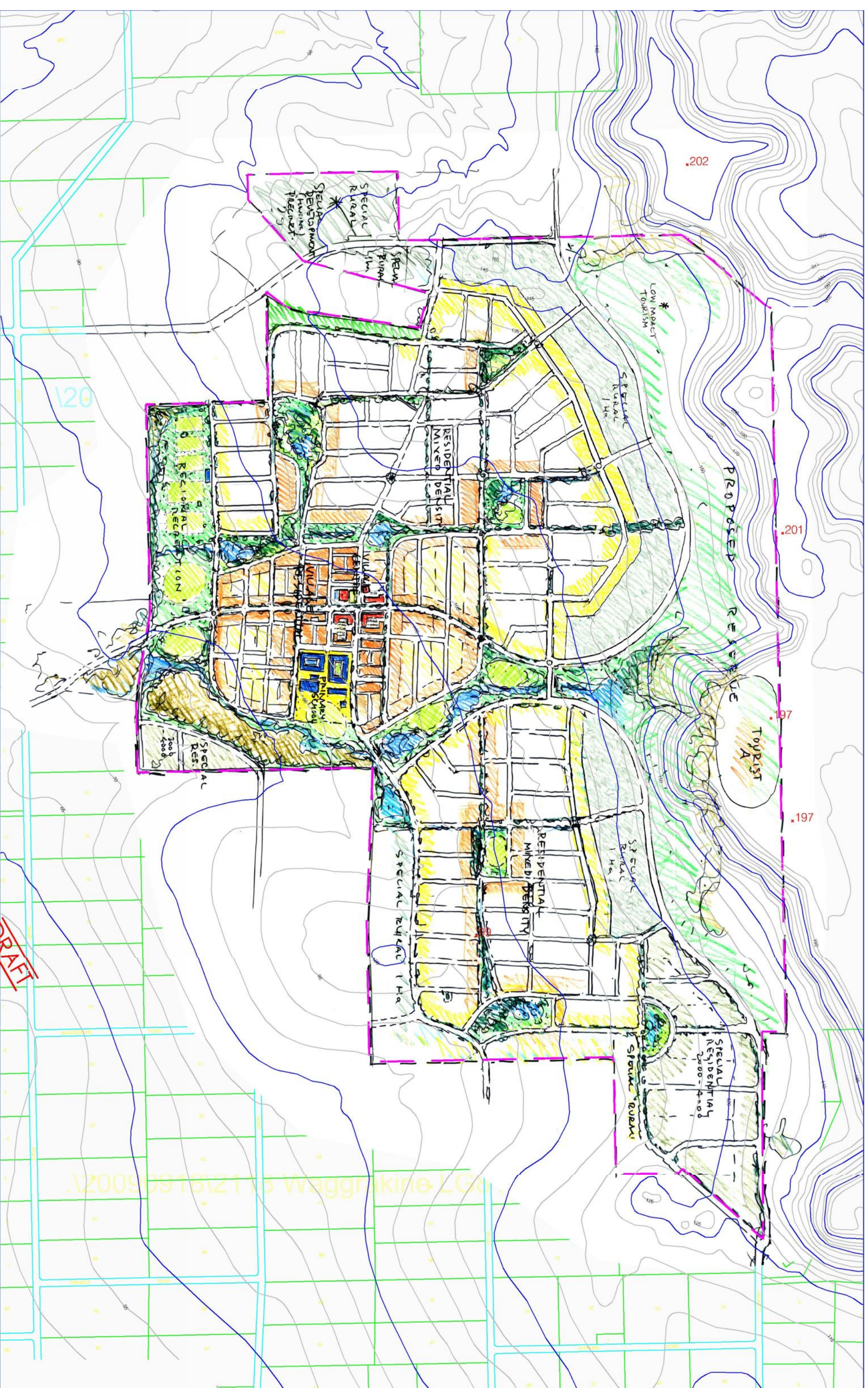
Pilgrim, D.H. (ed.) 1998, *Australian Rainfall & Runoff – A Guide to Flood Estimation*, Institution of Engineers, Australia.

Western Australia Planning Commission 2007, *Liveable Neighbourhoods: a Western Australian Government sustainable cities initiative* January 2009 Update 02, Western Australian Planning Commission, 2007.

Western Australia Planning Commission 2009, *Moresby Range Management Strategy*, WAPC, Perth.

Appendix A

Concept Sketch



CONCEPT SKETCH

Lots 80 & 81 Hackett Road
 Moresby Heights, Waggrakine

City of Geraldton-Greenough

DRAFT

W2009 0910/21 10 Waggrakine LGA

plan no: 2118-688-01

scale: 1:10,000 @ A3

date: 11.05.2011



**CHAPMAN
 LAMBERT
 EVERITT**

Appendix B

Environmental Assessment Report and Geotechnical Report

COTERRA
ENVIRONMENT

ENVIRONMENTAL ASSESSMENT REPORT

Lots 80 & 81 Hackett Road, Waggrakine

Rev 0, June 2011

This report was prepared by:

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): Luke Rogers
Report Version: Revision 0
Date: June 2011

This report was prepared for:

Humfrey Land Developments
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre.

The site is currently zoned 'Rural' under the City of Geraldton-Greenough Local Planning Scheme (LPS) No. 5 (Figure 3). The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009), and is bordered by Rural Residential development to the south and west.

In order to facilitate development of the site, the site must be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5. Under Section 48A of the Environmental Protection Act (1986), the proposed scheme amendment must be referred to the Environmental Protection Authority (EPA) for assessment.

This Environmental Assessment Report (EAR) has been prepared to inform the EPA and the CoGG of the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives through detailing proposed management measures to minimise, avoid or mitigate potential environmental impacts.

The site is elevated and rises from 75m AHD on the western edge of the property, up to 210m AHD at the commencement of the Moresby Ranges to the east. The site has been previously used for agricultural purposes and is therefore mostly cleared, however some small pockets of vegetation remain scattered across the site (Figure 2).

The site's vegetation condition and type has been assessed and mapped (Figure 9). The majority of the site can be broadly classified as cleared paddocks in 'Degraded' to 'Completely Degraded' condition, mainly consisting of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives.

Remnant vegetation in the north to northwest portion of the site was in 'Excellent' condition, with only small patches of cleared vegetation (Figure 9).

Remaining patches of vegetation were assessed as being in 'Good' to 'Completely Degraded' condition.

Regional vegetation mapping by Beard et. al. (1976) indicates the following vegetation complexes as occurring within the site:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The site contains two seasonally inundated wetlands, which have been historically grazed and are subsequently degraded. The wetlands are not recognised as regionally significant in the *Environmental Protection (South*

Western Agricultural Region Wetlands) Policy 2004, or listed under the Ramsar Convention (1971).

A proposed concept plan has been prepared by project planning consultants Chappell Lambert Everett, proposing a mixture of Residential, Special Rural, Town Centre and Tourism land uses.

No environmental issues have been identified that are considered to prevent rezoning and controlled development of the subject land, subject to appropriate design and management.

TABLE OF CONTENTS		Page
1.0	INTRODUCTION	1
1.1	Project Description and Planning Context.....	1
1.2	Scope of Report.....	1
2.0	KEY ENVIRONMENTAL POLICIES	3
2.1.1	Environmental Protection Act 1986	3
2.1.2	Moresby Range Management Strategy.....	3
2.1.3	Moresby Range Management Plan.....	4
2.1.4	Geraldton Regional Flora Survey 2010	4
2.1.5	EPA Bulletin 891 – Geraldton Region Plan	4
2.1.6	Guidance Statement No. 33 – Environmental Guidance for Land Development.....	5
3.0	EXISTING ENVIRONMENT.....	6
3.1	Site Location and Land Use.....	6
3.2	Topography, Landforms and Soils.....	6
3.2.1	Topography	6
3.2.2	Landforms and Soils.....	6
3.2.3	Acid Sulfate Soils	7
3.3	Hydrology.....	7
3.3.1	Groundwater	7
3.3.2	Wetlands	8
3.3.3	Surface Water and Drainage.....	8
3.4	Vegetation and Flora	8
3.4.1	Interim Biogeographical Regionalisation of Australia	8
3.4.2	Beard Vegetation Associations	9
3.4.3	Geraldton Regional Flora and Vegetation Survey	9
3.4.4	Vegetation Type and Condition	10
3.4.5	Flora	12
3.5	Fauna and Habitat.....	13
3.6	Cultural Heritage.....	14
3.7	Potential Contamination.....	14

4.0	IMPACTS AND MANAGEMENT	15
4.1	Vegetation and Flora	15
4.1.1	Development Design Measures.....	15
4.1.2	Other Management Measures	16
4.2	Fauna and Habitat.....	16
4.2.1	Development Design Measures.....	17
4.2.2	Other Management Measures	17
4.3	Wetlands.....	18
4.4	Moresby Ranges	18
4.5	Acid Sulfate Soils.....	19
4.6	Contamination	19
4.7	Construction Impacts.....	19
4.8	Water Management.....	20
5.0	IMPLEMENTATION STRATEGY	21
5.1	Vegetation	21
5.2	Fauna and Habitat.....	21
5.3	Additional Environmental Management Items	22
6.0	REFERENCES	23

TABLES (Compiled within the report)	Page
Table 1: Vegetation Complex Statistics.....	9
Table 2: GRFVS Plant Communities.....	10
Table 3: Explanation of Vegetation Condition Rating.....	11
Table 4: List of Threatened Fauna Species.....	13

FIGURES (Compiled at the end of the report)

Figure 1: Site Location
Figure 2: Aerial Photo
Figure 3: City of Geraldton-Greenough Local Planning Scheme Zoning
Figure 4: Topography and Geology
Figure 5: Acid Sulfate Soils
Figure 6: Wetlands and Surface Water Flow
Figure 7: Regional Vegetation Complexes
Figure 8: Site Assessed Vegetation Complexes
Figure 9: Vegetation Condition and Locations of Priority Flora
Figure 10: Draft Development Concept

APPENDICES

Appendix A: Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007)
Appendix B: Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011)
Appendix C: DEC Threatened Fauna database search results
Appendix D: Protected Matters Search Result – EPBC ACT
Appendix E: Department of Indigenous Affairs – Registered Sites Search Results
Appendix F: Results of UXO Search and FESA Confirmation
Appendix G: Proposed draft Local Planning Scheme text provisions

1.0 INTRODUCTION

1.1 Project Description and Planning Context

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the site') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. An aerial photograph of the site is shown as Figure 2.

The site is currently zoned 'Rural' under the City of Geraldton-Greenough Local Planning Scheme (LPS) No. 5 (Figure 3).

A proposed Concept Plan has been prepared by project planning consultants Chappell Lambert Everett, proposing a mixture of Residential, Special Rural, Town Centre and Tourism land uses.

In order to facilitate development of the site in accordance with this Concept Plan, the site is proposed be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5. This Environmental Assessment Report (EAR) is to be read in conjunction with the proposed scheme amendment documentation prepared by Chappell Lambert Everett.

The Development Concept has been prepared to respond to the site's key opportunities and constraints and provides for an intergrated planning outcome, complementing the site's context between Waggrakine Rural Residential area and the Moresby Range, whilst making best use of its strategic attributes (CLE, 2011).

The development Concept provides for:

- Development of a residential community of between 1500-2000 lots, centring around a main-street style village centre;
- Provision of a local primary school adjoining the village centre;
- Retention of the majority of existing vegetation on site within open space or as covenanted vegetation on large lots;
- Provision of an integrated network of public open space including:
 - Preservation of the Moresby Range 'tops' as regional park land;
 - District Open Space (playing fields and the like);
 - A variety of local open spaces, to service the local community, allow retention and enhancement of remnant vegetation and wetlands, and to provide recreation linkages to the Range;
- Integrated urban water management; and
- Establishment of a tourist facility on top of the Range to enhance public access to the range and provide a genuine tourist destination for both regional and local visitors.

1.2 Scope of Report

In accordance with Section 48A of the Environmental Protection (EP) Act (1986), any proposed change to a town planning scheme must be referred to the Environmental Protection Authority (EPA) for consideration.

This Environmental Assessment Report (EAR) has been prepared to inform the EPA and the CoGG on the key environmental characteristics of the site, and to demonstrate compliance with regulatory objectives by detailing proposed management measures to minimise, avoid or mitigate potential environmental impacts.

2.0 KEY ENVIRONMENTAL POLICIES

2.1.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* ('the Act') is the pre-eminent environmental legislation in Western Australia. Development projects are regulated under Part IV of the Act.

Assessment opportunities under the Act occur at the rezoning stage (Region Scheme and/or Town Planning Scheme) under Section 48A of the Act and the subdivision/ development stage under Section 38 of the Act.

The proposed rezoning of Lots 80 and 81 will require referral to the EPA under Section 48A of the Act.

2.1.2 Moresby Range Management Strategy

The Moresby Range Management Strategy was prepared by the Western Australian Planning Commission and adopted in 2009. It recognises the high landscape significance of the Range, and seeks to:

- Protect, conserve and enhance its natural values;
- Protect the indigenous and non-indigenous cultural values;
- Improve public access and recreation opportunities;
- Manage the risk of erosion and bushfire; and
- Ensure a consistent and coordinated policy approach to the areas planning.

To achieve these objectives, the WAPC makes a range of recommendations, of which the following are relevant to this site:

- Opportunities to retain biodiversity through the eradication and control of weeds and feral animals, and the protection and rehabilitation of remnant vegetation;
- Revegetation around areas of conservation significance with key target corridors identified. A small patch of remnant vegetation is identified in the south-west corner of the subject site;
- To ensure that development proposals maintain and enhance conservation values;
- Incorporation of public access to watercourses in development proposals;
- To incorporate linkages and walk trails through the area;
- To limit and manage erosion and bushfire risk;
- Minimisation of intensive development on the flat tops and side slopes, and in key view corridors and ensuring that that which occurs is consistent with the Strategy objectives; and
- To ensure that the landscape value of the area is taken into account in any development proposal and appropriate management responses are incorporated.

2.1.3 Moresby Range Management Plan

The Moresby Range Management Plan was prepared for the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range (closest to Geraldton).

It states that any development proposal should, address the objectives stipulated for the area west of the Range, namely:

- Ensuring that the ecological dynamics of the landscape are protected and enhanced;
- Placing larger lots closer to the Range Precinct and in areas of high visibility;
- Ensuring that the transport network minimises trip distances, allows for walking, bicycling and other forms of transport, provides easy linkages to commonly used facilities and the Range, and provides the basis for strategic tree plantings and ecological linkages between the foothills and the Range;
- Creating a visually smooth transition from the obvious dominance of buildings in the centre of the City to the bushy and green appearance of the Range;
- Ensuring that buildings sit in with the landscape and create the overall impression that buildings become more sensitive and integrated into the landscape the closer the observer is to the Range.

2.1.4 Geraldton Regional Flora Survey 2010

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed in 2010 by the WAPC. The objective was to provide a regional context for land use planning and environmental impact assessment of proposals affecting native vegetation in the Geraldton region.

Information collected through the GRFVS is intended to assist land use planning by the Department of Planning (DoP) and local governments, environmental impact assessments by the Environmental Protection Authority (EPA), and conservation planning by DEC.

The report, associated maps and data provide useful information for landowners and developers, but does not preclude the requirement for site-based ecological assessments of areas likely to be impacted by development. Importantly, the GRFVS will inform conservation and regional planning in the Geraldton region, including the preparation of a local biodiversity strategy that will identify priority natural areas for consideration in future land use planning.

2.1.5 EPA Bulletin 891 – Geraldton Region Plan

The Geraldton Region Plan was prepared by the WAPC in 1997, to provide a regional framework for planning decisions and to recognise the regional centre for the mid-west.

The stated objective of the EPA for native vegetation is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation types and communities. In assessing the Geraldton Region Plan under Section 16 of the *Environmental Protection Act 1986* (EPA Bulletin 891, 1998), the EPA supported the

development of a remnant vegetation inventory in the Geraldton region and the conservation of regionally significant vegetation in both private and government ownership. A list of recommendations were also made by the EPA in respect to the Regional Plan. Those recommendations that are potentially applicable for the site are listed below:

- *“Areas supporting regionally significant vegetation should be identified and appropriately designated for conservation”.*
- *“The regional landscape values of the Moresby Ranges should be appropriately protected in the Region Plan”.*

2.1.6 Guidance Statement No. 33 – Environmental Guidance for Land Development

Guidance Statement No. 33 (EPA, 2005) outlines the environmental protection process and provides the EPA’s advice on a range of environmental factors in order to assist in the protection, conservation and enhancement of the environment during the land planning and development process.

3.0 EXISTING ENVIRONMENT

3.1 Site Location and Land Use

The site is located within the City of Geraldton-Greenough (CoGG), and is bordered by Rural Residential development to the south and west, agricultural land to the north, and the Moresby Ranges to the east.

The site has been historically, and currently still is, used for cattle and sheep grazing. The site has therefore mostly been cleared for pasture, with some pockets of remnant vegetation scattered across landholding. A single residence is located at the base of the Moresby Ranges, near the south eastern corner which is occupied by the current farming caretaker of the property.

A gravel pit which is no longer in operation is located outside the north western tip of the site.

3.2 Topography, Landforms and Soils

3.2.1 Topography

The site contains a portion of the Moresby Ranges, which is considered to be a prominent feature of the Geraldton regional area (WAPC, 2009). The site is therefore elevated with the topography rising from approximately 75 metres Australian Height Datum (mAHD) on the western edge, up to 210 mAHD at the highest point of the ranges on the eastern edge (Figure 4).

Within 100m to 200m of the eastern boundary is the steepest section of the site, where the Moresby Ranges scarp descends to the foothills.

3.2.2 Landforms and Soils

Regional geological mapping (WA Geological Survey, 1971) identifies the main geological unit over the site as being the Chapman Group, which is characterised as exhibiting Moonyonooka Sandstone (yellow feldspathic sandstone and arkose) and Greenough Sandstone (variegated clayey sandstone) (Figure 4).

The lower slopes and the top of the ranges are classified as being Laterite with overlying quartz sand and underlying highly weathered rock. The steep portions along the scarp along the eastern side of the site are classified as either Champion Bay Group or Yarragadee Formation (Figure 4), characterised by non-marine fluvialite feldspathic, poorly sorted sandstones which are porous and poorly cemented, hence allowing for considerable groundwater reserves.

The Western Australian Geological Survey (2001) regional mapping provided in Figure 4 indicates that the project site contains primarily colluvial foot slopes, with silty sand over mottled sandy clay soils. The other less prevalent soil units occurring in the site are outlined below:

- Alluvial stream channels (including stream beds and banks; seasonally active, silty sand clay, slope deposits and weathered bedrock).

- Alluvial swamps, having waterlogged organic soil over silty sandy clay.
- Eolian formed, deflated dunes of residual quartz sand over calcarenite.
- Residual ferruginous pisolitic duricrust and mottled soil (weathered bedrock).
- Colluvial formed, talus slope to the escarpement, consisting of weathered rock debris, gravel and boulders and the Cadda Formation of shale, siltstone and sandstone with shelly sandy limestone.

3.2.3 Acid Sulfate Soils

The Department of Environment and Conservation Acid Sulfate Soils risk mapping (WA Atlas, 2011), indicates that there is a small area (approximately 2ha) at the western boundary of the site which is mapped as having a high risk of encountering ASS within 3m of the natural surface (Figure 5). The remainder of the site is mapped as having a low to no risk of encountering ASS within 3 m of natural surface level.

3.3 Hydrology

3.3.1 Groundwater

The Department of Water has approximately 40 bores located within a 5 km radius of the centre of the landholding, including one bore which is located within the site. This bore (bore no. 20002923) indicated that the depth to groundwater at this location was at 6 metres below ground level. This depth however is not necessarily indicative of the average depth to groundwater across the entire site given the variability in the topographic levels. Depth to groundwater is therefore likely to vary considerably at different points. Data obtained from the nearby Department of Water (DoW) bores indicates a range in groundwater depths of between 1.8 m to 36.5 m below ground level (GHD, 2006). However based on the data obtained from the DoW, the depth to groundwater is likely to be on average greater than 6 metres below ground level across the site.

The site is situated within the proclaimed Arrowsmith Groundwater Area, which covers the northern-most extent of the Northern Perth Basin, from Geraldton to Green Head and east to Coorow, in the state's Mid West region. A groundwater allocation plan has been prepared by the Department of Water (2010) which details the objectives of the proclaimed Arrowsmith Groundwater Area and broad management requirements. These include:

- A guideline for the allocation and licencing of groundwater in the Arrowsmith Groundwater Area.
- Details on the effects of abstraction on groundwater quality and groundwater-dependent ecosystems.

This plan will guide the assessment of groundwater licence applications in respect to allocations entitlements in the Arrowsmith Groundwater Area.

3.3.2 Wetlands

There are two seasonal wetlands within the site, located in the south-west and near the western edge (Figure 6). These wetlands are not recognised as regionally significant in the *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*, or listed under the Ramsar Convention (1971).

The vegetation condition for both wetland areas was noted as being between ‘Good to Degraded’ and ‘Degraded’ as determined through the botanical assessment (detailed in Section 3.4 below).

3.3.3 Surface Water and Drainage

Three natural drainage lines are present through the site, which have been highly modified due to clearing of vegetation (Figure 6). The drainage lines appear to be natural drainage channels for rainwater flowing off the scarp, however they remain dry most of the year, with limited flow reported from the last few years (GHD, 2006).

3.4 Vegetation and Flora

The vegetation and flora data relevant to this site has been obtained from the following sources:

- Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine (GHD, 2007) – Attached as Appendix 1.
- Level 1 Flora and Vegetation Survey for Lots 80 and 81 Waggrakine (Coterra, 2011) – Attached as Appendix 2.
- Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).

Where overlap on the assessments exists, the more recent data obtained in the Level 1 Flora and Vegetation survey (Coterra, 2011) supersedes the results of the previous Priority Flora Survey (GHD, 2007).

Based on review of the above documents a summary of the vegetation and flora on the site is outlined below.

3.4.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway and Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2,242,033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-

sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

3.4.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are:

- 675 - Shrublands; mixed thicket (Melaleuca and Hakea)
- 359 - Shrublands; Acacia and Banksia scrub

The remaining extent of these two vegetation associations’ within WA and the Geraldton Regional Flora and Vegetation Survey area (GRFVS), are presented in Table 1 below (WAPC, 2010).

Table 1 Vegetation Complex Statistics

Area	Beard vegetation association 675	Beard vegetation association 359
Pre-European extent in GRFVS	3, 148 ha	17, 805 ha
Current (remaining) extent within GRFVS	240 ha (7.62%)	3, 077 ha (17.3%)
Area protected within GRFVS	79.4 ha	1.4 ha
Pre-European extent in WA	51, 850 ha	44, 493 ha
Current (remaining) extent in WA	10, 992 ha (21%)	8, 366 ha (19%)
Area protected in WA	328 ha	1.25 ha

The EPA conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) is 30% retention of pre-European vegetation complex extent outside of constrained areas (i.e. Perth Metropolitan Area is a constrained area). This retention target has therefore not been met for the above vegetation complexes that are located within the site, for both the Geraldton region and in WA generally.

The locations of each of these vegetation complexes are outlined in Figure 7.

3.4.3 Geraldton Regional Flora and Vegetation Survey

The Geraldton Regional Flora and Vegetation Survey (GRFVS) aims to provide information to assist in the assessment of proposals that may affect the native vegetation within the Geraldton region (GRFVS, 2010).

Using Beard’s (1976) regional vegetation associations, the GRFVS maps vegetation at a local scale which are referred to as GRFVS plant communities. The original vegetation of study area, is likely to have consisted of three GRFVS plant communities, these are detailed in Table 2.

Table 2 GRFVS Plant Communities

Plant Community	Description	Beard Vegetation Association
10	Near Coastal: <i>Acacia rostellifera</i> shrubland	359
13	Sandplain: <i>Banksia prionotes</i> / <i>Acacia rostellifera</i>	359
15	Thicket: <i>Melaleuca</i> spp. /mixed spp.	675

The GRVFS outlines the following in respect to the local conservation significance of each of the recognised plant communities occurring within the site:

“Plant community 10 is more widespread than the other identified communities in the GRFVS area; however better condition representatives have local conservation significance” (WAPC, 2010).

“Plant community 13 occupies 754.39 ha in the GRVFS area, however much of this area is degraded. The better representatives of this plant community occur in the Glenfield and Waggrakine areas. A low heath variant of this plant community occurs in Karloo and Utakarra. This plant community is considered to have conservation significance because, although it has a greater natural extent than most the other communities, it is largely degraded or threatened” (WAPC, 2010).

“Plant community 15 includes the area which matches the description of the ‘natural value’ ecosystem ‘Moresby Ranges’ (Australian Natural Resources Atlas 2009) and the P1 priority ecological community ‘Plant assemblages of the Moresby Range system’ (DEC 2009a). Consequently, this area is considered to have conservation significance (WAPC, 2010)”.

The GRVFS recognises the local significance of the these plant communities due to the lack of original pre-European extent and due to ongoing degradation and clearing of the vegetation within the GRVFS study area.

The locations of the beard vegetation complexes across the site are shown in Figure 7.

3.4.4 Vegetation Type and Condition

The majority of the site has been cleared due to historical agricultural uses, however there are some small pockets of vegetation remaining across the site. In most of these areas, the vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these remnants.

The dominant remnant vegetation complexes across the site were noted as being the following (Coterra, 2011):

- Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostellifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.

- *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladus asper*, **Avena barbata* and Poaceae sp.? Open Herbland/Grassland.
- *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
- Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, *?Austrostipa* sp. and *Desmocladus asper* Herbland/ Grassland.

The vegetation complexes and their locations across the site are presented in Figure 8.

The condition of the vegetation present across the site was mapped during the Level 1 Flora and Vegetation survey undertaken in 2011 (Figure 9), and is described further below.

- The site can be broadly classified as cleared paddocks in ‘Degraded’ to ‘Completely Degraded’ condition (Figure 9). The vegetation that is present in the ‘Degraded’ to ‘Completely Degraded’ (cleared paddocks) areas consisted of Declared Plants (Dept. Agriculture and Food, 2011), Environmental Weeds (CALM, 1999), planted *Eucalyptus* spp. and scattered natives.
- The remnant vegetation in the north to northwest portion of the site was in ‘Excellent’ condition, with only small patches of cleared vegetation (Figure 9).
- Remaining patches of vegetation were assessed as being in ‘Good’ to ‘Completely Degraded’ condition.

The condition ratings have been rated in accordance the vegetation condition scale used in Keighery (1994) outlined below:

Table 3 Explanation of Vegetation Condition Rating (Keighery, 1994)

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive specie
3	Very Good	Vegetation structure altered, obvious signs of disturbance
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species

Some of the results of the assessment of the vegetation condition in April 2011, vary from the vegetation condition results determined in 2007. This is likely due to continued degrading land uses (predominantly grazing activities) and could also be partly attributed to a regional reduction in rainfall (Bureau of Meteorology, 2011).

3.4.5 Flora

A search of the Department of Environment and Conservation (DEC) Threatened (Declared Rare) Flora Database and the Western Australian Herbarium Specimen database for species of rare and priority flora located within the vicinity of the site was undertaken by GHD in 2007. Of the rare or priority species that were identified by the DEC as potentially occurring within the area, two priority flora species were confirmed as being located within the site as determined through the Level 1 Flora and Vegetation survey completed in April 2011. These species are:

- *Melaleuca huttensis* (Priority 1 Flora), and;
- *Grevillea triloba* (Priority 3 Flora).

A description of the significance of the priority species classification by the DEC is outlined below:

- *Priority 1 species are species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes (DEC, 2011).*
- *Priority 3 species are species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them (DEC, 2011).*

One individual *M. huttensis* was recorded within the northwest corner of the site. *G. triloba* was recorded in the northern and northwest corners of the site, in the areas classified as being in 'Good' to 'Excellent' condition, at densities of 20%, 5% and patches of 20% respectively. The location of these species across the site is shown in Figure 9.

A search of the DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database indicated that there was no previously known TECs or PECs identified as occurring within the site area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca magecephala* and *Hakea pycnoneura* thickets on the Morseby Range.

3.5 Fauna and Habitat

As the majority of the site is cleared and used for grazing of livestock, the fauna habitat value of the site is limited. However, pockets of remnant vegetation will provide islands of habitat for some species.

Vegetation condition is often used as an indicator of fauna habitat value. The majority of the remnants were rated as being in 'Good' to 'Completely Degraded' condition (Section 3.4.3), thereby offering varying habitat value for native fauna. The portion of vegetation in the very north-west tip, which has been assessed as being in 'Excellent' condition, is likely to contain greater fauna habitat value and viability (Figure 9).

A search of the DEC's Threatened Fauna database, and the federal Department of Sustainability, Environment, Water, Populations and Community's (DoSEWPC) database of listed matters of National Environmental Significance protected under the Environmental Protection and Biodiversity Conservation Act (EPBC Act) (1999) was undertaken. The search indicated that the following Rare or Threatened fauna species could potentially occur within the site. This has been determined based on a comparison between the available fauna habitats within the site, and the information provided on the habitat requirements of each of the listed species:

Table 3 – List of Threatened Fauna Species

Fauna Species	Conservation Status	Likelihood of Being on-site
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)	Threatened	Possible – Limited foraging habitat available
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)	Threatened	Possible – Limited foraging habitat available
<i>Cyclodomorphus branchialis</i> (Slender Blue Tongue Skink)	Threatened	Possible, though unlikely due to lack of suitable habitat
<i>Falco peregrinus</i> (Peregrine Falcon)	Specially Protected Fauna	Unlikely – lack of suitable habitat
<i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)	Threatened	Possible, though unlikely due to disturbed nature of site
<i>Lerista lineata</i>	Priority 3	Possible, though unlikely due to disturbed nature of site
<i>Macropus irma</i> (Western Brush Wallaby)	Priority 4	Unlikely – habitat disturbed onsite
<i>Morelia spilota subsp. imbricata</i> (Carpet Python)	Specially Protected Fauna	Possible, though unlikely due to disturbed nature of site
<i>Pomatostomus superciliosus subsp. ashbyi</i> (White-browed Babbler (western wheatbelt))	Priority 4	Possible, though unlikely due to disturbed nature of site
<i>Psacadonotus seriatus</i> (Cricket)	Priority 1	Possible, though unlikely due to disturbed nature of site
<i>Tyto novaehollandiae subsp. Novaehollandiae</i>	Priority 3	Unlikely – lack of suitable habitat

The DEC database search results are presented in Appendix C, with the results of a protected matters search under the EPBC Act presented in Appendix D.

Whilst some of the habitats present within the site are considered suitable for a number of the Rare or Priority species listed above, the likelihood that these species can sustain viable populations within the site is low due to the fragmented and disturbed nature of the remnant habitats available.

Some of these species are listed as possibly occurring within the site, primarily due to the area of intact vegetation in the northwest corner. Ground dwelling species such as reptiles and insects may inhabit this portion of the site.

Foraging habitat for Carnaby's and Baudin's Cockatoo is present in some areas of existing vegetation across the site.

The level of impact on these species will need to be determined following final planning design, when the area of foraging habitat required to be cleared can be fully assessed in consideration of the significant impact thresholds under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act), 1999.

3.6 Cultural Heritage

A search of the Department of Indigenous Affairs website determined that there are no sites of Aboriginal significance which have been recorded on the site (Appendix E) (DIA, 2011). The closest registered site is located approximately 3km north-west of the northern edge of the site.

All contractors working on the development need to be made aware of their responsibilities under the Aboriginal Heritage Act with regard to finding potential archaeological sites. In the event a site is discovered, all work in the area is required to cease and the Department of Indigenous Affairs is to be contacted.

3.7 Potential Contamination

The use of the site for agricultural and pastoral purposes is not viewed historically as intensive, therefore it is unlikely that contamination has occurred. Additionally, the site is not listed on the Department of Water, Water Information (WIN) information database for potentially contaminated sites, nor under the DEC's Contaminated Sites Database (DEC, 2011).

A former Shire of Greenough landfill was once located immediately west of the site, however operations ceased approximately 15 years ago and no contamination has been identified. Additionally groundwater flows in a westerly direction under the former landfill, away from the site.

A threat of UXO's (Unexploded Ordinances) from an area 2km north east of the site called Red Peak has previously been identified. A subsequent UXO threat analysis has, however, resulted in the Unexploded Ordinance Services section of FESA concluding that this area poses a minimal risk as, and that further searching for UXO is unnecessary (refer Appendix F). FESA advise that an Advice Note only will be recommended to be placed upon any subdivision approvals issued for the site.

4.0 IMPACTS AND MANAGEMENT

4.1 Vegetation and Flora

The site contains limited pockets of vegetation due to historical agricultural uses that have resulted in the majority of the site being cleared. Most of the remaining vegetation has been degraded due to ongoing grazing activities, weed invasion and general human and livestock use adjacent to and within these vegetation remnants.

However, the vegetation in the very north to northwest portion of the site is the exception, assessed as being in 'Excellent' condition, with only small patches of cleared vegetation. This area also sustains populations of Priority 1 and 3 species.

The EPA's conservation target as outlined in Guidance Statement No. 33 (EPA, 2008) of 30% retention of pre-European vegetation complex extent has not been met for the vegetation complexes present within the site, for both the Geraldton region and in WA generally.

In addition, both the Moresby Range Management Strategy, the EPA's assessment of the Geraldton Region Plan, and the GRVFS refer to the significance of remnant vegetation and the need to ensure that development proposals maintain and enhance conservation values.

Therefore, despite the condition of the remnant vegetation, it is considered appropriate to retain existing vegetation wherever possible in an effort to preserve and enhance the ecological integrity of the site, and to increase amenity for prospective residents.

4.1.1 Development Design Measures

The draft concept plan is attached as Figure 10, and outlines the areas of vegetation proposed for retention within the development. The proposed development will allow for the retention of the majority of currently vegetated areas. In addition, all areas with Priority Flora located in them will be retained in Public Open Space (POS) and in large covenanted lots.

Two pockets of remnant vegetation located near the central western edge of the site and within the south western corner, are proposed to be reserved for POS. A long linear section of POS will also be provided on the eastern portion of the site to protect this section of the Moresby Range and associated vegetation.

Large covenanted lots are proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will be designed and conditioned for minimal clearing. Building envelopes will be designated in this portion of the site where vegetation is degraded or already cleared.

Revegetation with native species will be undertaken following development, predominantly within selected areas of the open space and in streetscape landscaping. The proposed species list for revegetation will be approved by the CoGG prior to development occurring.

Approximately 30% of the site is proposed for open space under the current Development Concept Plan. Further detail on precise areas, design, species to be used and management will be developed and submitted to approval agencies as part of the structure planning and subdivision processes.

The proposed reservation of these areas in POS and the covenanted large lot designs in the north-west of the site, will be designed to ensure an ecological corridor runs between the vegetated larger semi-rural blocks to the west of the site, to the Moresby Ranges in the eastern portion of the site.

This corridor will include the area of existing vegetation within the western portion of the site, with the objective of retaining this vegetation and enhancing its ecological integrity through revegetation and proposing a link to other areas of vegetation in open space.

4.1.2 Other Management Measures

To ensure the future viability of retained vegetated and revegetated areas the following management strategies are proposed:

- Delineate POS areas containing retained vegetation and revegetation zones from the development by separating them by a road or significant pedestrian accessways.
- Preparation of a POS Management Plan, to be signed off by the Local Authority in consultation with the DEC, which will provide details on the following:
 - minimisation of clearing and vegetation disturbance during construction,
 - access control (during construction and post-construction),
 - revegetation species and establishment,
 - weed control,
 - dieback control and management,
 - stormwater management,
 - ongoing maintenance and management of the vegetated areas,
 - protection of wetlands,
 - fire management, and
 - interface management.

This will ensure the long term protection and viability of the vegetation and associated vegetation retained in POS

4.2 Fauna and Habitat

Habitat is generally limited due to the fragmented and degraded nature of the existing vegetation across the site. Key species of conservation significance which have been identified as potentially utilising habitat present at the site include Carnaby's Black Cockatoo and Baudin's Black Cockatoo.

Black Cockatoo's typically utilise areas of Banksia, Allocasuarina and Eucalyptus woodland, which can be found intermittently amongst the remnant vegetation areas

across the site. The northwest corner of the site also contains potential habitat for some species of conservation significance, as well as other fauna species.

4.2.1 Development Design Measures

The draft concept plan is attached as Figure 10, and outlines the areas of vegetation and fauna habitat proposed for retention within the development. As is evident in this plan, the majority of the vegetation and habitat currently existing on the site will be retained in open space.

One of the key design initiatives, which underpins the environmental and aesthetic objectives of this project, is the retention and development of an ecological corridor, between the vegetated larger semi-rural blocks to the west, to the Moresby Ranges in the eastern portion of the site. This corridor will include the area of existing vegetation within the western portion of the development, with the objective of retaining this vegetation and enhancing the ecological integrity through revegetation and linking it with other areas of vegetation in open space.

This corridor will allow for the safe movement of fauna across the site, ensuring a continuous link between fauna habitats that are currently separated by agricultural land and increasing the overall fauna habitat viability of the landholding.

Large covenanted lots are also proposed within the area of the site containing intact remnant vegetation in the north-west corner, which will ensure minimal clearing. Building envelopes will be strategically located in this portion of the site where vegetation is degraded or already cleared.

Overall, the majority of the existing vegetation is proposed for retention in Public Open Space, in large covenanted lots or as part of the Moresby Ranges open space. In addition individual and small clusters of trees will be retained where possible.

4.2.2 Other Management Measures

A POS Management Plan will be prepared prior to development, to be signed off by Local Authority in consultation with the DEC, which will provide details regarding:

- minimisation of clearing and vegetation disturbance during construction,
- access control (during construction and post-construction),
- revegetation species and establishment,
- weed control,
- dieback control and management,
- stormwater management,
- ongoing maintenance and management of the vegetated areas,
- protection of wetlands,
- fire management, and
- interface management.

This will ensure the long term protection and viability of the vegetation and associated fauna habitats retained in POS.

4.3 Wetlands

There are two seasonal wetlands located within the site, situated in the southwest and the western edge of the site (Figure 6). Both wetland areas will be retained in Public Open Space.

Management of these wetlands will be included in the POS Management Plan, which will be prepared prior to development occurring. The POS Management Plan which will provide details regarding:

- revegetation species and establishment,
- weed control,
- access control (during construction and post-construction),
- dieback control and management,
- stormwater management,
- fire management, and
- interface management.

4.4 Moresby Ranges

The WAPC prepared the *Moresby Range Management Strategy* in 2009 with the aim of protecting, enhancing and promoting the regional significance of the Moresby Range over the next 25 years.

In addition to this, the Shire of Chapman, City of Geraldton - Greenough and the Department of Planning prepared the Moresby Range Management Plan in 2010, to provide further direction on the implementation of the Range Management Strategy as it applies to the southern part of the Range.

The visual and landscape significance of the Range as a backdrop to Geraldton, and icon to the region, is recognised and discussed throughout both documents. Recognition of the biodiversity values and retention of these values within the Moresby Ranges is also recommended in these plans.

A specific set of recommendations applying to the site is outlined in Section 2 above. These recommendations in respect to environmental management are generalised and have been addressed through incorporation of the key objectives of this plan into the Development Concept Design. The Moresby Ranges will remain in POS as part of this development, and will be retained and managed in perpetuity. Therefore the biodiversity values of the range will not be compromised. Further, management recommendations for the foothills, in which the development portion of this site is part of, have been considered into the design concept, and in this document.

In addition a specific visual and landscape assessment has been prepared for the site by EPCAD (2011) to determine limitations to development and to guide the preparation of the concept and structure plans. This was not based on any particular development plan, but provided a framework for the development of one. This assessment concluded that:

“The development area of the site... will not be prominent in the landscape from contextual views, therefore the regionally important landscape of the scarp is not adversely affected from public viewpoints.” (EPCAD, 2011).

4.5 Acid Sulfate Soils

WAPC mapping indicates that the site contains a small area near the western edge of the site mapped as having a high risk of ASS (Figure 5).

In accordance with DEC guidelines, a Preliminary Site Assessment will be undertaken to assess the presence and extent of ASS prior to subdivision. Depending upon the results of the preliminary assessment, an Acid Sulfate Soil Assessment and Dewatering Management Plan will be prepared if required. This plan will be approved for implementation by the DEC prior to any ground disturbing works being undertaken.

4.6 Contamination

The site is not registered on the DEC’s contaminated sites database. However agricultural activity involves the use of substances which can potentially be pollutants. These include the use of toxic chemicals such as pesticides and herbicides, and hydrocarbons such as fuels and lubricants.

As such, a desktop Preliminary Site Investigation will be undertaken to assess the likelihood of contamination being present on the site. Depending upon the results of the preliminary investigation, further investigation and on-site sampling may be required. This sampling and subsequent report will need be approved by a registered contaminated sites auditor to the satisfaction of the DEC prior to any works being undertaken.

4.7 Construction Impacts

Construction activities need to be managed to minimise the impact to adjacent residents, retained vegetation and wetlands. Impacts can include:

- Nuisance dust generation during bulk earthworks.
- Disturbance of Acid Sulfate Soils during earthworks and/or installation of services.
- Silt and sediment run-off from uncontrolled run-off during site works.
- Inadvertent damage to trees and other vegetation earmarked for retention.
- Inappropriate disposal of waste building material and poor housekeeping on building sites leading to wind blown litter.

All of these potential impacts are manageable through appropriate engineering design and appropriate site management practices. Management of these potential

impacts will be detailed in the POS Management plan for the protection of existing vegetation during construction, and through the provision of standard subdivision conditions on the subdivision approval.

4.8 Water Management

Infiltration within the site appears good with little current surface runoff. All additional runoff generated by the development will be contained within the site and disposed of through a network of infiltration basins integrated into POS.

Detailed water management is not required to be addressed at this stage of the planning and approvals process primarily due to the reported and expected depth to groundwater (Section 3.3.1).

Water management will be adequately addressed for the site, in consideration of the proposed development at Local Structure Planning Stage, and prior to subdivision, through the production of a Local Water Management Strategy and Urban Water Management Plans to the satisfaction of the DoW and the CoGG.

5.0 IMPLEMENTATION STRATEGY

The key environmental considerations for the site relate to vegetation and fauna and habitat. The findings and conclusions from this assessment are presented below.

Detailed management strategies will be determined through the POS Management Plan identified above, prepared through an appropriate schedule in the Local Structure Plan, to be approved by the Local Authority. This will provide statutory assurance that this plan will be completed in accordance with the objectives outlined above, as the CoGG Local Planning Scheme states that development must be in accordance with an approved Structure Plan. Therefore Proposed draft Local Structure Plan provisions are included in Appendix G.

No environmental issues have been identified that are considered to prevent rezoning and controlled development of the subject land, subject to appropriate design and management.

5.1 Vegetation

Approximately 30% of the site is proposed for retention in Public Open Space, which includes almost all existing remnant vegetation located across the site.

Degraded land at the site which is identified as POS is proposed to be rehabilitated through the planting of locally endemic species.

To ensure the future viability of retained vegetated and revegetated areas, the management strategies which will be implemented will include delineation of retained vegetation, management of stormwater flow and preparation of a POS Management Plan.

5.2 Fauna and Habitat

Viability of fauna habitat is directly linked to the viability of the remnant vegetation across the site. Therefore the management measures pertaining to the retention and rehabilitation of the remnant vegetation across the site will ensure the long term sustainability of the existing fauna habitat.

Approximately 30% of the site is proposed for retention in Public Open Space, which includes almost all existing remnant vegetation located across the site, and also includes the formation of an ecological corridor between the vegetated larger semi-rural blocks to the west and the Moresby Ranges in the eastern portion of the site.

To ensure the future viability of retained habitat a POS Management Plan will detail specific management strategies to the satisfaction of the Local Authority in consultation with the DEC.

5.3 Additional Environmental Management Items

An Acid Sulfate Soil Management Plan will also be prepared if AASS or PASS is found to be present at the site. This plan would be prepared in accordance with the DEC ASS guidelines and approved by the DEC prior to implementation.

6.0 REFERENCES

Bureau of Meteorology, (2011) *Climate of Geraldton*, Overview [Online] <http://www.bom.gov.au/wa/geraldton/climate.shtml>

Coterra Environment (2011) *Level 1 Flora and Vegetation Survey of Moresby Heights*. Coterra, Perth

Department of Agriculture and Food, (2011) *Declared Plants Database* [Online] http://agspsrv95.agric.wa.gov.au/dps/version02/01_plantsearch.asp

Department of Environment and Conservation and the West Australian Herbarium (2006) *FloraBase*. [Online] <http://florabase.calm.wa.gov.au>

Department of Environment and Conservation. (2001-2010). *Contaminated Sites Management Series*. DEC, Perth.

Department of Environment and Conservation, Contaminated Sites Database [Online] <https://secure.dec.wa.gov.au/idelve/css/>

Department of Indigenous Affairs. (2001) [Online] <http://www.dia.wa.gov.au/>

Department of Sustainability, Environment, Water, Population and Communities (2010) *Environment Protection and Biodiversity Conservation Act 1999*, Overview [Online] <http://www.environment.gov.au/epbc/about/index.html> (Accessed 02/09/2010).

Department of Minerals and Energy (1986). *Serpentine sheet (Jordan JE 1986b Serpentine Sheet part of Sheets 2033 II and 2133 III. Environmental Geology Series. Geological Survey of Western Australia, Perth, Western Australia.)*

Desmond & Chant (2001) *Geraldton Sandplains 2 (GS2 Geraldton Hills Subregion)* DEC, Perth.

Environmental Protection Act 1986 Environmental Protection Authority (1998) *EPA Bulletin 891 – Geraldton Region Plan*, EPA, Perth

Environmental Protection Authority (2004) *Environmental Protection (South Western Agricultural Region Wetlands) Policy 2004*. Environmental Protection Authority, Perth.

Environmental Protection Authority (2005) - *Guidance Statement No. 3 for the separation distances between industrial and sensitive land uses*. Final Guidance No. 3. Environmental Protection Authority, Perth.

Environmental Protection Authority (2008) - *Guidance Statement No. 33: Environmental Guidance for Planning and Development*. Environmental Protection Authority, Perth.

Geological Survey of Western Australia (1971) *Geraldton – Houtman Abrolhos 1:250,000 Geological Series, Sheet SH 50-1 and Part of Sheet SH 49-4*.

Geological Survey of Western Australia (2001) *Howatharra 1:50000 Regolith – Landform Resource Series Sheet 1840 – IV First Edition*

GHD (2006) *Humphrey Land Developments: 80 & 81 Hackett Road, Waggrakine, Environmental Assessment*. GHD, Perth

GHD (2007) *Priority Flora Survey for Lots 80 and 81 Hackett Road, Waggrakine*. GHD, Perth

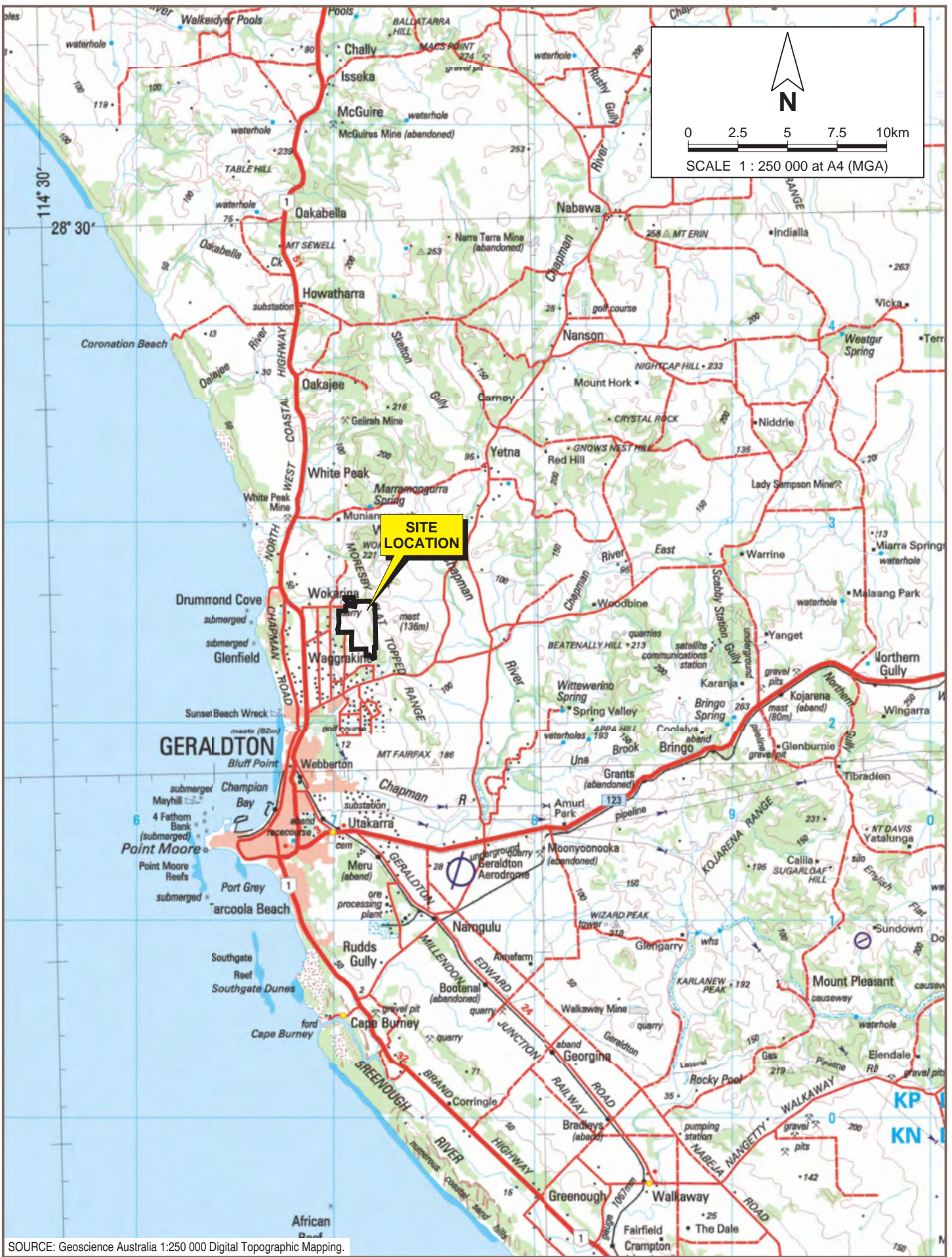
Keighery, B.J. (1994). *Bushland Plant Survey: a Guide to Plant Community Surveys for the Community*. Wildflower Society of Western Australia (Inc.) Nedlands, Western Australia

Thackway, R. & Cresswell I. D. 1995, *An Interim Biogeographical Regionalisation for Australia: a Framework for Setting Priorities in the National Reserves System Cooperative Program*, Australian Nature Conservation Agency, Canberra, ACT.

Western Australian Planning Commission (2010) *Geraldton Regional Flora and Vegetation Survey*. WAPC, Perth

Western Australian Planning Commission (2009) *Moresby Range Management Strategy*, WAPC, Perth

FIGURES



SOURCE: Geoscience Australia 1:250 000 Digital Topographic Mapping.

COTERRA
ENVIRONMENT

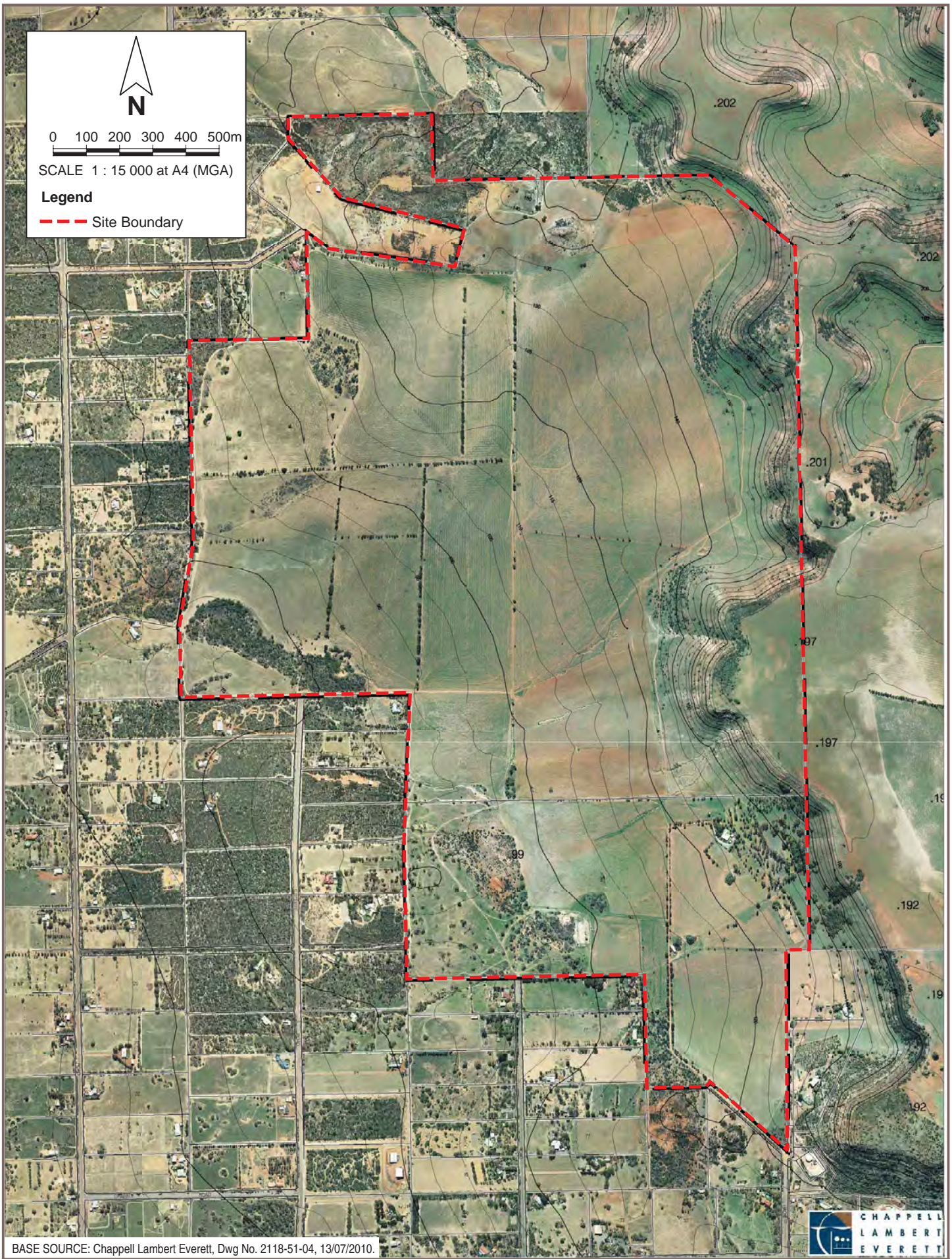
Humfry Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

SITE LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-401.dgn



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f02.dgn

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



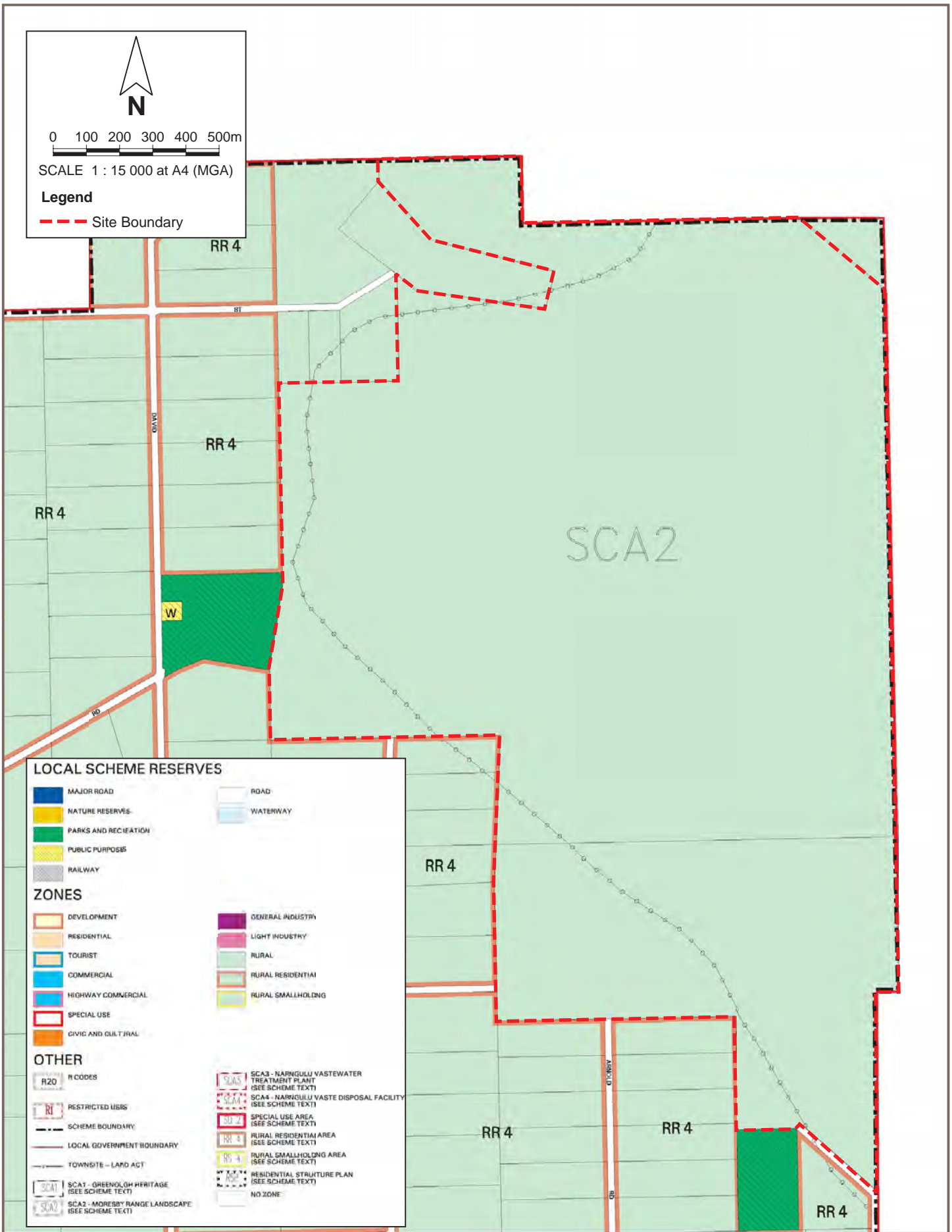
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

AERIAL PHOTOGRAPH

Figure 2



SOURCE: Department of Planning, February 2011.

COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers

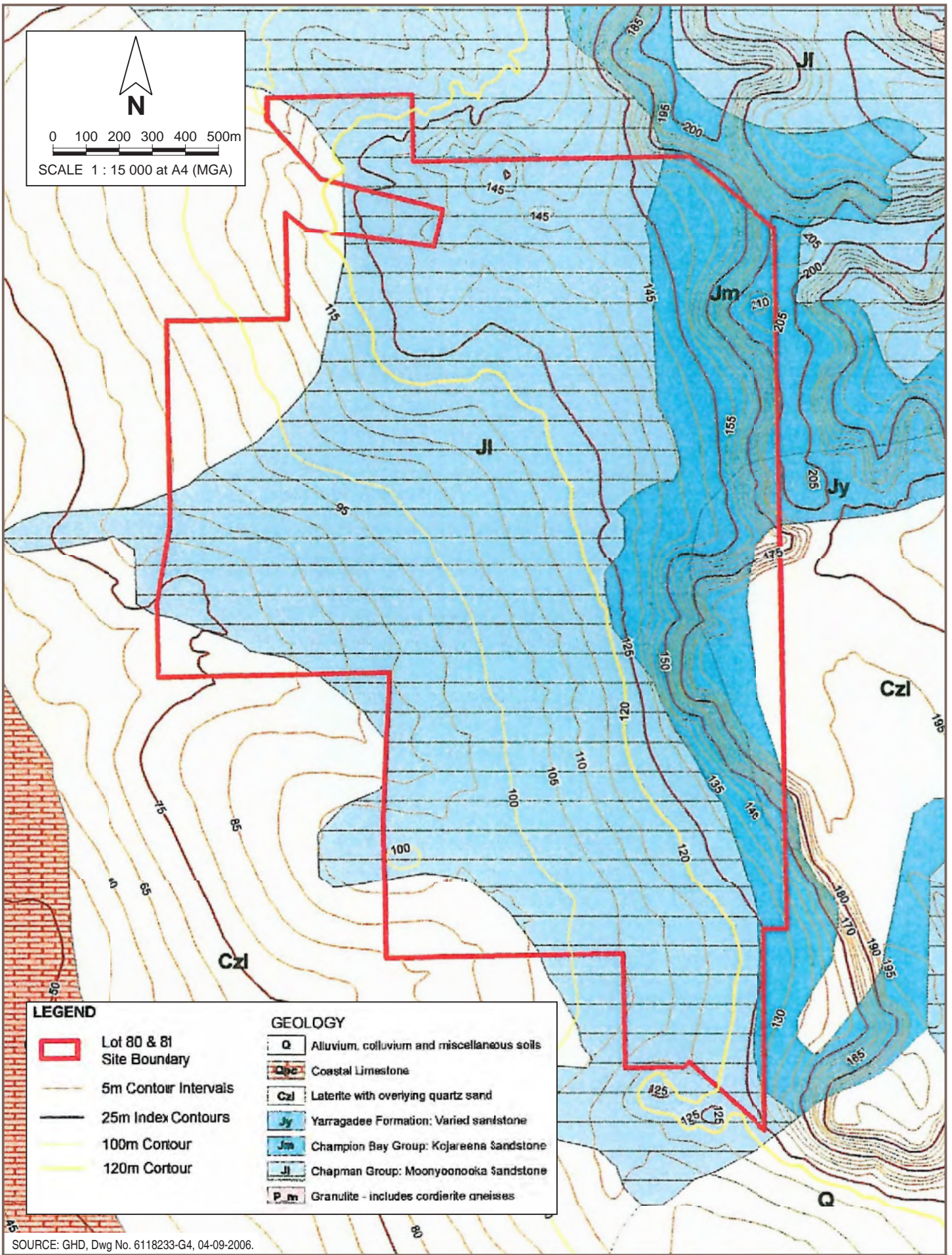
Date: 11 May 2011

Job: HUMMOR01

Revision: A

**CITY OF GERALDTON-GREENOUGH
LOCAL PLANNING SCHEME ZONING**

Figure 3



SOURCE: GHD, Dwg No. 6118233-G4, 04-09-2006.

COTERRA
ENVIRONMENT

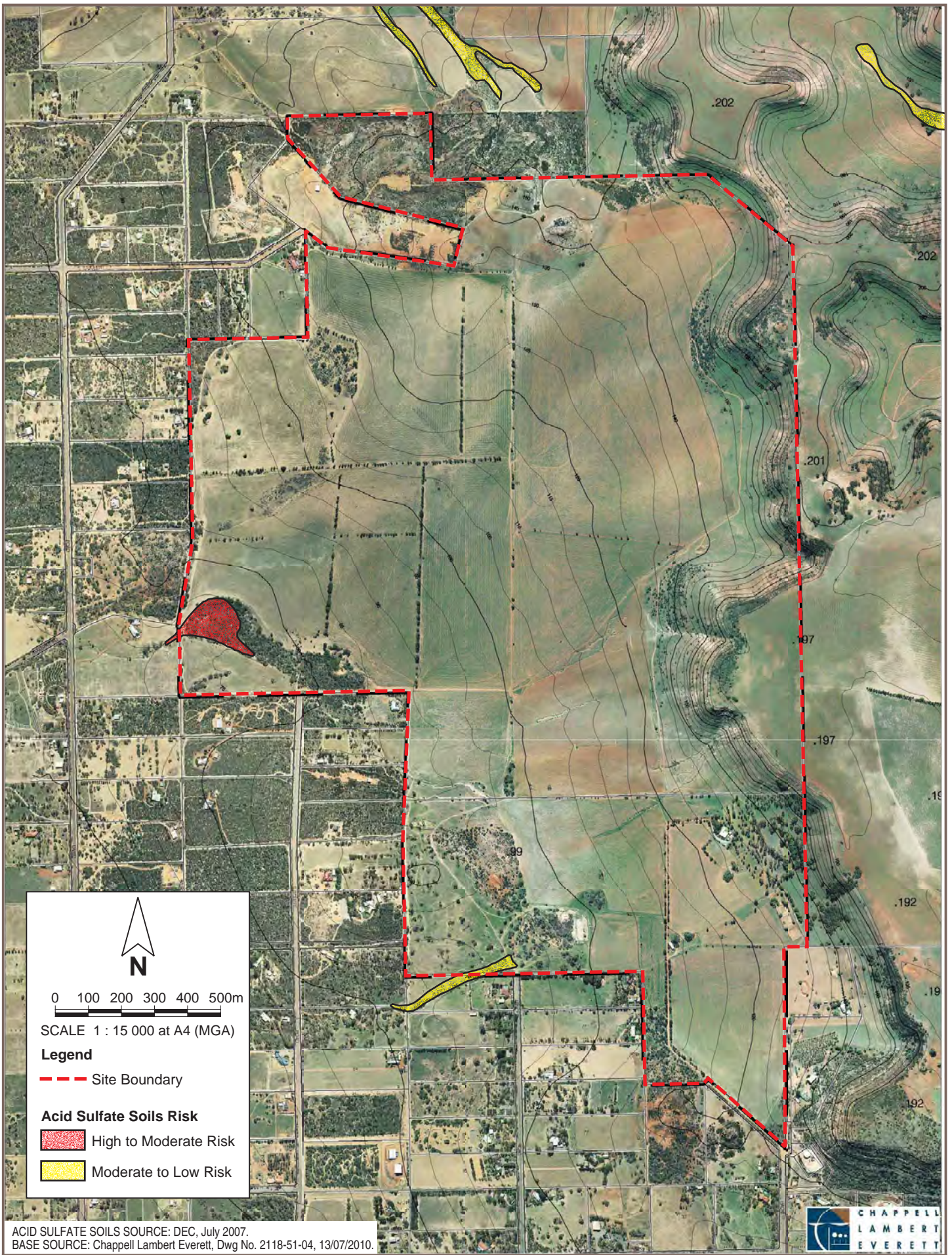
Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers Date: 11 May 2011
Job: HUMMOR01 Revision: A


TOPOGRAPHY AND GEOLOGY

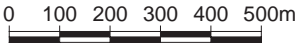
Figure 4

HUMMOR01-f04.dgn
PINPOINT CARTOGRAPHICS (08) 9562 7136



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f05.dgn


N


 0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

Legend


- Site Boundary

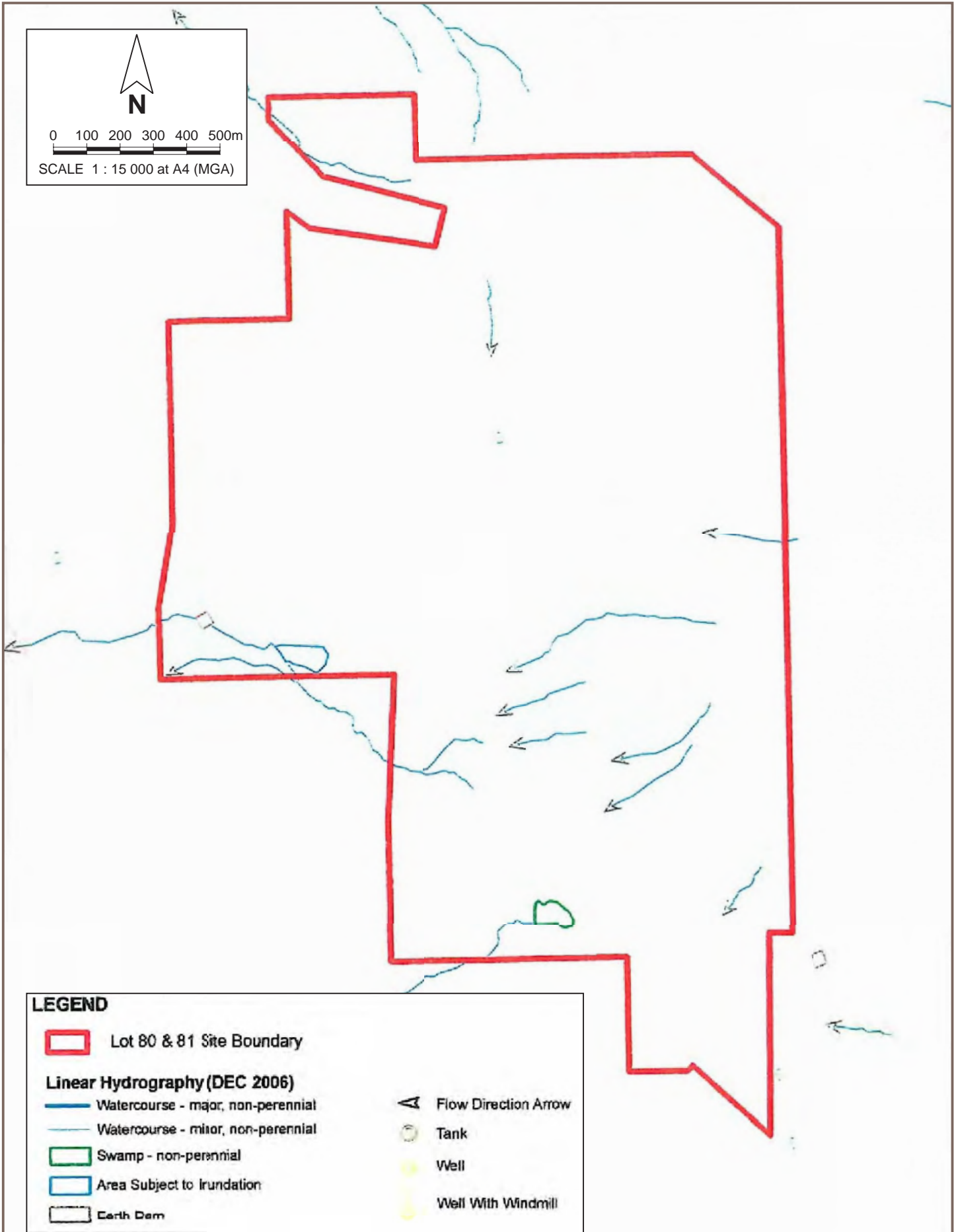
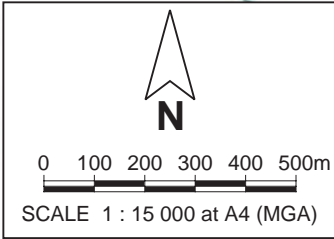
Acid Sulfate Soils Risk

- High to Moderate Risk
- Moderate to Low Risk

ACID SULFATE SOILS SOURCE: DEC, July 2007.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON	Figure 5
Drawn: L. Rogers	Date: 11 May 2011	ACID SULFATE SOILS	
Job: HUMMOR01	Revision: A		



LEGEND

- Lot 80 & 81 Site Boundary
- Linear Hydrography (DEC 2006)**
- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to Irrigation
- Earth Dam
- A Flow Direction Arrow
- Tank
- Well
- Well With Windmill

SOURCE: GHD, Dwg No. 6118233-G5, 04-09-2006.

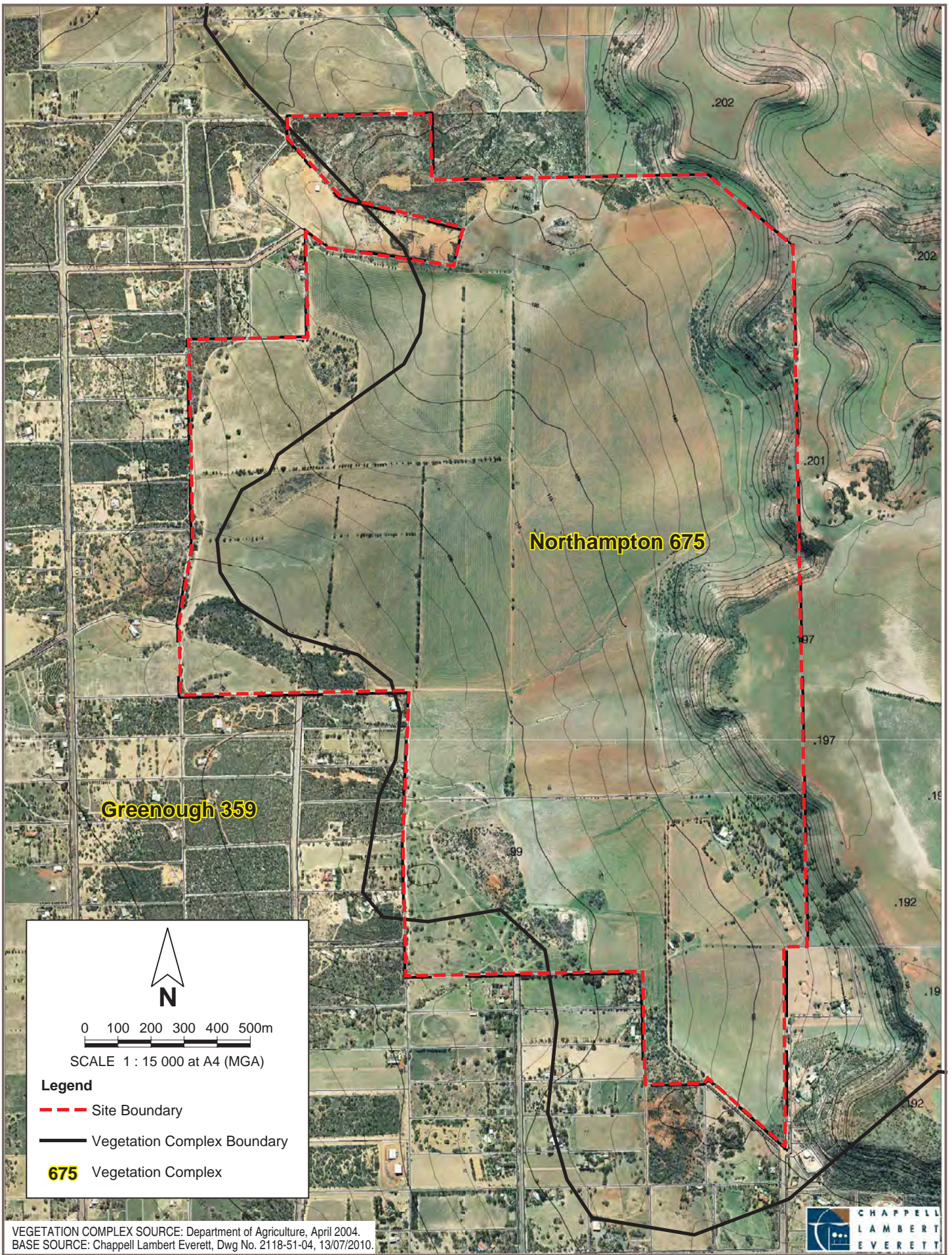
COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON


Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

WETLANDS AND SURFACE WATER FLOW

Figure 6



HUMMOR01-07.dgn
 PINPOINT CARTOGRAPHICS (08) 9562 7136


N


0 100 200 300 400 500m
 SCALE 1 : 15 000 at A4 (MGA)

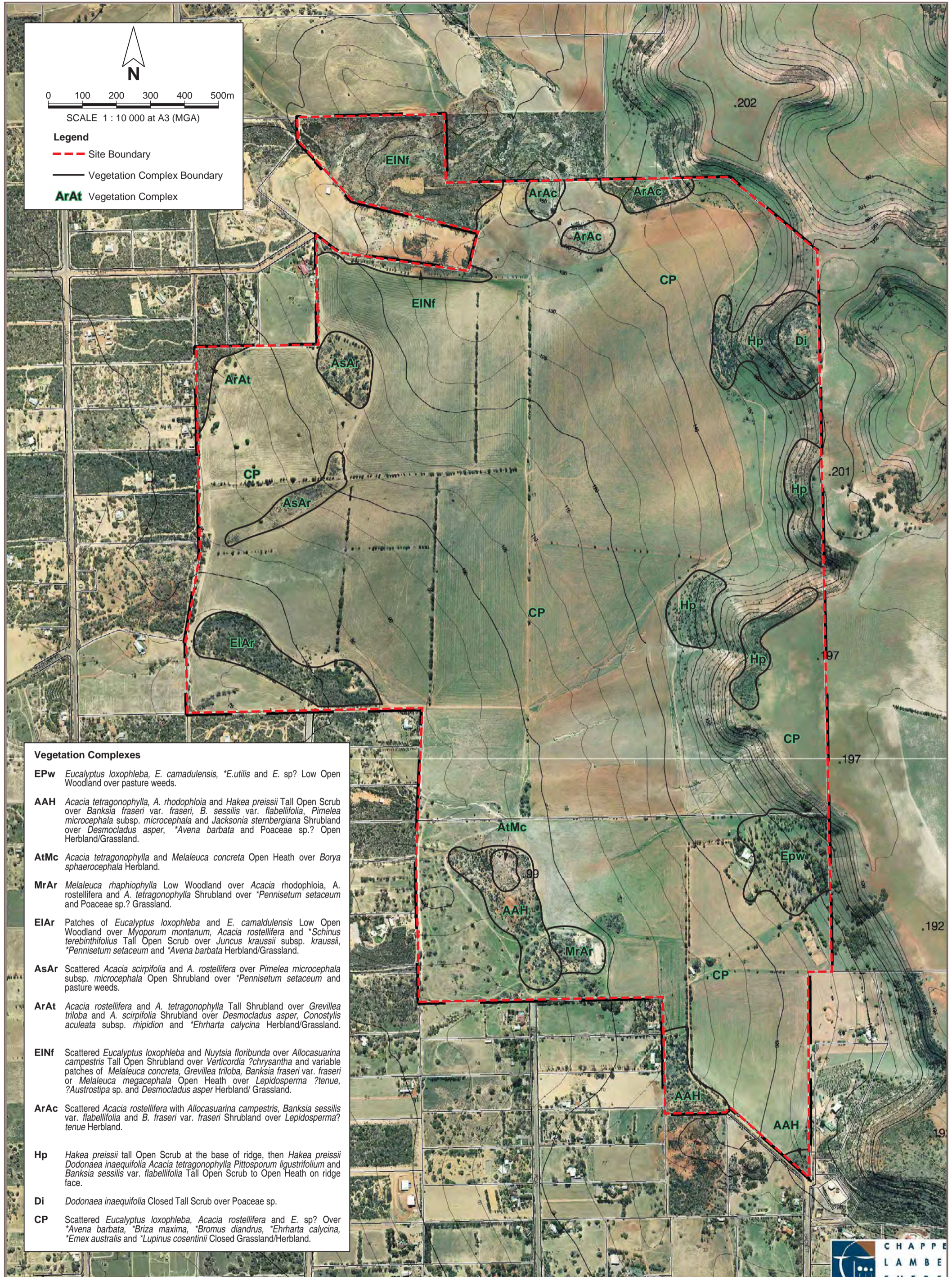
Legend

- - - Site Boundary
- Vegetation Complex Boundary
- 675 Vegetation Complex

VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



		Humfrey Land Developments LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS) GERALDTON	Figure 7
Drawn: L. Rogers	Date: 11 May 2011	REGIONAL VEGETATION COMPLEXES	
Job: HUMMOR01	Revision: A		



- Vegetation Complexes**
- EPw** *Eucalyptus loxophleba*, *E. camadulensis*, **E. utilis* and *E. sp?* Low Open Woodland over pasture weeds.
 - AAH** *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia stembergiana* Shrubland over *Desmodcladus asper*, **Avena barbata* and *Poaceae sp?* Open Herbland/Grassland.
 - AtMc** *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland.
 - MrAr** *Melaleuca rhapsiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostelifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and *Poaceae sp?* Grassland.
 - EIAr** Patches of *Eucalyptus loxophleba* and *E. camadulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostelifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland.
 - AsAr** Scattered *Acacia scirpifolia* and *A. rostelifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds.
 - ArAt** *Acacia rostelifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmodcladus asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
 - EINF** Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenua*, **Austrostipa sp.* and *Desmodcladus asper* Herbland/Grassland.
 - ArAc** Scattered *Acacia rostelifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland.
 - Hp** *Hakea preissii* tall Open Scrub at the base of ridge, then *Hakea preissii Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face.
 - Di** *Dodonaea inaequifolia* Closed Tall Scrub over *Poaceae sp.*
 - CP** Scattered *Eucalyptus loxophleba*, *Acacia rostelifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland.



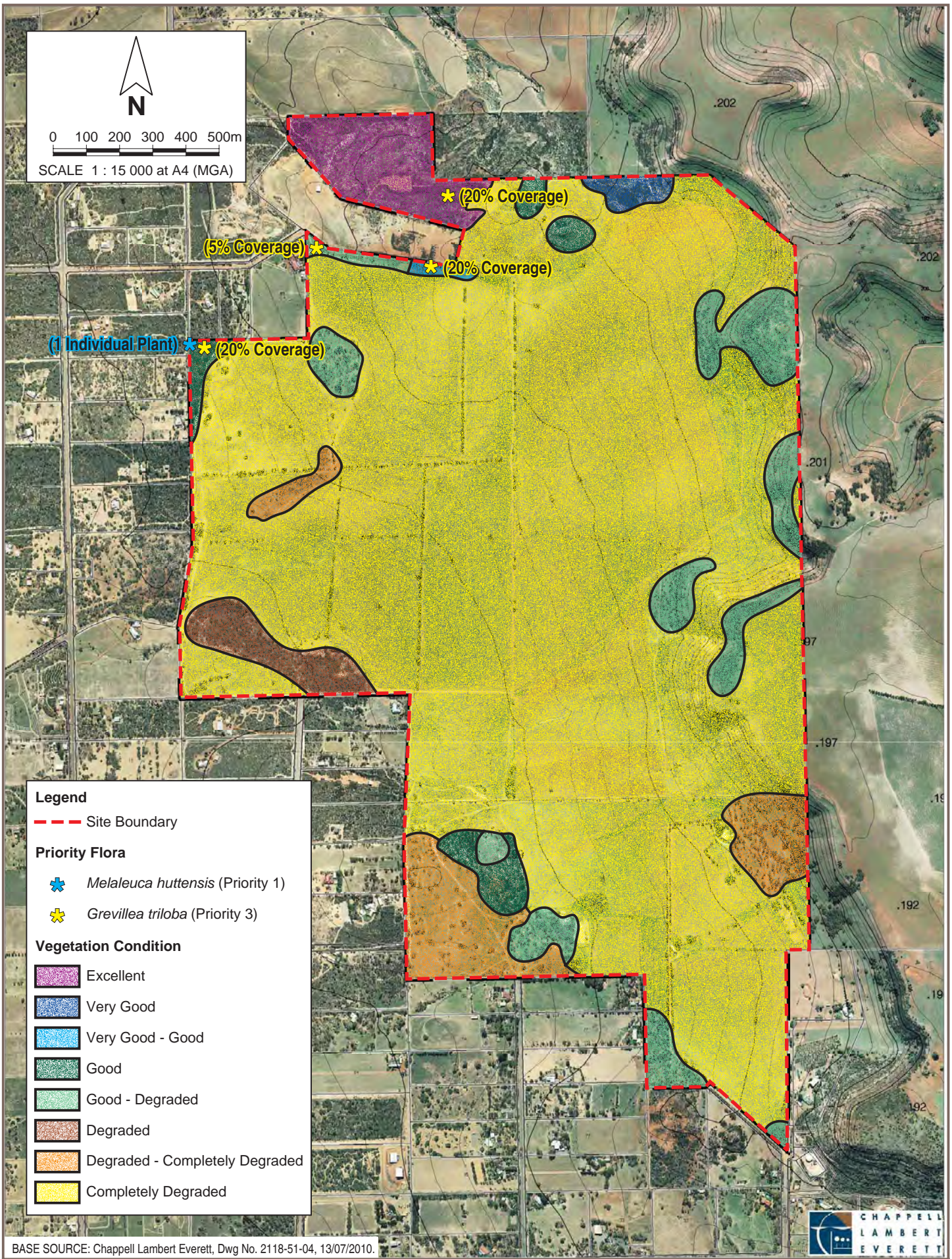
COTERRA ENVIRONMENT

Humfrey Land Developments
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
 GERALDTON

Drawn: L. Rogers Date: 11 May 2011
 Job: HUMMOR01 Revision: A

SITE ASSESSED VEGETATION COMPLEXES

Figure 8



HUMMOR01-f09.dgn
 PINPOINT CARTOGRAPHICS (08) 9562 7136



BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.

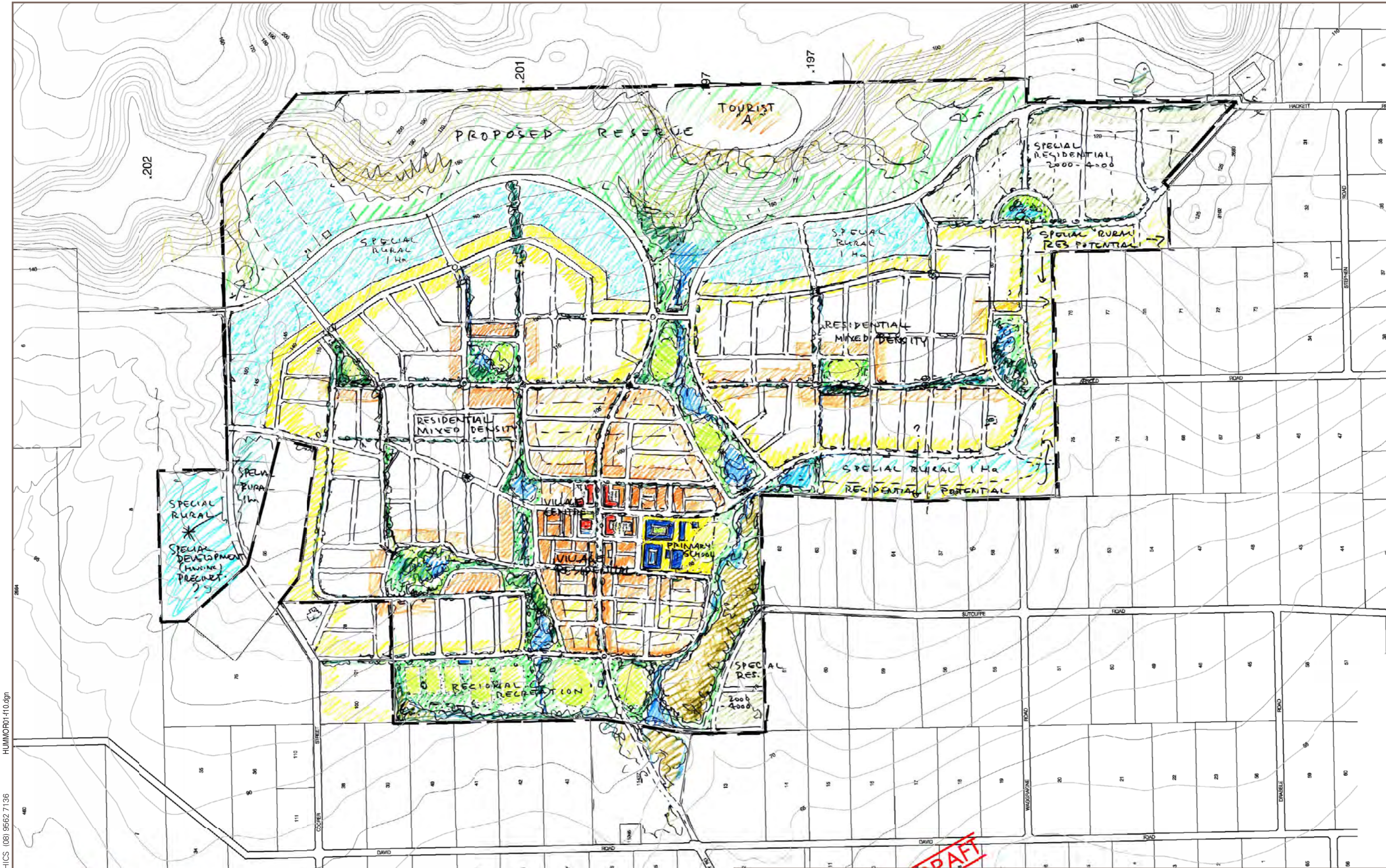
COTERRA
ENVIRONMENT

Humfrey Land Developments
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
 GERALDTON

Drawn: L. Rogers	Date: 11 May 2011
Job: HUMMOR01	Revision: A

VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA

Figure 9



CHAPPELL
LAMBERT
EVERETT

COTERRA
ENVIRONMENT

Humfrey Land Developments
LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS)
GERALDTON

Drawn: L. Rogers Date: 11 May 2011
Job: HUMMOR01 Revision: A

DRAFT DEVELOPMENT CONCEPT

PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-f10.dgn

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-68-01, 08/04/2011.

Figure 10

**APPENDIX A - Priority Flora Survey for Lots 80 & 81 Hackett Road (GHD,
2007)**

**Humfrey Land
Developments**

**Report for Lots 80 & 81 Hackett
Road, Waggrakine Priority Flora
Survey**

**Addendum to September 2006
Environmental Assessment**

February 2007

Contents

1.	Introduction	1
1.1	Background	1
1.2	Scope of Works	1
2.	Desktop Review	2
2.1	Vegetation Composition	2
2.2	Priority Flora In the Vicinity	2
2.3	Threatened Ecological Communities In the Vicinity	4
3.	Targeted Flora Survey	5
3.1	Methodology	5
3.2	Site Vegetation Condition	5
3.3	Site Flora	6
4.	Conclusions	8
5.	Limitations of this Report	9
5.1	Survey Limitations	9
5.2	Report Limitations	9
6.	References	10

Table Index

Table 1	Regional Assessment of Vegetation Extent	2
Table 2	Threatened and Priority Flora	3
Table 3	Government of Western Australia (2000) Vegetation Condition Scale	8
Table 4	Priority Species Located on Site	6

Figure Index

Figure 1	Location Map
Figure 2	Site Aerial and Proposed Lot Layouts
Figure 3	Priority Flora
Figure 4	Vegetation Condition

Appendices

- A DEC Priority Flora Search Results**
- B Site Photos**
- C Flora Species Recorded on Site**

1. Introduction

1.1 Background

Hunfrey Land Developments (HLD) are proposing to develop a rural residential subdivision on Lots 80 and 81 Hackett Road, Waggrakine (the Site). The Site comprises two separate parcels of land, totalling an area of approximately 380 hectares (refer to Figure 1).

HLD previously requested GHD Pty Ltd (GHD) to undertake an environmental appraisal of the site in relation to the proposed development. GHD issued a report to HLD in September 2006 entitled "Lots 80 and 81 Hackett Road: Environmental Assessment", with the following recommendation for further work:

The following additional issues will require further assessment prior to finalising a development concept, and managed where the assessment suggest management is required:

- ▶ *Effluent disposal;*
- ▶ *Rare flora;*
- ▶ *Acid sulfate soils – only if excavation near wetlands is required; and*
- ▶ *Unexploded Ordnance.*

1.2 Scope of Works

In response to the recommendations of the September 2006 Environmental Assessment, HLD requested GHD to undertake a Priority Flora survey on the Site.

The scope of works involved:

- ▶ A desktop review, in particular a search of the DEC Threatened (Declared Rare) Flora (TFD) and the *Western Australian Herbarium Specimen (WAHERB)*, as well as the *Declared Rare and Priority Flora (DR&PF)* list. This information is attached at *Appendix A*;
- ▶ Targeted Priority Flora Survey;
- ▶ Herbarium verification of actual and potential Priority Flora; and
- ▶ Reporting.

The September 2006 report provides some comments regarding the likelihood of priority flora existing on the Site, but this addendum provides a more full response. This addendum should now form part of the existing September 2006 Environmental Assessment Report.

2. Desktop Review

2.1 Vegetation Composition

The composition of remnant native vegetation in the project area was interpreted from mapping conducted by Beard (1976). According to this mapping, the project area was originally likely to contain two vegetation communities being: Shrublands; mixed thicket (*Melaleuca* and *Hakea*) and Shrublands on the higher ground; and *Acacia* and *Banksia* scrub on the western portion of the Site.

The relative importance of conserving remnant native vegetation in the project area at a regional scale was determined via the analysis of aerial photos by Shepherd (*pers comm*, 2006), the dataset has been archived as the 2005 vegetation extent. The results of the Vegetation Association assessment for the Geraldton Sandplains IBRA (Interim Biogeographic Regionalisation for Australia) area are summarised in Table 1.

Table 1 Regional Assessment of Vegetation Extent

Vegetation Association	Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining (2005)
675	Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51,854	10,989	21.2
359	Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub.	44,412	8,383	18.9

The Environmental Protection Authority (EPA), has established through Position Statement No. 2, (*Environmental Protection of Native Vegetation in Western Australia*), the "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level. This is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type (EPA, 2000).

In the case of those Vegetation System Associations detailed in Table 1 above, less than 30% of the original regional extent remained intact as at 2005. Clearing of such vegetation may be considered contradictory to the EPA's recommendations stated in Position Statement No. 2. However, much of the Site proposed to be developed has been historically cleared of native vegetation for agricultural purposes, also several areas of remnant bushland (also degraded by past agricultural activities) are proposed to be set aside in Public Open Space (POS), as identified in Figure 2.

2.2 Priority Flora in the Vicinity

A search was undertaken through the Department of Environment and Conservation (DEC) Threatened (Declared Rare) Flora Database (TFD) and the *Western Australian Herbarium Specimen* (WAHERB) database for species of rare and priority flora located within the vicinity of the Site. Species found have been listed and described in Table 2.

Table 2 Threatened and Priority Flora

Species	Conservation Category	Database	Description (FloraBase, 2006)
<i>Drummondia ericoides</i>	DRF	TFD	Divaricately branched shrub, 0.3–1 m high. Fl. yellow, white, violet, purple, Sep–Oct. Rocky places.
<i>Vorticordia penicillaris</i>	P4	TFD WAHERB	Low spreading shrub, 0.15–0.3 m high, to 1 m wide. Fl. cream, yellow, Sep–Oct. Shallow gritty soils. Granite outcrops.
<i>Eucalyptus bleasdelii</i>	DRF	TFD WAHERB	Mallee, 1–4 m high, bark smooth. Fl. white, cream, Aug–Nov. Grey sand, clay. Rocky hillsides, creek flats.
<i>Acacia guiretli</i>	P4	WAHERB	Spreading to straggling or erect & spindly shrub, 0.3–2(–2.5) m high. Fl. yellow, Jun–Sep. Rocky loam, lateritic gravelly soils. Stony hills.
<i>Thryptomene stenophylla</i>	P2	WAHERB	Spreading shrub, 0.3–1.2 m high. Fl. pink, purple, Jun–Aug. Red or yellow sand, loam. Limestone hills, sandplains.
<i>Grevillea triloba</i>	P3	WAHERB	Diffuse or spreading shrub, (0.4–)0.9–1.5(–2.5) m high. Fl. white, pink, Jun–Oct. Sandy loam on sandstone or limestone, lateritic soils.
<i>Vorticordia densiflora</i> var. <i>roseostella</i>	P3	WAHERB	Open shrub, 0.4–1.3 m high. Fl. pink, white, Sep–Dec. Sandy gravelly soils.
<i>Vittadinia cervicularis</i> var. <i>occidentalis</i>	P1	WAHERB	Annual, herb, more than 0.3 m high. Fl. white, purple, blue, Aug–Sep.
<i>Melaleuca huttensis</i>	P1	WAHERB	Upright shrub, to 3 m high, bark gnarled, white to grey. Fl. cream, yellow, Jun–Sep. Light yellow or beige sand. Lower slopes of undulating plains, sandplains.
<i>Eucalyptus diminuta</i>	P4	WAHERB	Mallee, 1.7–5 m high. Fl. white, cream, Jul–Nov. Sandy clay, white/grey sand, often over laterite. Sandplains, near swampy areas.
<i>Eucalyptus cupree</i>	DRF	WAHERB	Mallee, 2.5–5 m high, bark rough to 1.5 m, box-type. Fl. white, Aug–Nov. Shallow soils over granite.
<i>Thryptomene</i> sp. <i>Moresby Range</i>	P3	WAHERB	Spreading shrub, 0.3–1 m high. Fl. pink, Jul–Sep. Light brown loam, clay loam, sandy clay, sandstone. Hillsides & summits.

Conservation Category Key:

- DRF Declared Rare Flora, taxa which are deemed to be in the wild rare, in danger of extinction, or otherwise in need of special protection and have been declared under the Wildlife Conservation Act 1960 to be "rare flora".
- P1 Taxa known from only one, or a few populations which are under threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P2 Taxa known from only one, or a few populations, at least some of which are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.
- P3 Taxa which are known from several populations, and the taxa are not believed to be under immediate threat. May be considered for declaration as "rare flora", but are in urgent need of further study.

P4 Taxa which are considered to have been adequately surveyed and which, whilst being rare, are not currently threatened by any identifiable factors.

DEC also provided results from a search of their *Declared Rare and Priority Flora (DR&PF)* list. The species in this list are those known to exist in the general Geraldton region and surrounds, and not to this project Site specifically.

The results of these searches are attached at **Appendix A**.

The previous report considered the possibility of these species being found on Site was low due to the degraded nature of the land and continued disturbance through grazing activities, however, the DEC search did indicate that priority species were previously located on Site, refer to Figure 2.

2.3 Threatened Ecological Communities in the Vicinity

A search of the CALM Threatened Ecological Community (TEC) database was undertaken. No known occurrences of threatened ecological communities have been recorded within the Site boundaries.

CALM further advised that there are known occurrences of the priority ecological community referred to as "*Melaleuca megacephala* and *Hakea pycnonera* thickets on the Moresby Range" within 10 kilometres of the Site.

3. Targeted Flora Survey

3.1 Methodology

A site visit was conducted by GHD on 11th August 2006 as part of the original environmental assessment work. A further site visit was conducted on the 21st September 2006 to survey the area for priority flora known to exist in the vicinity, as per the CALM search results. A final inspection was undertaken on the 21st December 2006 to review the Priority Flora populations.

The site was inspected on foot and by vehicle for the CALM listed Priority Flora species. Other common native species were recorded, but a full flora survey of the Site was not undertaken. The survey particularly focused on bushland areas to the west of the Site in or adjacent to proposed development areas. No detailed survey was undertaken of the escarpment, plateau or bushland area to the north, as these locations are proposed to be set aside in Public Open Space (POS).

No quadrat or transect recordings were undertaken.

Any potential Priority Flora species that couldn't be readily identified, were collected and identified at the Perth Herbarium at later date.

3.2 Site Vegetation Condition

The vegetation at the Site was given a condition rating based on the Bush Forever (Government of Western Australia, 2000) vegetation condition ratings scale. This scale recognises a level of intactness of vegetation, which is defined by the following:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping;
- The potential for natural or assisted regeneration.

The ratings in this scale are described in Table 3.

The majority of the Site supported Completely Degraded (Condition 6) agricultural grazing land, as shown in the aerial photograph in Figure 2 and photographs in Appendix B. Some individual, or copses of, remnant trees remain in these areas.

One area of Excellent (Condition 2) and several areas of Very Good (Condition 3) vegetation do exist to the north of Lot 81, in general these areas are proposed to be set aside in POS. Other areas of remnant bushland that are to be set aside in POS are considered to vary from Very Good to Degraded (Condition 3 to 5).

One isolated portion of bush on the western boundary (containing all of the Priority Flora) is also considered to be in Very Good to Good (Condition 3 to 4) condition, this area has been shown as being located within a proposed development lot.

The wetland area on Lot 80 had been recently burnt and so it was not possible to assess the condition of this section, it is assumed that this area was similar to the surrounding unburnt areas.

Vegetation conditions have been presented in Figure 4.



Table 3 Government of Western Australia (2000) Vegetation Condition Scale

Assigned Number	Classification	Description
1	<i>Pristine or nearly so</i>	No obvious signs of disturbance
2	<i>Excellent</i>	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species
3	<i>Very Good</i>	Vegetation structure altered, obvious signs of disturbance
4	<i>Good</i>	Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it
5	<i>Degraded</i>	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6	<i>Completely degraded</i>	The structure of the vegetation is no longer intact and the area is completely or almost without native species

3.3 Site Flora

3.3.1 General

Although a full flora survey was not conducted as part of this assessment a list of common weed and native species on site have been tabulated in Appendix C.

3.3.2 Priority Species

The site was inspected for the Priority Flora species identified by the DEC searches.

No Declared Rare Flora (DRF) was recorded on site.

Three Priority Flora species were identified, being; *Gleznovia verrucosa* ssp *formosa*, *Grevillea triloba* and *Metaleuca huttensis*. Refer to Table 4 for details.

Table 4 Priority Species Located on Site

Species	Conservation Code (see details at Table 2)	Number of plants seen
<i>Gleznovia verrucosa</i> ssp <i>formosa</i>	P3	1
<i>Grevillea triloba</i>	P3	> 100
<i>Metaleuca huttensis</i>	P1	1

The general location of these species has been shown in Figure 3.

Note, the *Gelasznowia verrucosa* ssp *formosa* was not located again in the December 2006 review, therefore no GPS position was recorded, however, the one plant located during the September 2006 survey was known to have occurred in the small area of bush in which the *Melaleuca huttersis* was located (with the general location indicated on Figure 3).

3.3.3 Threatened Ecological Communities

The DEC referred to the possibility of a "*Melaleuca megacephala* and *Hakea pycnantha* thickets on the Moresby Range" within 10 kilometres of the Site. Neither this TEC, nor these flora species, were identified on site.

3.3.4 Weed Species

The site was largely covered with pastoral weed species. Common weed species are included in the plant species list at Appendix C, identified by an asterix (*) notation.

One species, Paterson's Curse, identified on site is declared under the *Agriculture and Related Resources Protection Act (1976)*. Within the Shire of Greenough this is classified as a P1 declared plant species, which prohibits movement of plants or their seeds within the State and prohibits the movement of contaminated machinery and produce including livestock and fodder.

4. Conclusions

The Site largely supports completely cleared and degraded agricultural land, however, there are small isolated pockets of vegetation in Good to Very Good condition.

The survey undertaken found no Declared Rare Flora (DRF) on site, however, three species of Priority Flora were identified.

DRF is protected under the *Wildlife Conservation Act 1950* and any disturbance to these species requires permission to 'take'. To 'take' under the Act includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora. Additionally, the DEC keeps a list of Priority Flora species, that are not listed under legislation but for which the DEC feels there is cause for concern, or for which not enough information is known. The DEC would expect to be consulted with regards to potential loss of Priority Flora species.

Any clearing on site would require a clearing permit approval under the *Environmental Protection Act 1986*, unless the activity qualifies for an exemption under the Act or the *Environmental Protection (Clearing of Native Vegetation Regulations) 2004*. For example, exemptions are available for some approvals received under the *Town Planning & Development Act 1928*.

5. Limitations of this Report

5.1 Survey Limitations

This report presents the results of a desktop review and a single targeted Priority Flora site inspection carried out on the 21st September 2006.

This survey was carried out during only one season, and in one year. Complete surveys require multiple surveys, at different times of the year, and over a period of a number of years, to enable full survey of all species present.

Some flora species, such as annuals, are only available for collection at certain times of the year, and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to above factors. Therefore, while this flora survey was conducted at a time of year when the majority of the flora species would be able to be identified, there is the possibility that some species of Priority Flora on site have been overlooked.

The report provided does not meet the requirements of the Environmental Protection Authority (2004) *Guidance No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. However, due to the disturbed nature of the area, the opportunistic survey undertaken should be adequate for impact assessment purposes.

5.2 Report Limitations

This report presents the results of a targeted flora investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project described herein and must be reviewed by a competent scientist before being used for any other purpose. GHD Pty Ltd accepts no responsibility for other use of the data.

Where reports, searches, any third party information and similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

For these investigations GHD has conducted desktop data searches and field surveys. The conclusions of this report were based on the information gathered during these investigations and thus reflect the environment of the Site at the time of survey. GHD accepts no responsibility for any variation in the flora present at the Site due to natural and seasonal variability.

6. References

Agriculture and Related Resources Protection Act (1976).

Beard, J.S. (1976) *Vegetation Survey of Western Australia: The Vegetation of the Geraldton Area, Western Australia*. Vegmap Publications, Perth.

Environmental Protection Authority (2000) *Environmental Protection of Native Vegetation in Western Australia. clearing of native vegetation, with particular reference to the agricultural area*. Position Statement No. 2. Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Act 1966

Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

GHD Pty Ltd (2006) *80 & 81 Hackett Road, Waggrakine: Environmental Assessment*.

Government of Western Australia (2002) *Bush Forever Volume 2 – Directory of Bush Forever Sites*. Western Australian Planning Commission, Western Australia.

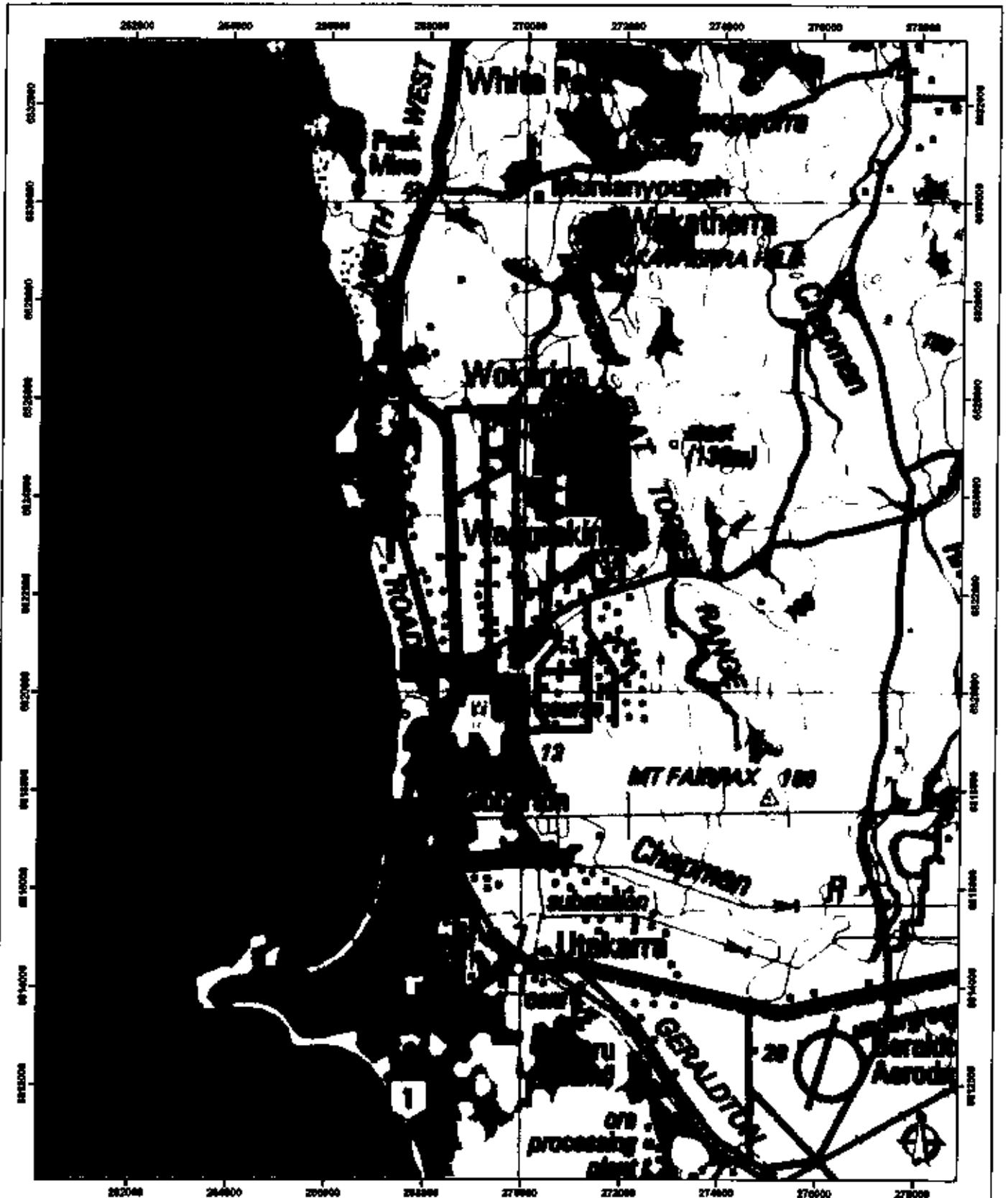
Shepherd, D.P, Beeston, G.R and Hopkins, A.J.M (2002) *Native Vegetation in Western Australia: Extent, Type and Status*. Natural Resource Management Technical Report No. 249: Department of Agriculture.

Shepherd, D.P. (2006) *Personal Communication*. Information updated from above reference, but not as yet developed into a final report.

Town Planning & Development Act 1928

Wildlife Conservation Act (1950).

Figures



LEGEND

 Lot 60 & 61 Hackett Rd Site Boundary

SCALE
 750 0 750 1,500 2,250m
 1:75,000 at A3

LOCALITY MAP



1:40,000 at A3
 WOODWARD W.A.

COPYRIGHT

THE INFORMATION ON THIS MAP IS THE PROPERTY OF GILLY & PARTNERS
 AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS
 WITHOUT THE WRITTEN PERMISSION OF GILLY & PARTNERS

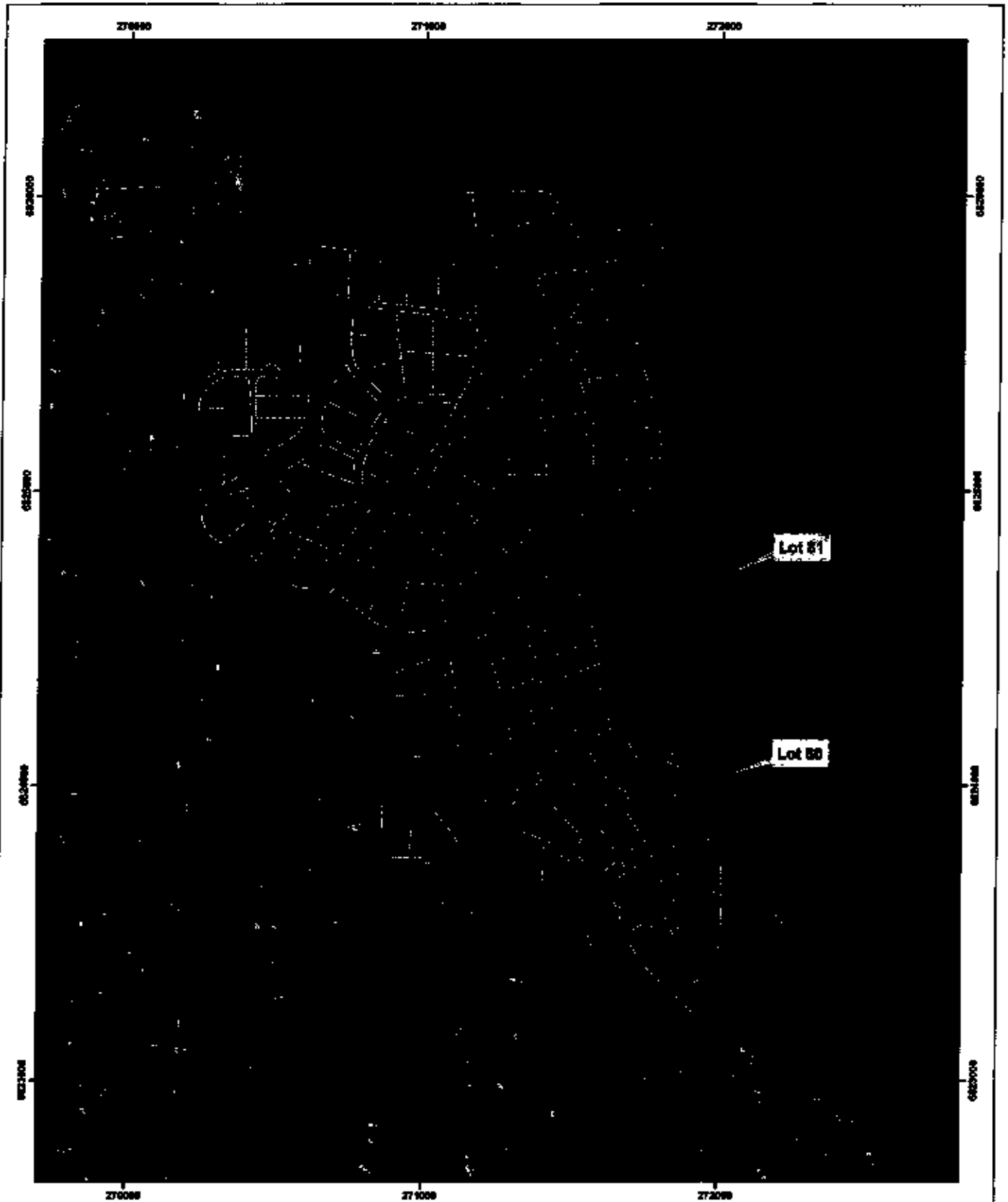
CREATED BY ML	CHECKED	APP'D BY
HORIZONTAL DATUM: GDA 94		PROJECTION: MGA ZONE 50
VERTICAL DATUM: NA		METADATA: ISO19115-2
DATE 04.08.2009	FILE LOCATION I:\GIS\Projects\116225-09.mxd	
REVISION 0	CREATED BY ML	






Environmental Assessment
 Hackett Road, Wooroloo

Figure 1 - Site Locality

MAP UNITS PROMOTED IN MGA ZONE 50
 NOTE THAT POSITIONAL ERRORS CAN BE ± 5M IN SOME AREAS
 THIS BOUNDARY SHOULD BE CHECKED ON THE GROUND



LEGEND

-  Existing Cadastre
-  Proposed Subdivision Cadastre
-  Lot 60 & 61 Site Boundary

SCALE
 0 125 250 375m
 1:12,800 at A3



COPYRIGHT

UNRECORDED: THIS DRAWING IS THE PROPERTY OF GHD Pty Ltd. THE INFORMATION ONLY IS FOR YOUR INFORMATION. IT IS NOT TO BE USED FOR ANY OTHER PURPOSES WITHOUT THE WRITTEN PERMISSION OF GHD Pty Ltd.

CREATED BY WD	CHECKED	APPROVED
------------------	---------	----------

COORDINATE DATUM: GDA 94
 PROJECTION: MGA ZONE 50
 HEIGHT DATUM: MSL
 METADATA RECORDED: 1998

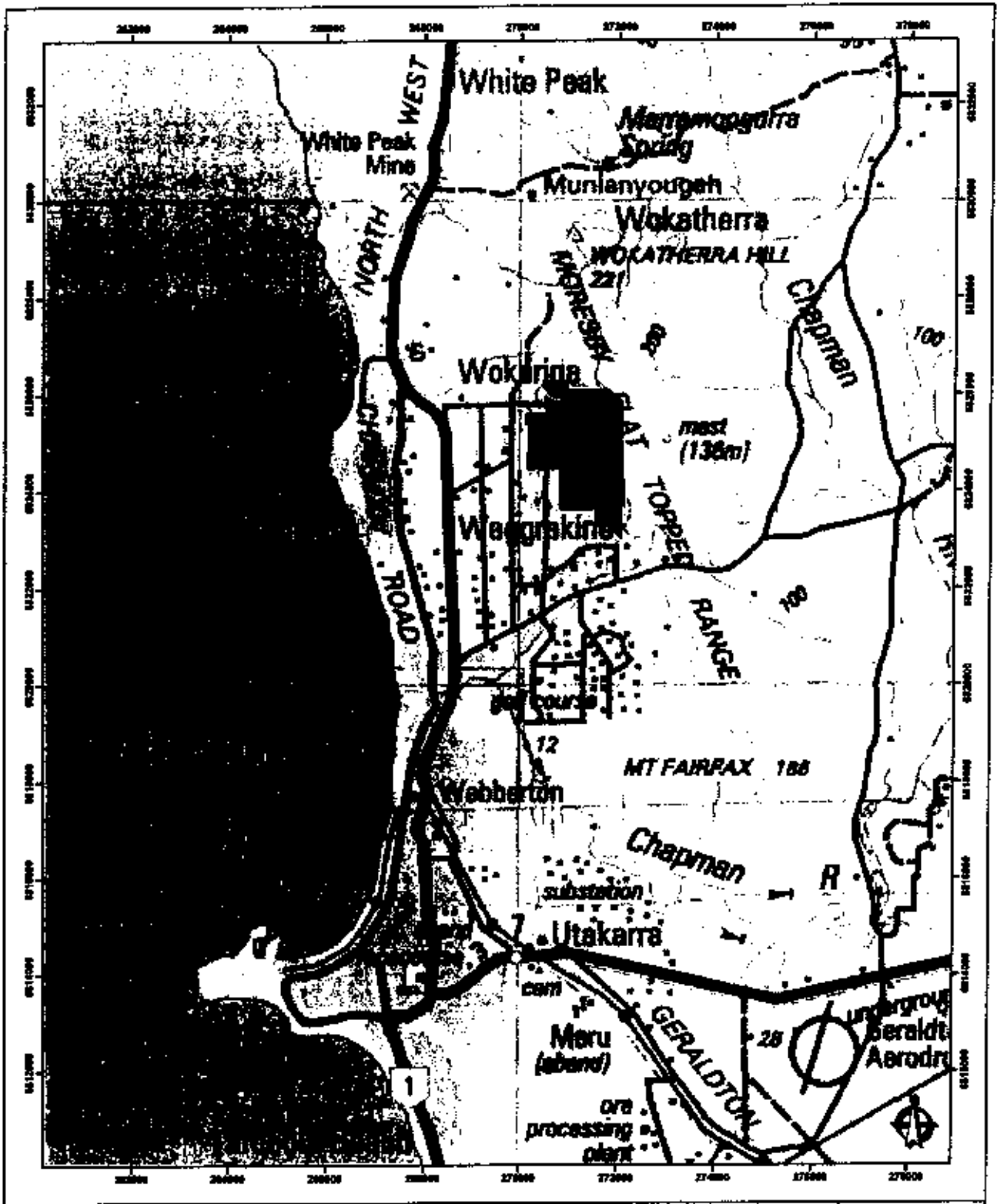
DATE 12.02.07	FILE LOCATION G:\PROJECTS\Roads\112226-02_Rev1.dwg
REVISION 1	DRAWING NO 04112226-02




Environmental Assessment
 Heekod Road, Wagga Wagga

Figure 2 - Proposed Development

NOTE THAT POSITIONAL ERRORS CAN BE ± 0.4 M IN SOME AREAS
 AIRPHOTO PHOTOGRAPHY ACQUIRED FROM DJL - 2005 ORIGINATOR: NOT REPRODUCED BY PERMISSION
 OF THE DEPT. OF LAND INFORMATION SYSTEMS, WESTERN AUSTRALIA, COPYRIGHT LICENSE 2006/04



LEGEND

 Lot 80 & 81 Hackett Rd
Site Boundary

MAP DATA PROVIDED BY BMA LTD/NO 20
NOTE THAT PORTIONALS SHOWN CAN BE ± 5M IN SOME AREAS
2004 BMA/NO 20 SOURCES GEOGRAPHIC AUSTRALIA



COPYRIGHT
MARGARET RANGELANDS DEVELOPMENT AUTHORITY
THE INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
AND IS RELEASED UNDER THE COMMONWEALTH
GOVERNMENT INFORMATION ACT 1989

DESIGNED BY	DATE	APPROVED
ML		

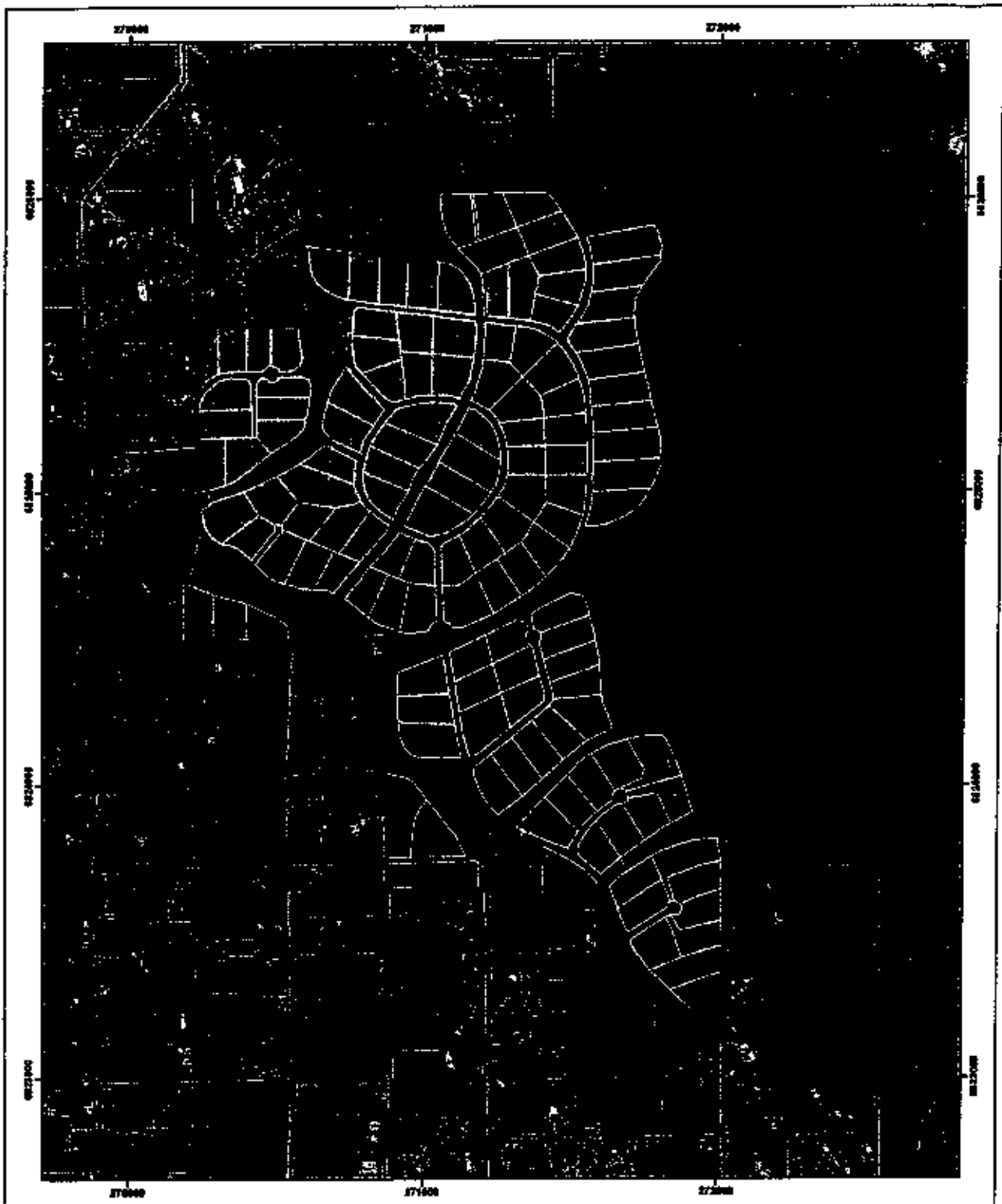
PROJECT/LOCATION/SCALE: GDA 94	PROJECTION: MGA 50M UTM
MAPSHEET: M20/100000	REVISIONS: 0000000000

DATE: 04/10/2005	FILE LOCATION: \\MS01\0000\proj\0000000000\0000000000
REVISION: 0	ISSUING NO: 01/0000-00






Environmental Assessment
Hackett Road, Waggakine

Figure 1 - Site Locality



LEGEND

-  Existing Cadastral
-  Proposed Subdivision Cadastral
-  Lot 80 & 51 Site Boundary



COPYRIGHT

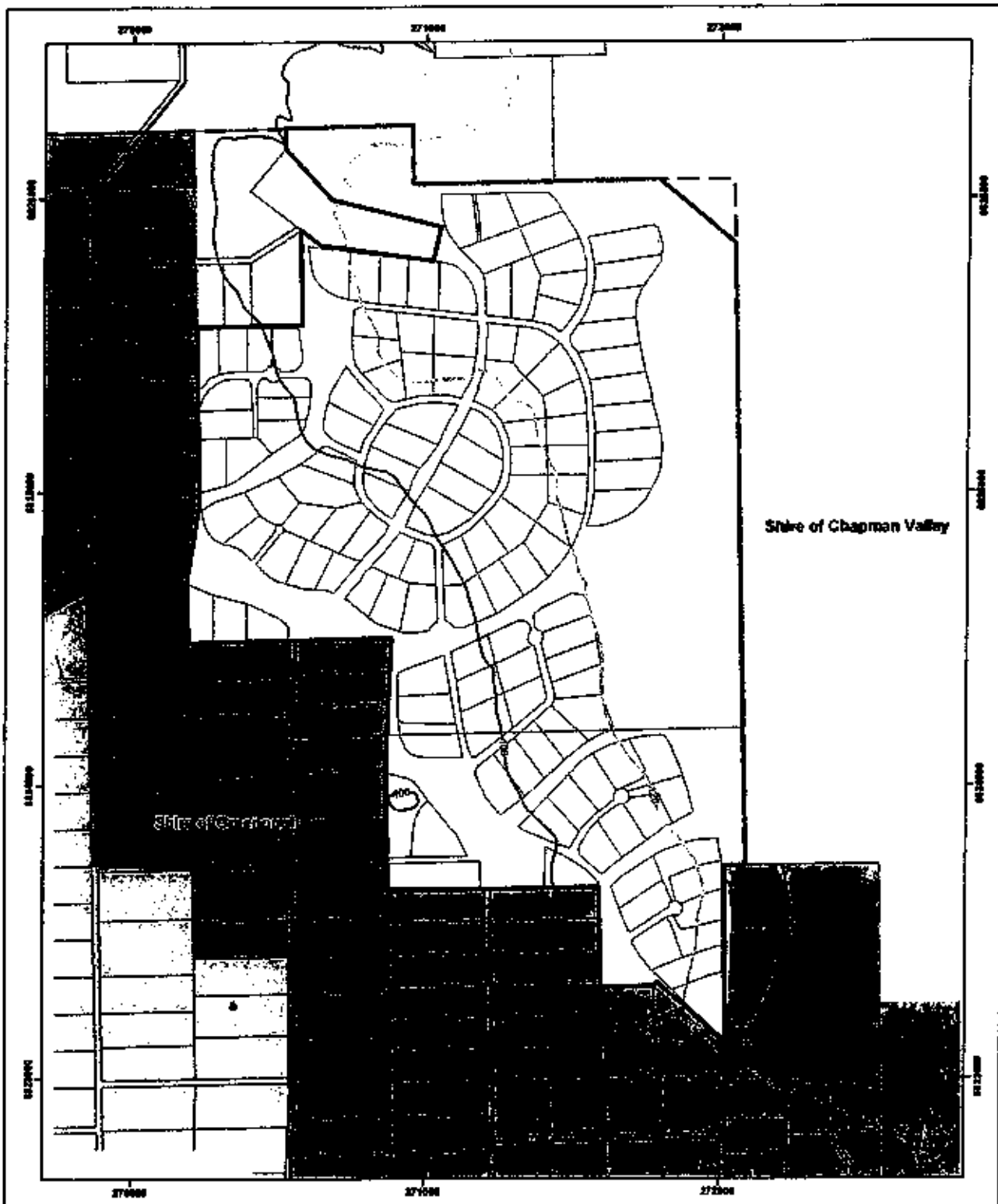
Information is provided under the provisions of the Access to Information Act / RÈGLEMENT SUR L'ACCÈS À L'INFORMATION. This information is provided under the provisions of the Access to Information Act / RÈGLEMENT SUR L'ACCÈS À L'INFORMATION.

DESIGNED BY ML	DESIGNED ML	APPROVED ML
REVISIONS DATE: 04.06.2008 REVISION: 2		PROPOSED BY: MGA ZONE 03 PROJETS: 03000000000000000000
PROJECT NAME: HUCKLETT ROAD WAGGAKINE		PROJECT NO: 03000000000000000000

Environmental Assessment
Hucklett Road, Wagga Wagga

Figure 2 - Proposed Development

NOTE THAT COORDINATE SYSTEMS CAN BE - BE IN WORDS A/ENG
A/ENG, PROPORTIONALLY SCALED FROM ELLI - 2011 DEVELOPMENT/REGISTRATION/PROVISION BY PERMISSION
OF THE DEPT. OF LAND INFORMATION/INFORMATION - AUSTRALIA, COPYRIGHT LEGALISE 2008/11



LEGEND

- Existing Cadastral
- Proposed Subdivision Cadastral
- 100m Contour
- 120m Contour
- ▭ Lot 80 & 81 Sta Boundary
- ▭ Local Government Boundary

Northern Camaldon District Structure Plan Area

- ▭ R17
- ▭ R10 B
- ▭ R10 A

NOTE THAT PORTION OF THESE COORDINATES MAY BE SHOWN WITH A DIFFERENT POSITIONING SYSTEM FROM THE MAIN COORDINATE SYSTEM REPRODUCED BY PERMISSION OF THE DEPT. OF LAND INFORMATION/ANZL/ANZL/ANZL/AUSTRALIA. COORDINATE SYSTEM: 2011

SCALE
0 125 250 375m

1:12,500 at A3

LOCALITY MAP



MID-WEST WA

COPYRIGHT

THIS DOCUMENT IS THE PROPERTY OF THE DEPARTMENT OF LAND INFORMATION/ANZL/ANZL/AUSTRALIA. IT IS TO BE USED FOR THE PURPOSES INDICATED AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE EXPRESS WRITTEN PERMISSION OF THE DEPARTMENT OF LAND INFORMATION/ANZL/ANZL/AUSTRALIA.

DRAWN BY: ML CHECKED: APPROVED:

REVISIONS: NONE

PROJECT NO: 100-2016-02

PROJECT NAME: MID-WEST WA

PROJECT LOCATION: MID-WEST WA

PROJECT DATE: 01/10/2016

PROJECT NO: 100-2016-02

PROJECT NAME: MID-WEST WA

PROJECT LOCATION: MID-WEST WA

PROJECT DATE: 01/10/2016

PROJECT NO: 100-2016-02

PROJECT NAME: MID-WEST WA

PROJECT LOCATION: MID-WEST WA

PROJECT DATE: 01/10/2016

PROJECT NO: 100-2016-02

PROJECT NAME: MID-WEST WA

PROJECT LOCATION: MID-WEST WA

PROJECT DATE: 01/10/2016

PROJECT NO: 100-2016-02

PROJECT NAME: MID-WEST WA

PROJECT LOCATION: MID-WEST WA

PROJECT DATE: 01/10/2016

PROJECT NO: 100-2016-02

PROJECT NAME: MID-WEST WA

PROJECT LOCATION: MID-WEST WA

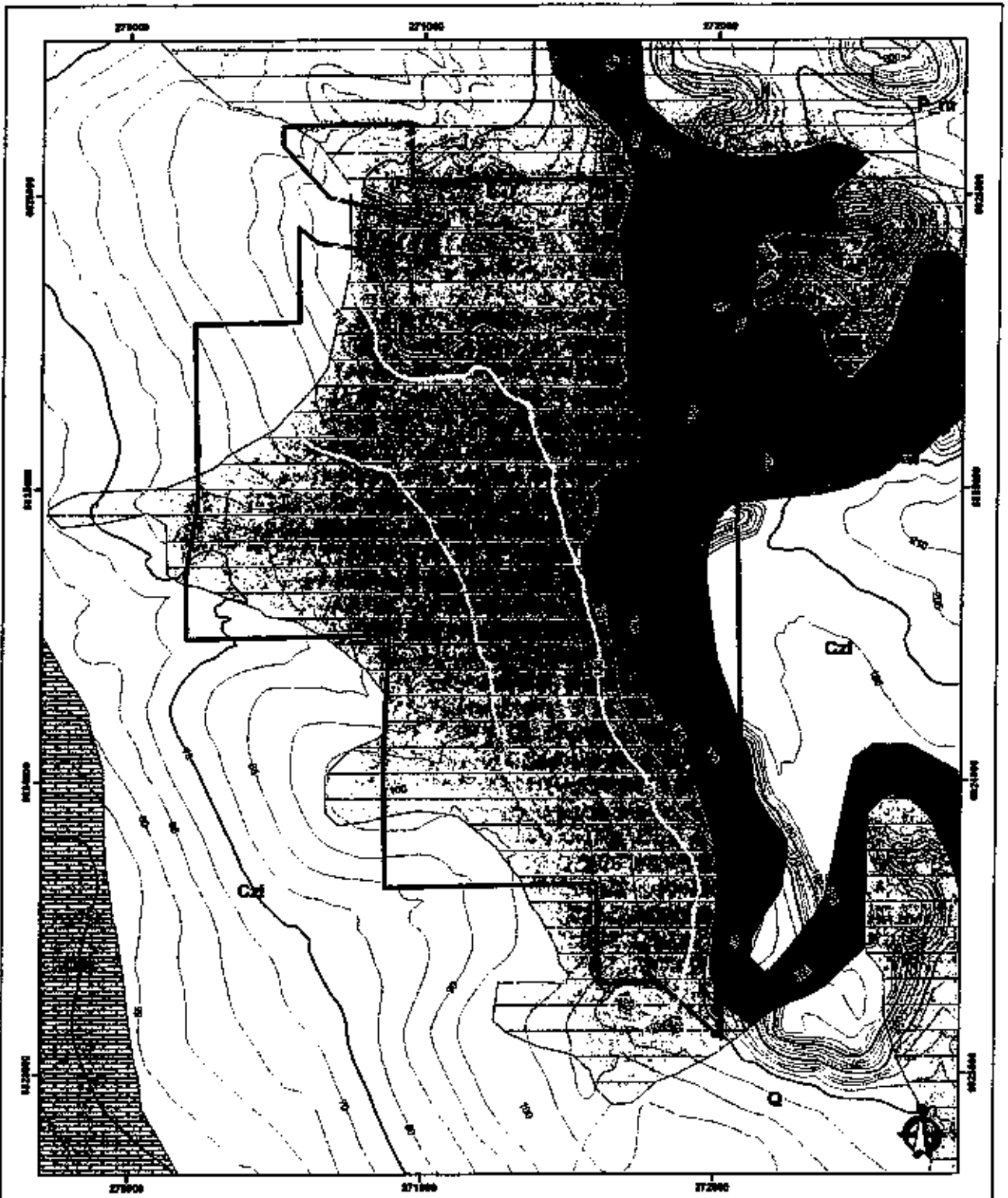
PROJECT DATE: 01/10/2016

PROJECT NO: 100-2016-02

Environmental Assessment

Mid-West WA

Figure 3 - Planning Scheme and Constraints



LEGEND

Lot 80 & 81 Site Boundary
 5m Contour Intervals
 25m Index Contours
 100m Contour
 120m Contour

GEOLOGY

Alunatum, calciferous sand micaceous silts
 Coastal Limestone
 Lenticle with overlying quartz sand
 Yampahoe Formation: Vailed sandstone
 Champion Bay Group: Kojarama Sandstone
 Choptank Group: Morysotooka Sandstone
 Granulite - Includes cordierite gneiss

MAP UNITS PROJECTED IN NAD 83 ZONE 87
 NOTE THAT PORTIONING ERRORS CAN BE > 8M IN SOME AREAS

SCALE

125 0 125 250 375m

1:12,500 @ A3

LOCALITY MAP

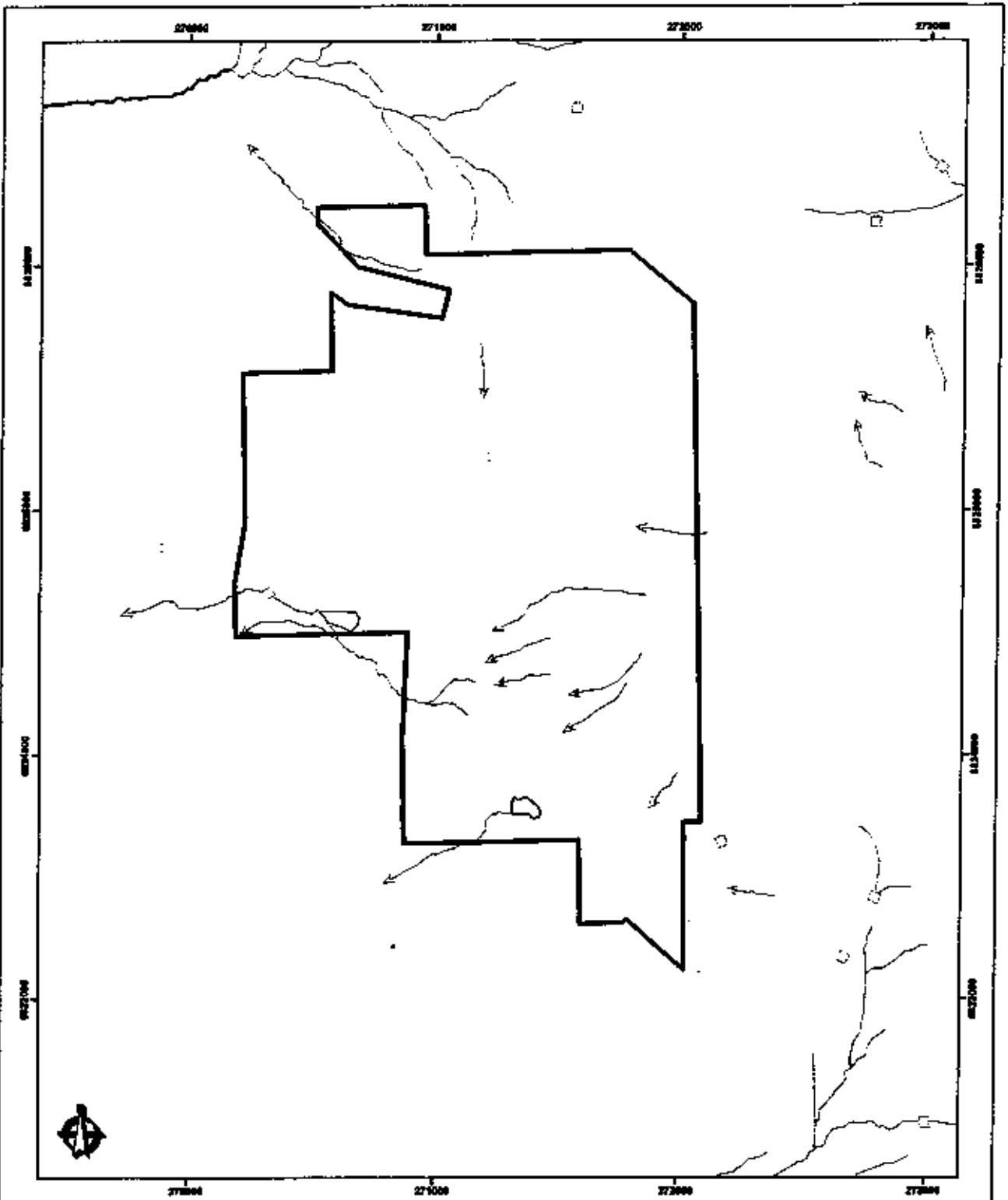
ARD-WEST W/A

COPYRIGHT

THE INFORMATION SHOWN ON THIS MAP IS THE PROPERTY OF ARD WEST W/A
 AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS
 WITHOUT THE WRITTEN PERMISSION OF ARD WEST W/A

CREATED BY	CHRYSTO	APPROVED
BY		
HORIZONTAL DATUM: GDA 84		VERTICAL DATUM: MALDEN 1985
HEIGHT REFERENCE: MA		REVISIONS: RECORDED IN RECORDS 1985
DATE	FILE LOCATION	
14/03/2008	K:\0811000\geology\808110000-04_gm_topo.mxd	
PROJECT	PROJECT NO	
0	80811000	
	BY	
	14/03/08	

Environmental Assessment
 Hackett Road, Weybridge
 Figure 4 - Geology and Topography



LEGEND

Lot 80 & 81 Site Boundary

Lower Hydrography (DEC 2005)

- Watercourse - major, non-perennial
- Watercourse - minor, non-perennial
- Swamp - non-perennial
- Area Subject to inundation
- Earth Dam

- Flow Direction Arrow
- Tank
- Well
- Well With Windmill

MAP DATA PROVIDED BY MRN 2006-02. NOTE THAT POSITIONAL ACCURACY CAN BE +/- 5m IN SOME AREAS

SCALE

 1:75 250 M:AS

LOCALITY MAP



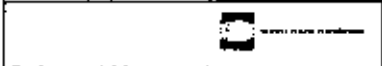
COPYRIGHT

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF THE GOVERNMENT OF WESTERN AUSTRALIA AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE GOVERNMENT OF WESTERN AUSTRALIA.

DATE 14	DRAWN ML	APPROVED ML
------------	-------------	----------------

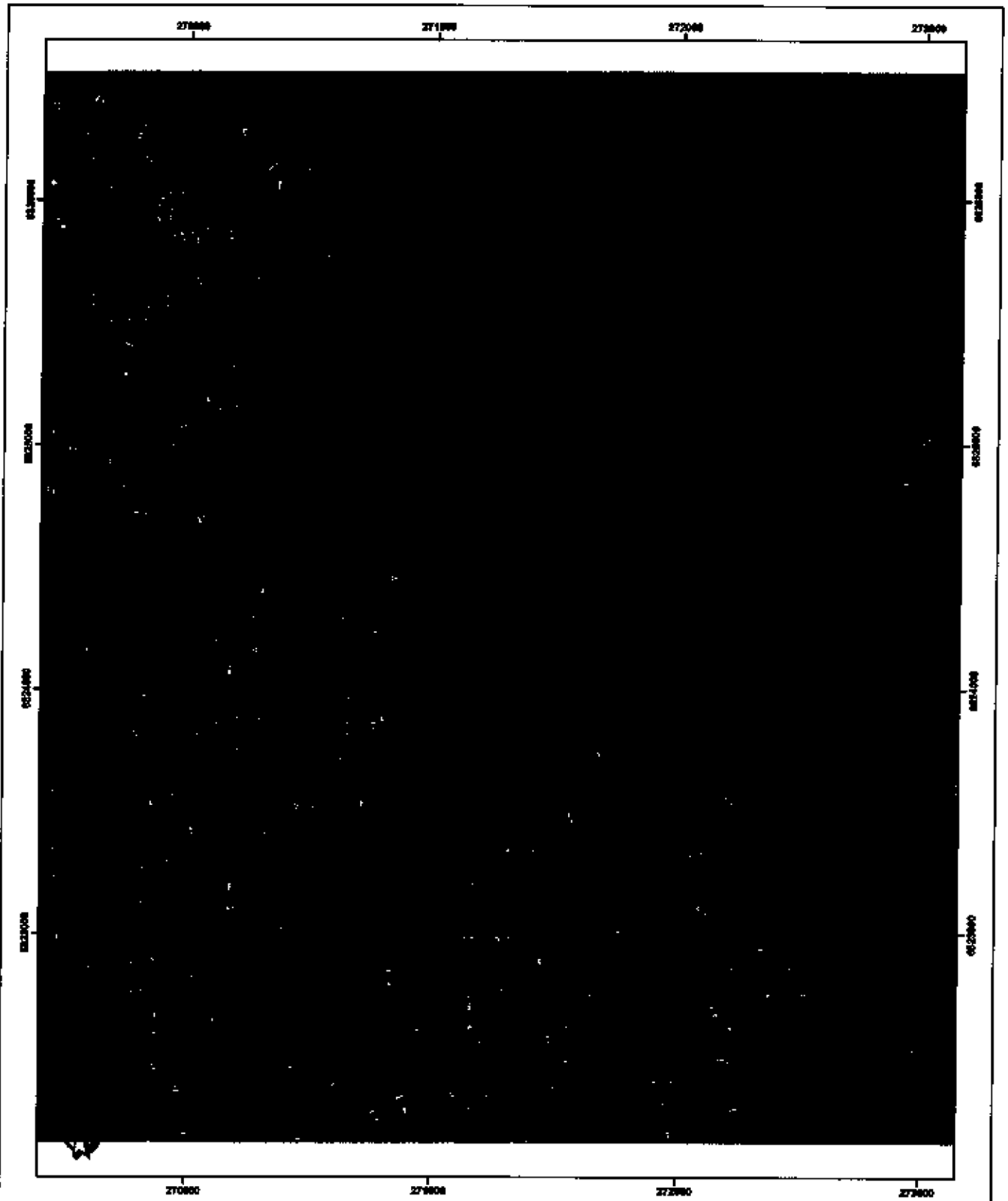
HORIZONTAL DATUM: GDA 94
 HORIZONTAL DATUM: GDA 94
 PROJECTION: MGA ZONE 50
 RESOLUTION: 1:75 250 M:AS

DATE 04.06.2006	FILE LOCATION C:\Program Files\MapInfo\MapInfo 11.00\GIS\Hydro\Map
REVISION 0	DESCRIPTION 14.06.2006



Environmental Assessment
 Hockatt Road, Waggralain

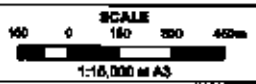
Figure 6 - Hydrography



LEGEND

- Lot 80 & 81 Site Boundary
- Declared Rare and Priority Flora**
- (R) Declared Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa

- Priority Species**
- Gravillea adspira*
 - Melicope holosericea*
 - Colobrodia verticillata* ssp. *formosa*



CREATED BY MT	CHECKED	APPROVED
------------------	---------	----------

HORIZONTAL DATUM: SDA 84
HEIGHT DATUM: NA
PROJECTION: UTM ZONE 50
DATUM RECORDING YEAR

DATE 20/1/07	FILE LOCATION G:\1\1023\glaciated\1023-01.jpg Revised
REVISION 0	DRAWING NO 011023-01

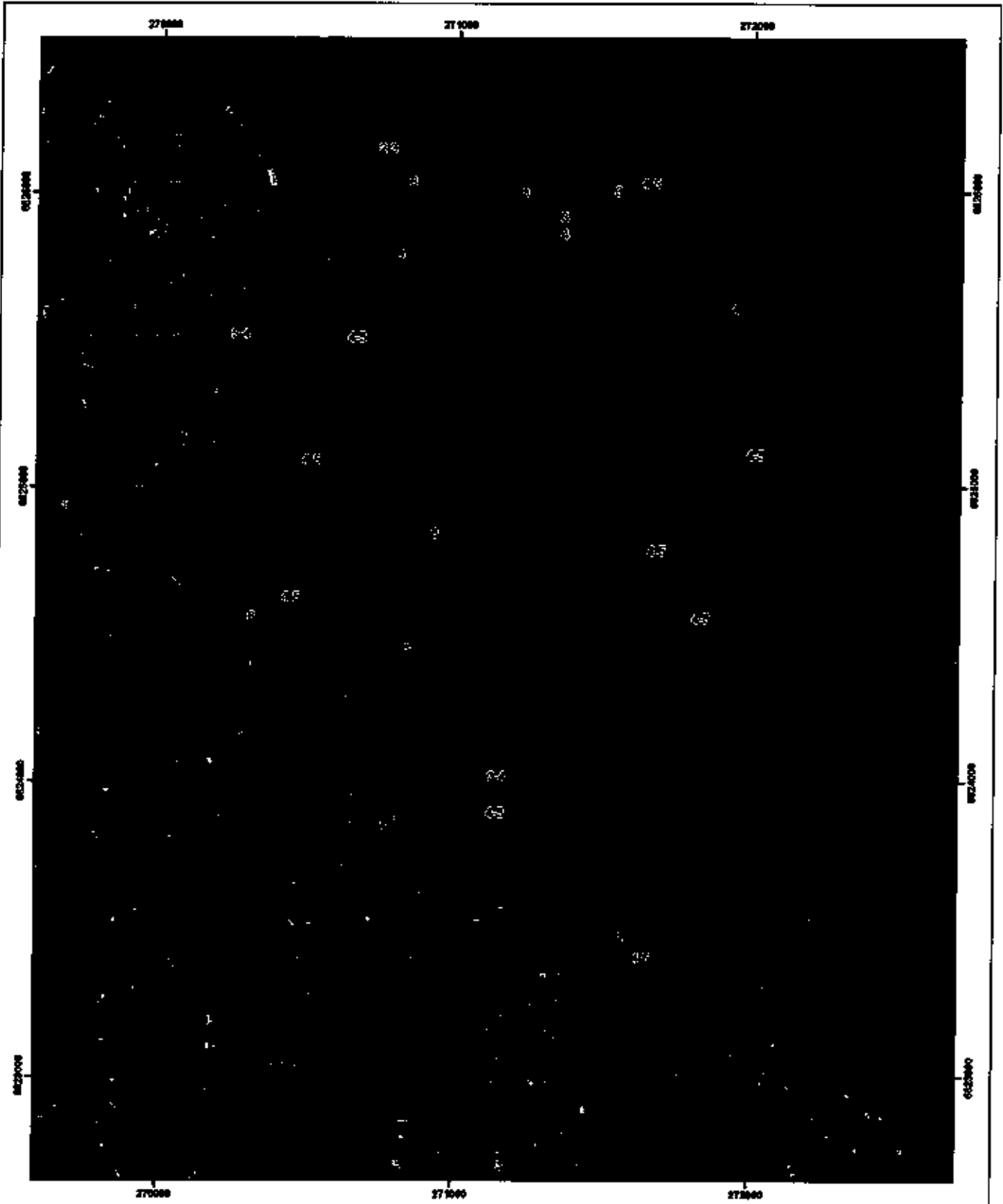


Environmental Assessment
Hackett Road, Waggrakine



Figure 3 - Priority Flora

MAP UNITS PROJECTED IN MGA ZONE 80 NOTE THAT POSITIONAL ERRORS CAN BE + 5M IN SOME AREAS

COPYRIGHT
THIS DOCUMENT IS UNCLASSIFIED AND IS THE PROPERTY OF THE STATE OF WESTERN AUSTRALIA. IT IS LOANED TO YOU BY THE DEPARTMENT OF THE ENVIRONMENT AND HERITAGE. IT IS TO BE KEPT IN CONFIDENCE AND NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE GOVERNMENT OF WESTERN AUSTRALIA.



LEGEND

-  Lot 80 & 81 Site Boundary
-  Burnt Area

- Vegetation Condition**
1. Pristine or nearly so
 2. Excellent
 3. Very Good
 4. Good
 5. Degraded
 6. Completely degraded

SCALE
125 0 125 250 375 m

1:12,500 at A3

LOCALITY MAP



COPYRIGHT

THIS DOCUMENT IS THE PROPERTY OF THE COMMONWEALTH OF AUSTRALIA AND IS LOANED TO YOUR OFFICE. IT IS TO BE RETURNED TO THE COMMONWEALTH OF AUSTRALIA. ANY REPRODUCTION OF THIS DOCUMENT IS PROHIBITED WITHOUT THE WRITTEN PERMISSION OF THE COMMONWEALTH OF AUSTRALIA.

DEVELOPED BY MID	DESIGNED MID	APPROVED MID
---------------------	-----------------	-----------------

HORIZONTAL DATUM: GDA 84
VERTICAL DATUM: MSL
PROJECTION: UTM ZONE 52
METADATA RECORDS: None

DATE 18.02.2007	FILE LOCATION D:\GIS\Projects\2007\2007-02-18_VegCond
VERSION 1	ISSUANCE NO. 000000-00



Figure 4 - Vegetation Condition

MAP UNITS PROJECTED IN MGA ZONE 52. NOTE THAT POSITIONAL ERRORS CAN BE > 1M IN SOME AREAS.

Appendix A

DEC Priority Flora Search Results



Department of Environment and Conservation

Your reference:
Our reference: 2006-003551
Enquiries: Ben Lullfitz

Phone: 9334 0123
Fax: 9334 0278
Email: Ben.Lullfitz@dec.wa.gov.au

GHD Pty Ltd
76 Forrest Street
GERALDTON WA 6530

Attention: Cathie Miller

Dear Ms Miller

REQUEST FOR RARE FLORA INFORMATION

I refer to your request of 3 August 2006 for information on rare flora in the Geraldton and Morawa areas. The search co-ordinates used were (Geraldton) 28° 39' - 28° 43' S and 114° 37' - 114° 41' E and (Morawa) 29° 07' - 29° 15' S and 115° 57' - 116° 05' E.

A search was undertaken for this area of (1) the Department's *Threatened (Declared Rare) Flora* database (for results, if any, see "Threatened Flora Data" - coordinates are GDA94), (2) the *Western Australian Herbarium Specimen* database for priority species opportunistically collected in the area of interest (for results, if any, see "WAHERB" - coordinates are GDA94 - see condition number 9 in the attached 'Conditions in Respect of Supply' and (3), the Department's *Declared Rare and Priority Flora List* [this list is searched using 'place names'. This list which may also be used as a species target list, contains species that are declared rare (Conservation Code R or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) - for results, if any, see "Declared Rare and Priority Flora List"]. The results are attached electronically to this email.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the seventh point, which refers to the requirement to undertake field investigations for the accurate determination of rare flora occurrence at a site. *The information supplied should be regarded as an indication only of the rare flora that may be present and may be used as a target list in any surveys undertaken.*

The information provided does not preclude you from obtaining and complying with, where necessary, land clearing approvals from other agencies.

An invoice for \$350 (plus GST) to supply this information will be forwarded.

It would be appreciated if any populations of rare flora encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss rare flora management, please contact my Principal Botanist, Dr Ken Atkins, on (08) 9334 0425.

Yours faithfully

B.R. Lullfitz

.....
for Keiran McNamara
DIRECTOR GENERAL
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

4 August, 2006

Please note: Co-ordinates supplied for all data search requests must be provided in latitude/longitude format, 'eastings and northings' are no longer suitable. Thank you.

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

RARE FLORA INFORMATION

CONDITIONS IN RESPECT OF SUPPLY OF INFORMATION

1. All requests for data to be made in writing to the Director General, Department of Environment and Conservation, Attention: Threatened Flora Database Officer, Species and Communities Branch.
2. The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided, without the prior written consent of the Director General, Department of Environment and Conservation.
3. Specific locality information for Declared Rare Flora is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for DRF may not be used in public reports without the written permission of the Executive Director, Department of Environment and Conservation. Publicly available reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Department is to be contacted for guidance on the presentation of rare flora information.
4. Note that the Department of Environment and Conservation respects the privacy of private landowners who may have rare flora on their property. Rare flora locations identified in the data as being on private property should be treated in confidence, and contact with property owners made through the Department of Environment and Conservation.
5. Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data provided, they may be present. The Department of Environment and Conservation accepts no responsibility for this.
6. Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.
7. It should be noted that the supplied data do not necessarily represent a comprehensive listing of the rare flora of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area. The receiving organisation should employ a botanist, if required, to undertake a survey of the area under consideration.
8. Acknowledgment of the Department of Environment and Conservation as source of the data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Environment and Conservation, Attention: The Manager, Species and Communities Branch.
9. The development of the PERTH Herbarium database was not originally intended for electronic mapping (eg. GIS ArcView). The latitude and longitude coordinates for each entry are not verified prior to being databased. It is only in recent times that collections have been submitted to PERTH with GPS recorded in latitude and longitude coordinates. Therefore, be aware when using this data in ArcView that some records may not plot to the locality description given with each collection.

THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DECLARED RARE AND PRIORITY FLORA LIST

for Western Australia

CONSERVATION CODES

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

ABBREVIATIONS USED IN THREATENED FLORA DATABASE PRINTOUTS

VESTING		EXL	Exploration Lease
AGR	Chief Exec Dept of Agriculture	EXP	Experimental Farm
ALT	Aboriginal Land Trust	FIR	Firing Range
BAP	Baptist Union of WA Inc	FOR	State Forest
BSA	Boy Scouts Association	GHA	Grain Handling
CC	Conservation Commission - NPNCA - LFC	GOL	Golf
CGT	Crown Grant in Trust	GRA	Gravel Pit
COM	Commonwealth of Australia	GRE	Green Belt
CRO	Crown Freehold-Govt Ownership	GVT	Government Requirements
DOL	Dept of Land Administration	HAR	Harbour Purposes
DFU	Ministry for Planning	HEP	Heritage Purposes
EXD	Exec Direc CALM	HER	Heritage trail
FRE	Freehold	HOS	Hospital
HOW	Homeswest	KEN	Kennels
ILD	Industrial Lands Develop. Auth	MIN	Mining lease
JOI	Joint Vesting-NPNCA & Shire	MUN	Municipal Purposes
LAC	LandCorp	NPK	National Park
LFC	Lands and Forests Commission	NRE	Nature Reserve
MAG	Minister for Agriculture	OTH	Other
MED	Ministry of Education	PAC	Public access
MHE	Minister for Health	PAR	Parkland (& Recreation)
MIN	Minister for Mines	PAS	Pastoral lease
MPL	Ministry for Planning	PFL	Protection of Flora
MPR	Minister for Prisons	PIC	Picnic ground
MRD	Main Roads WA	PLA	Plantation
MTR	Minister for Transport	POS	Public Open Space
MWA	Minister for Water Resources	FPA	Public parkland
MWO	Minister for Works	PRS	Prison site
NAT	Natural Trust of Australia WA	PUT	Public Utility
NON	Not Vested	QUA	Quarry
NPN	NPNCA	RAD	Radio Station
OTH	Other	RAC	Racecourse
FRI	Private	REC	Recreation
RAI	Westrail	REH	Rehabilitation
SEC	Western Power	RNP	Re-establish Native Plants
SHI	Shire	RRE	Railway Reserve
SPC	State Planning Commission	RUB	Rubbish
TEL	Telstra	SAN	Sand
TGR	Timber Govt Requirement	SCH	School-site
TOW	TOWN	SET	Settlers requirements
UNK	Unknown	SHI	Shire Requirements
WAT	Water Corporation	SHO	Showgrounds
WEL	Minister Community Welfare	SNN	Sanitary
WRC	Water & Rivers Commission	STO	Stopping place
XPL	Ex-Pastoral Lease	TIM	Timber
		TOU	Tourism
		TOW	Town-site
		TRA	Training Ground
		TRI	Trig station
		TVT	Television transmitting
		UNK	Unknown
		UTI	Utilities
		VCL	Vacant Crown Land
		VER	Road Verge
		VPF	Vermin Proof Fence
		WAT	Water
		WCO	Water & Conservation of F & F
		WOO	Firewood
PURPOSES			
ABR	Aboriginal Reserve		
AER	Aerodrome		
CAM	Camping		
CAR	Caravan park		
CEM	Cemetery		
CFA	Conservation of Fauna		
CFF	Conservation Of Flora & Fauna		
CFL	Conservation of Flora		
CHU	Church		
CPK	Car Park		
COM	Common		
CON	Conservation Park		
DEF	Defence		
DRA	Drain		
EDE	Educational Endowment		
EDU	Educational purposes UWA		
ENE	Enjoyment of Natural Environ.		
EXC	Excepted from sale		

* Please note that LPC now comes under the Conservation Commission.

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
DECLARED RARE AND PRIORITY FLORA LIST
30 June 2006

SPECIES / TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER PERIOD
<i>Acacia guinetii</i>	4	MW	Geraldton-Northampton	Jun-Aug
<i>Acacia latipes</i> subsp. <i>lidna</i>	3	MW	Erangy Springs, Geraldton, Three Springs, Northampton, Huti River, Eneabba	Jun-Jul
<i>Acacia leptospermoides</i> subsp. <i>psammophila</i>	3	MW	Geraldton, Yuna, Indarra, Eradu	
<i>Acacia megacephala</i>	2	MW	E of Geraldton, Kojarena, Burma Road	Jun-Sep
<i>Baeckea</i> sp. <i>Walkaway</i> (AS George 11249)	3	MW	Nanson, Ambania, Walkaway, Burma Road Reserve, Mt Fanny, Mt Homer	Jan-Apr
<i>Caladenia hoffmanii</i>	R	MW	Geraldton-Kalbarri	Aug-Oct
<i>Chorizema humile</i>	R	MW	Strawberry, Camamah, Geraldton, Kojarena, Coorow	Jul-Sep
<i>Cryptandra scoparia</i> var. <i>microcephala</i>	2	MW	Kalbarri N.P., Geraldton	May-Aug
<i>Dicrastylis incana</i>	2	MW	E of Geraldton, Yuna, Eradu	Sep, Nov
<i>Drummondita ericoides</i>	R	MW	N of Geraldton	Sep-Oct
<i>Enakbatius bounites</i> ms	2	MW	Howatharra Hill	July
<i>Eranophila brevifolia</i>	2	MW, WB	Geraldton, Mt Caroline, Northampton	Aug-Sep
<i>Eucalyptus blaxellii</i>	R	MW	NE of Geraldton	Aug-Nov
<i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>	4	MW	Nanson, Mt Michael, Eradu, Mt Homer, Moresby Range	-
<i>Gastrolobium propinquum</i>	1	MW	Northampton, Geraldton	Jun-Nov
<i>Geleznowia verrucosa</i> subsp. <i>formosa</i> ms	3	MW, WB	Kalbarri, Hill River, Geraldton, Eneabba	Jun-Sep
<i>Grevillea bractiiosa</i>	R	MW, SW	Geraldton, Howatharra, Mullewa, Milling, Bindoon	Aug-Oct
<i>Grevillea candicans</i>	3	MW, WB	Dalwallinu, Mingenew, Geraldton, Galena, Yuna, Mullewa	Jul-Oct
<i>Grevillea hirtella</i>	3	MW	Walkaway, Burma Road, Geraldton, Greenough	-
<i>Grevillea triloba</i>	3	MW	Geraldton, Northampton	Jul-Aug
<i>Harperia ferruginipes</i>	1	MW	Geraldton/Mullewa	Apr-May
<i>Homalocalyx chapmanii</i>	1	MW	Arrowsmith River, Geraldton, One Tree Hill, Three Springs	
<i>Homalocalyx inermibundus</i>	2	MW	Geraldton, Bindoo Hill, East Yuna, Mount Magnet	Sep, Oct
<i>Lepidobolus basiflorus</i>	1	MW	Geraldton-Mullewa	Apr-May
<i>Leucopogon oblongus</i> ms	2	MW	Northampton, Howatharra	Jul
<i>Malleostemon</i> sp. <i>Moonyoonooka</i> (RJ Cranfield 2847)	2	MW	Kalbarri, Geraldton	Aug, Sep
<i>Schoenia filifolia</i> subsp. <i>subulifolia</i>	R	MW	Champton Bay, Geraldton	
<i>Scholtzia</i> sp. <i>Valentine Road</i> (S Patrick 2142)	1	MW	Geraldton-Mullewa	Nov
<i>Stenanthemum gracilipes</i>	1	MW	Geraldton, Nabawa	Aug-Sep
<i>Thryptomene</i> sp. <i>Moresby Range</i> (AS George 14873)	3	MW	Moresby Range, Chapman Valley, Howatharra	Jul-Sep
<i>Thryptomene</i> sp. <i>Yuna Reserve</i> (AC Burns 100)	2	MW	East Yuna Reserve, East Chapman, Bella Vista NR	Aug-Sep
<i>Thryptomene stenophylla</i>	2	MW	Kalbarri, Geraldton	-
<i>Verticordia chrysostachya</i> var. <i>pallda</i>	3	MW	Geraldton, Northampton	Dec
<i>Vittadinia cervicalaris</i> var. <i>occidentalis</i>	1	MW	Geraldton, Northampton	-
<i>Wumbea tubulosa</i>	R	MW	Geraldton-Mingenew-Three Springs	Jun-Jul

WA HERBARIUM DATABASE - 4 August 2000

SHEET_NO.	GENUS	SPECIES	RANK	INFRASP	CONS.CODE
PERTH 196940	Acacia	guinetii			P4
PERTH 1135155	Verticordia	penicillaris			P4
PERTH 196428	Acacia	guinetii			P4
PERTH 196371	Acacia	guinetii			P4
PERTH 05395909	Grevillea	triloba			P3
PERTH 00755729	Acacia	guinetii			P4
PERTH 00759430	Acacia	guinetii			P4
PERTH 196399	Acacia	guinetii			P4
PERTH 1048945	Eucalyptus	blaxellii			R
PERTH 02032279	Verticordia	penicillaris			P4
PERTH 197335	Acacia	guinetii			P4
PERTH 197394	Acacia	guinetii			P4
PERTH 196393	Acacia	guinetii			P4
PERTH 196401	Acacia	guinetii			P4
PERTH 196436	Acacia	guinetii			P4
PERTH 196444	Acacia	guinetii			P4
PERTH 05398344	Grevillea	triloba			P3
PERTH 04159918	Grevillea	triloba			P3
PERTH 01648659	Grevillea	triloba			P3
PERTH 05392195	Thryptomene	stenophylla			P2
PERTH 1050508	Eucalyptus	blaxellii			R
PERTH 1048937	Eucalyptus	blaxellii			R
PERTH 196932	Acacia	guinetii			P4
PERTH 197408	Acacia	guinetii			P4
PERTH 01404539	Verticordia	densiflora	var.	roseostella	P3
PERTH 522309	Vitadina	cerviculata	var.	occidentalis	P1
PERTH 00759449	Acacia	guinetii			P4
PERTH 05481074	Melaleuca	huttensis			P1
PERTH 04257413	Grevillea	triloba			P3
PERTH 05498228	Grevillea	triloba			P3
PERTH 05046433	Melaleuca	huttensis			P1
PERTH 06297161	Eucalyptus	blaxellii			R
PERTH 06297145	Eucalyptus	blaxellii			R

PERTH 1096846	Eucalyptus	diminuta	P4
PERTH 1039646	Eucalyptus	diminuta	P4
PERTH 1022814	Eucalyptus	cuprea	R
PERTH 05758408	Eucalyptus	blaxellii	R
PERTH 06095880	Eucalyptus	blaxellii	R
PERTH 06095879	Eucalyptus	blaxellii	R
PERTH 02191385	Thyptomene	sp. Moresby Range (A.S. George 1457	P3
PERTH 07901049	Metaleuca	huttensis	P1

THREATENED FLORA DATABASE - 4 August 2006

GENUS	SPECIES	CONS. CODE
Drummondita	ericoides	R
Verticordia	pericillaris	4
Eucalyptus	blaxellii	R

Appendix B
Site Photos



Plate 1 – Cleared Pasture Land



Plate 2 – View from escarpment onto Lot 81

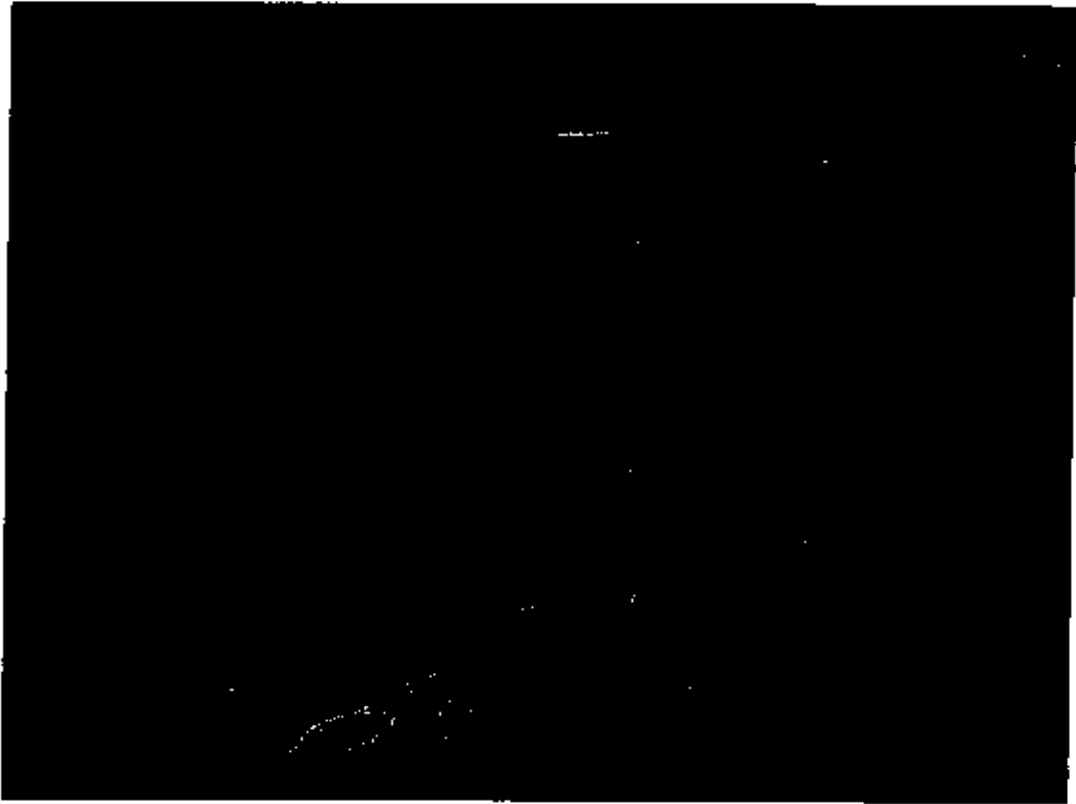


Plate 3 – vegetated area to the north of Lot 81 in mid to background of photo

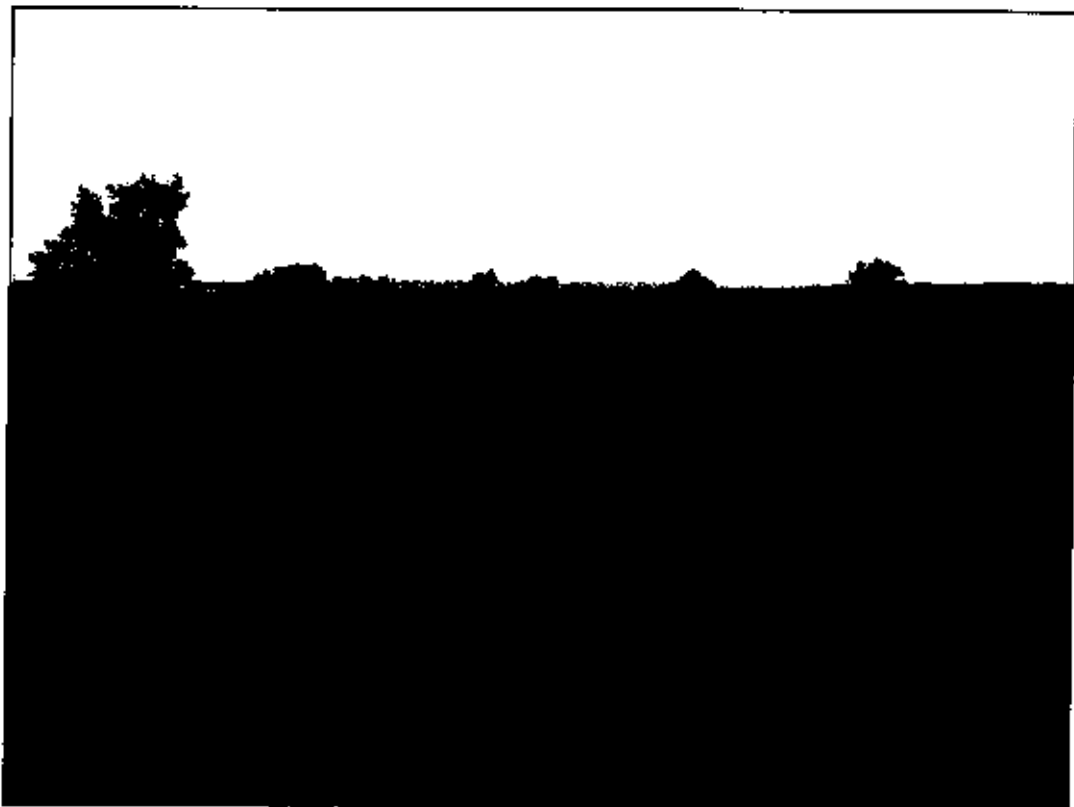


Plate 4 – northern fence line on Lot 81 hosting *Grevillea trifida* population



Plate 5 – Burnt Wetland Area on Lot 80

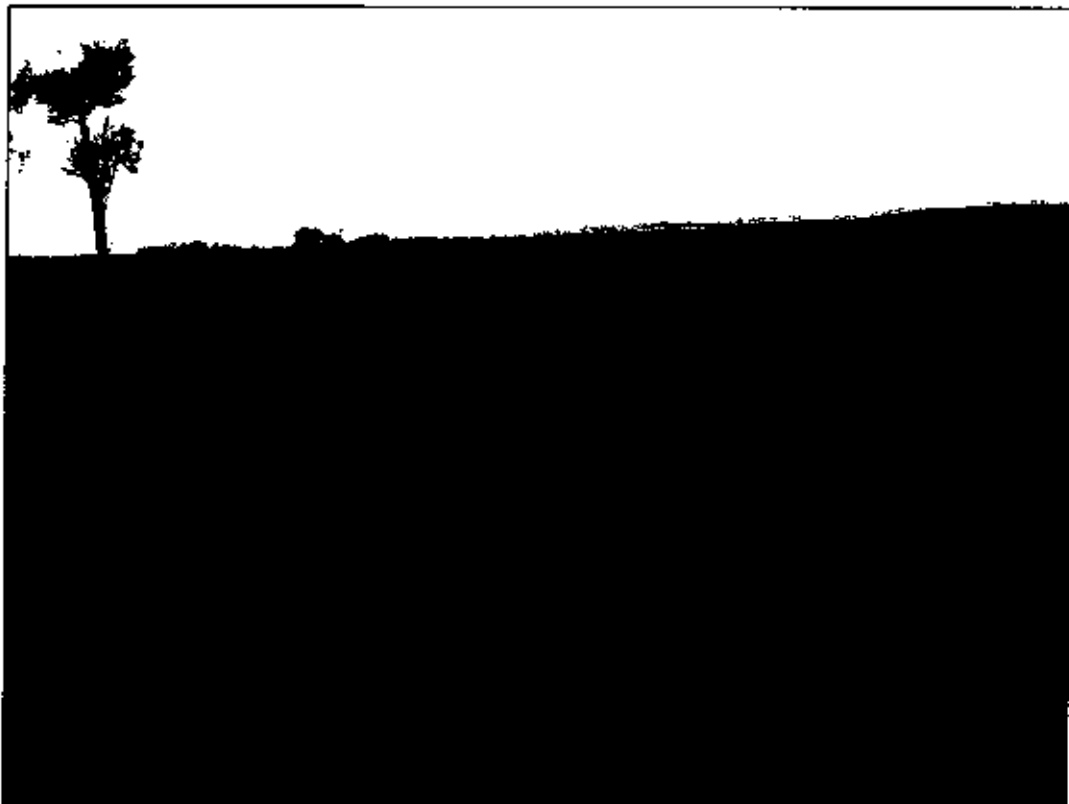


Plate 5 – Gravel Outcrop on Lot 80

Appendix C
Flora Species Recorded on Site

Family	Species	Common Name
	<i>Ptilotus polystachyus</i>	Prince of Wales Feather
AMARANTHACEAE	<i>Ptilotus obovatus</i> var <i>obovatus</i>	Cotton Bush
ANACARDIACEAE	* <i>Schinus terebinthifolia</i>	Japanese Pepper
	<i>Cassia micrantha</i>	Pale Grass Lily
	<i>Corynothea micrantha</i>	Sand Lily
ANTHERICACEAE	<i>Tricoryne elatior</i>	Yellow Autumn Lily
APIACEAE	<i>Trachymene cyanopetala</i>	
	* <i>Arthrotheca calendula</i>	Cape Weed
	<i>Brechyscome ciliaris</i>	
	* <i>Hypochaeris</i> sp	Flat Weed
	<i>Lamrancellia rosea</i>	
	* <i>Monoculus monstrosum</i>	
	<i>Podolepis lessoni</i>	
	<i>Rhodantha manglesi</i>	
	<i>Rhodantha spicata</i>	
	* <i>Sonchus oleraceus</i>	Sowthistle
	* <i>Urospermum picroides</i>	False Hawkbit
ASTERACEAE	* <i>Ursinia anthemoides</i>	Ursinia
BORAGINACEAE	* <i>Echium plantagineum</i> (DP)	Paterson's Curse
BRASSICACEAE	* <i>Brassica tournefortii</i>	Wild Turnip
	* <i>Raphanus raphanistrum</i>	Wild Radish
	* <i>Rapistrum rugosum</i>	Turnip Weed
BORYACEAE	<i>Borya sphaerocephala</i>	Pincushions
CARYOPHYLLACEAE	* <i>Petrohragia dubia</i>	
CASUARINACEAE	<i>Allocasuarina campestris</i>	
CHENOPODIACEAE	<i>Chenopodium gaudichaudianum</i>	Cottany Saltbush

	<i>Enchyleena tomentosa</i> var <i>tomentosa</i>	Ruby Saltbush
	<i>Rhagodia pretsii</i> subsp <i>obovata</i>	
CONVOLVULACEAE	<i>Convolvulus remotus</i>	
CRASSULACEAE	<i>Crassula colorata</i>	
CUCURBITACEAE	* <i>Citrullus lanatus</i>	Paddy Melon
CUNONIACEAE	<i>Aphanopetalum dematideum</i>	
	<i>Lepidosperma leptostachyum</i>	
	<i>Lepidosperma tenue</i>	
CYPERACEAE	<i>Mesomelaena pseudostygia</i>	Semaphore Sedge
DASYPOGONACEAE	<i>Acanthocarpus pretsii</i>	
	<i>Hibbertia hypericoides</i>	Yellow Buttercups
DILLENIACEAE	<i>Hibbertia potentilliflora</i>	
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>	
GOODENIACEAE	<i>Dampiera incana</i> var <i>incana</i>	
GYROSTEMONACEAE	? <i>Gyrostemon racemiger</i>	
	<i>Conostylis aculeata</i>	Prickly Conostylis
HAEMODORACEAE	<i>Conostylis cardicans</i>	Grey Cottonhead
JUNCACEAE	<i>Juncus kraussii</i>	Sea Rush
LAURACEAE	<i>Cassytha</i> sp.	Dodder Laurel
LORANTHACEAE	<i>Nuytsia floribunda</i>	WA Christmas Bush
MALVACEAE	<i>Hibiscus ?sturtii</i>	
	<i>Acacia microbotrya</i>	Manna Wattle
	<i>Acacia oxyclada</i>	
	<i>Acacia rostellifera</i>	Summer-scented Wattle
	<i>Acacia setigera</i>	Orange Wattle
MIMOSACEAE	<i>Acacia tetragonophylla</i>	Kurara
MYOPORACEAE	<i>Myoporum montanum</i>	

	<i>Eucalyptus camaldulensis</i> var <i>obtusa</i>	Northern River Red Gum
	<i>Eucalyptus laeophleba</i>	
	<i>Eucalyptus subangulata</i> esp <i>subangulata</i>	
	<i>Malaleuca huttensis</i> (P1)	
	<i>Malaleuca rhamnophylla</i>	Swamp Paperbark
	<i>Malaleuca uncinata</i>	Broom Bush
MYRTACEAE	<i>Verticordia chrysantha</i>	
	<i>Daviesia divaricata</i>	
	<i>Daviesia divaricata</i> esp <i>laniflora</i>	
	<i>Gastrolobium trifangulare</i>	
	<i>Jacksonia calcicola</i>	
	<i>Leptosema aphyllum</i>	
	* <i>Lupinus cosentinii</i>	Blue Lupins
	* <i>Melilotus indica</i>	Common Melilot
	* <i>Trifolium fragiferum</i>	Strawberry clover
PAPILIONACEAE	* <i>Trifolium hirtum</i>	Rose clover
PHORMACEAE	<i>Dianella revoluta</i> var <i>divaricata</i>	Blueberry Lily
PITTOSPORACEAE	<i>Pittosporum ligustifolium</i>	
POACEAE	<i>Austroelype elegantissima</i>	Elegant Spear Grass
	* <i>Avena barbata</i>	Bearded Oat Grass
	* <i>Avena fatua</i>	Wild Oats
	* <i>Briza maxima</i>	Blow Fly Grass
	* <i>Bromus diandrus</i>	Great Brome
	* <i>Eriochloa celycina</i>	Perennial Veldt Grass
	* <i>Hordeum leporinum</i>	Barley Grass
	<i>Neurochne alopecuroides</i>	Foxtail Mulga Grass
	* <i>Pennisetum clandestinum</i>	Kikuyu

	* <i>Pennisetum setaceum</i>	Fountain grass
POLYGONACEAE	* <i>Emex australis</i>	Doublegee
	<i>Muehlenbeckia adpressa</i>	Climbing Lignum
PORTULACACEAE	<i>Calandrinia liniflora</i>	
PRIMULACEAE	* <i>Anagallis arvensis</i>	Pimpernel
	<i>Banksia prionotes</i>	
	<i>Dryandra fraseri</i> var <i>fraseri</i>	
	<i>Dryandra sessilis</i> ssp <i>flabellifolium</i>	Parrot Bush
	<i>Grevillea candolabroides</i>	
	<i>Grevillea pinaster</i>	
	<i>Grevillea triloba</i> (P3)	
	<i>Hakea lissocarpa</i>	Honeybush
	<i>Hakea prostrata</i>	Needle Tree
	<i>Hakea recurva</i> ssp <i>recurva</i>	
PROTEACEAE	<i>Petrophile conferta</i>	
RUTACEAE	<i>Galeznovia verrucosa</i> ssp <i>famosa</i> (P3)	
SAPINDACEAE	<i>Dodonaea inaequalifolia</i>	
	* <i>Lycium ferocissimum</i>	African Boxthorn
	* <i>Solanum nigrum</i>	Blackberry Nightshade
SOLANACEAE	<i>Solanum elaeagnifolium</i>	
	<i>Gutchenotis micrantha</i>	
STERCULIACEAE	<i>Thomasia hemeranthifolia</i>	
STYLIDIACEAE	<i>Stylidium septentrionale</i>	
THYMELAEACEAE	<i>Pimelea microcephala</i> ssp <i>microcephala</i>	Shrubby Riceflower
VITACEAE	<i>Clematicissus angustissima</i>	

KEY:

* introduced plant species

DP = declared plant, see Section 3.3.4

P1, P3 = Priority Flora species, see Section 2.3 for further details

GHD Pty Ltd ABN 39 008 488 373

76 Forrest Street Geraldton WA 6530

PO BOX 164 Geraldton WA 6531

T: (08) 9964 3877 F: (08) 9921 7997 E: geraldtonmell@ghd.com.au

© GHD Pty Ltd 2007

This document is and shall remain the property of GHD Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
	C Miller	A Napier		M Coombes		

APPENDIX B - Level 1 Flora and Vegetation Survey (Coterra, 2011)

COTERRA
ENVIRONMENT

Level 1 Flora and Vegetation Survey

Lots 80 & 81 Hackett Road, Waggrakine

Rev 0, May 2011

This report was prepared by;

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

19/336 Churchill Avenue
Subiaco WA 6008

T: (08) 9381 5513
F: (08) 9381 5514
E: info@coterra.com.au
W: www.coterra.com.au

Our Ref: HUMMOR01
Author(s): A. Benkovic
Report Version: Rev 0
Date: May, 2010

This report was prepared for;

Humfrey Land Developments
PO Box 1917
GERALDTON WA 6531

Notice

This document is and shall remain the property of Coterra Environment. The document may only be used for the purposes for which it was commissioned. Unauthorised copying or use of this document is prohibited.

EXECUTIVE SUMMARY

Key Elements	
Flora	<p>A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants.</p> <p>No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian <i>Wildlife Conservation Act 1950</i> or governed by the <i>Environment Protection and Biodiversity Conservation Act 1999</i> were located within the study area.</p> <p>Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>.</p> <p>No other flora species of other conservation significance as stated in <i>Guidance Statement 51</i> (EPA, 2004) were recorded within the study area.</p>
Vegetation	<p>An expert botanist defined and mapped 12 vegetation units across the study area.</p> <p>The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition. The north western extent of the study area contains remnant heath vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition.</p>
Regional Representation Vegetation	<p>The study area is represented by two Beard vegetation associations: 359 - (Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub) and 675 - (Shrublands; <i>Melaleuca</i> and <i>Hakea</i> mixed thicket). Both of these vegetation associations are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010).</p> <p>Within the study area there are 3 plant communities, as mapped by the Geraldton Regional Flora and Vegetation Survey (WAPC, 2010). These plant communities are: 10 Near Coastal: <i>Acacia rostelifera</i> shrubland, 15 Thicket: <i>Melaleuca</i> spp. /mixed spp. and 13 Sandplain: <i>Banksia prionotes</i>/<i>Acacia rostelifera</i>.</p>
Regionally Significant Vegetation	<p>According to <i>Guidance Statement 33</i> (EPA, 2008) and <i>Position Statement 2</i> (EPA, 2000) the study area is considered Regionally Significant because:</p> <ol style="list-style-type: none"> 1. The vegetation associations within the study area have <30% of their present extents remaining within in WA. 2. The study area contains native vegetation remnants in good or better condition. 3. Two Priority Flora species were recorded; Priority 1 (P1) <i>Melaleuca huttensis</i> and Priority 3 (P3) <i>Grevillea triloba</i>. 4. Within the study area boundary lies, in part, the Moresby Range.

TABLE OF CONTENTS	Page
1.0 BACKGROUND.....	6
1.1 Objectives	6
1.2 Previous Investigations	6
2.0 EXISTING INFORMATION	8
2.1 Threatened Flora and Priority Flora	8
2.1.1 State Legislation.....	8
2.1.2 Federal Legislation	10
2.1.3 Other Species of Conservation Significance.....	10
2.2 Vegetation.....	10
2.2.1 Interim Biogeographical Regionalisation of Australia	10
2.2.2 Beard Vegetation Associations	11
2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010).....	11
2.3 Conservation Significant Vegetation	12
2.3.1 Threatened Ecological Communities	12
2.3.2 Threshold Levels for Biodiversity Conservation.....	12
2.3.3 Areas of High Conservation Value.....	13
2.3.4 Significant Natural Areas.....	13
3.0 METHODS	14
3.1 Field Survey.....	14
3.1.1 Vegetation Sampling.....	14
3.2 Vegetation Condition	15
4.0 RESULTS AND DISCUSSION	16
4.1 Flora.....	16
4.1.1 Flora of Conservation Significance	16
4.1.2 Introduced Flora (Weeds).....	18
4.2 Vegetation.....	18
4.2.1 Vegetation Units	18
4.2.2 Vegetation Condition.....	19
4.3 Conservation Significant Vegetation	20

4.3.1	Biodiversity Threshold Levels.....	20
4.3.2	GRFVS Plant Community Representation.....	20
4.3.3	Regionally Significant Natural Areas and Areas of High Conservation Value.....	21
5.0	CONCLUSIONS & RECOMMENDATIONS	23
6.0	LIMITATIONS.....	24
7.0	REFERENCES	25

TABLES (Compiled within the report)

	Page
Table 1: Priority Flora Recorded in 2006 by GHD.....	7
Table 2: Significant Flora Species	9
Table 3: Regional Vegetation Association within Western Australia.....	11
Table 4: Regional Vegetation Association within the GRFVS Area	11
Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010).....	12
Table 6: Vegetation Structure Classes.....	15
Table 7: Vegetation Condition Scale.....	15
Table 8: Criteria for Environmental Weeds Strategy Rating.....	18
Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton	18

PLATES (Compiled within the report)

Plate 1: Mean Monthly Temperatures and Rainfall for Geraldton Airport (1941-2010) (BOM, 2011).....	Error! Bookmark not defined.
Plate 2: P1 <i>Melaleuca huttensis</i>	17
Plate 3: P3 <i>Grevillea triloba</i>	17

FIGURES (Compiled at the end of the report)

- Figure 1: Beard Vegetation Association
- Figure 2: Vegetation Units
- Figure 3: Vegetation Condition

APPENDICES

- Appendix A: Species List
- Appendix B: Vegetation Unit Photos

1.0 BACKGROUND

Humfrey Land Developments are proposing to rezone Lots 80 and 81 Hackett Road, Waggarakine ('the study area') to facilitate subdivision and development of this landholding (Figure 1). The 385 hectare (ha) site is located within the City of Geraldton-Greenough (CoGG), and is approximately 10 kilometres (km) north-east of the Geraldton town centre. In order to facilitate development of the site in accordance with this Concept Plan, the site is proposed be rezoned from 'Rural' to 'Development' under the CoGG LPS No. 5.

In accordance with Section 48A of the Environmental Protection (EP) Act (1986), any proposed change to a town planning scheme must be referred to the Environmental Protection Authority (EPA) for consideration.

In order to provide the EPA with the information necessary to properly assess this rezoning application, Coterra Environment have undertaken this Level 1 Flora and Vegetation survey to supplement the Environmental Assessment Report which will form part of the overall amendment application.

1.1 Objectives

This report presents the findings of the Level 1 Flora and Vegetation Survey for Lots 80 & 81 Hackett Road. The survey was carried out in accordance with the EPA's Guidance Statement 51 – *Terrestrial Flora and Vegetation Surveys for Environmental Impact assessment in Western Australia* requirements for a Level 1 Flora and Vegetation Survey (EPA, 2004) and involved the following components:

- Desktop review of the Department of Environment and Conservation (DEC) database search to identify any significant flora species that could potentially exist on site.
- A site visit to detail the vegetation and flora present on site. This involved undertaking selective low level sampling of native vegetation to produce maps of vegetation units and condition across the site.
- A targeted search for any Threatened Flora (TF) or Priority species known from the Geraldton area (as identified in the DEC database search).
- Analysis of the floristic composition of the vegetation for any species of conservation significance. This includes TF, Priority species and any species of other conservation value (EPA, 2004).
- Assessment of the condition and conservation significance of the vegetation using criteria outlined in *Position Statement 2* (EPA, 2000) and *Guidance Statement 33* (EPA, 2008).
- Preparation of a report and relevant maps.

1.2 Previous Investigations

A Priority Flora survey of the study area was conducted previously in 2006 by GHD (GHD, 2007). This survey only concentrated on locating DEC listed Priority Flora and therefore did not meet the requirements of a full flora survey. In addition the study did

not include the escarpment, plateau or bushland area in the north, as these portions of the site were proposed to be set aside as open spaces.

In this GHD survey, three Priority Flora species were recorded within the study area. These species and the number of plants recorded are listed in Table 1.

Table 1: Priority Flora Recorded in 2006 by GHD

Species	Conservation Code	Number of Plants Recorded
<i>Geleznovia verrucosa</i> subsp. <i>formosa</i> #	P3	1
<i>Grevillea triloba</i>	P3	>100
<i>Melaleuca huttensis</i>	P1	1

This taxon name is no longer current; it is a taxonomic synonym of *Geleznovia verrucosa*, which is not a Priority Flora species

The priority flora report completed by GHD (2007) is attached to the EAR, prepared as part of the overall scheme amendment submission.

2.0 EXISTING INFORMATION

2.1 Threatened Flora and Priority Flora

2.1.1 State Legislation

Threatened Flora (TF) are flora that have been adequately surveyed and are considered to be in danger of extinction, rare or otherwise in need of special protection within Western Australia. TF are protected under the *Wildlife Conservation Act 1950* (as amended).

Additionally in Western Australia there are five categories of Priority Flora, which are not specifically covered under current legislation, but their conservation status warrants some protection and/or further investigation. Three categories of Priority Flora are allocated to species that are poorly known (Priority 1 to 3). These require more information to be assessed for inclusion as TF. The categories are arranged to give an indication of the priority for undertaking further surveys based on the number of known sites, and the degree of threat to those populations. A fourth category of priority (Priority 4) is included for those species that have been adequately surveyed and are considered to be rare but not currently threatened. Priority 5 species are those that are also not threatened but are subject to a specific conservation program

The Department of Environment and Conservation's (DEC) databases for Threatened Flora, the Western Australian Herbarium (WAH) Specimen and Threatened Flora were searched for known records within the vicinity of the study area. There were twelve conservation significant species recorded, three of which are TF. The list of significant flora is provided in **Table 2** below.

Table 2: Significant Flora Species

Species	Conservation Code ¹
<i>Drummondita ericoides</i>	T - EN
<i>Eucalyptus cuprea</i>	T - EN
<i>Melaleuca huttensis</i>	P1
<i>Vittadinia cervicularis</i> var. <i>occidentalis</i>	P1
<i>Thryptomene</i> sp. Moresby Range	P3
<i>Verticordia densiflora</i> var. <i>roseostella</i>	P3
<i>Grevillea triloba</i>	P3
<i>Thryptomene stenophylla</i>	P2
<i>Acacia guinetii</i>	P4
<i>Eucalyptus blaxellii</i>	P4
<i>Verticordia penicillaris</i>	P4

¹ T: Threatened Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. Threatened Flora are further ranked by the Department according to their level of threat using IUCN Red List criteria:

CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
 EN: Endangered – considered to be facing a very high risk of extinction in the wild
 VU: Vulnerable – considered to be facing a high risk of extinction in the wild.

P1: Priority One - Poorly known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

P4: Priority Four – Rare, Near Threatened and other species in need of monitoring

Rare Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection

Near Threatened Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent

Other Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

P5: Priority Five – Conservation Dependant Species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

2.1.2 Federal Legislation

Some flora species have additional protection under the *Environment Protection and Biodiversity Conservation Act (EPBC) 1999*. In Western Australia, this predominantly consists of Threatened Flora. Penalties apply for any damage to individuals, populations or habitats of species protected.

2.1.3 Other Species of Conservation Significance

Environmental Protection Authority (EPA) *Guidance Statement 51* (EPA, 2004) lists species other than Threatened Flora and Priority Flora as of conservation significance where a species has:

- A keystone role.
- Relictual status.
- Anomalous features indicating a potential new discovery.
- A representation of a species range (range extensions, extremes or an outlier population).
- Status as a restricted subspecies, variety, or naturally occurring hybrid.
- Poor reservation.
- Status as a local endemic or has a restricted distribution.

This document states that conservation significance includes these criteria, but is not limited to them. It may include flora that are poorly represented in WAH and short range endemic flora (those with a known range less than 200km).

2.2 Vegetation

2.2.1 Interim Biogeographical Regionalisation of Australia

The study area lies with the Interim Biogeographical Regionalisation of Australia (IBRA) region of the Geraldton Sandplains, subregion Geraldton Hills (Thackway & Cresswell, 1995, as amended) (Environment Australia, 2000).

The Geraldton Hills subregion is 2, 242, 033 ha in size (Desmond & Chant, 2001) and is described as:

“Exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent Banksia and Actinostrobus, York Gum woodlands on alluvial plains, proteaceous heath and Acacia scrubs on limestones depending on depth of coastal-sand mantle, low closed forest of Acacia rostellifera (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton)” (Desmond & Chant, 2001).

2.2.2 Beard Vegetation Associations

Beard (1976) conducted regional vegetation mapping of Western Australia and grouped the vegetation of the state into associations. According to the study by Beard (1976) the original vegetation of the study area is likely to be made up of two vegetation associations, these are;

- 675 -Shrublands; mixed thicket (*Melaleuca* and *Hakea*), and;
- 359 -Shrublands; *Acacia* and *Banksia* scrub.

The extent of these two vegetation associations within the study area is illustrated in **Figure 1**.

The vegetation extents within Western Australia of these two 'associations' are presented in **Table 3** (WAPC, 2010).

Table 3: Regional Vegetation Association within Western Australia

Vegetation Association	Pre-Europe Extent (WA)	Current Extent (WA)	% Remaining in WA
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	51 850	10 992	21.2
359 Shrublands; <i>Acacia</i> and <i>Banksia</i> scrub	44 493	8 366	18.8

The vegetation extents within the Geraldton Regional Flora and Vegetation Survey area (see section 2.4.3) of these two associations' are presented in **Table 4** (WAPC, 2010).

Table 4: Regional Vegetation Association within the GRFVS Area

Vegetation Association	Pre-Europe Extent (GRFVS)	Current Extent (GRFVS)	% Remaining in GRFVS area
675 Shrublands; mixed thicket (<i>Melaleuca</i> and <i>Hakea</i>)	3 148	240	7.62
359 Shublands; <i>Acacia</i> and <i>Banksia</i> scrub	17 805	3 077	17.28

2.2.3 Geraldton Regional Flora and Vegetation Survey (WAPC, 2010)

The Geraldton Regional Flora and Vegetation Survey (GRFVS) was completed to describe and map the flora and vegetation within the Geraldton area. The report generated from the outcomes of this survey aims to provide information, from a regional context, to aid local scale studies in the assessment of proposals that may affect the native vegetation within the Geraldton region (WAPC, 2010). This survey

has been endorsed by the EPA (2010) as a key source to help minimise the environmental impact of future development in the Geraldton region.

Most of the remnants in the study area are within the GRFVS boundaries. However, no GRFVS quadrats were established within the study area for the GRFVS report. Therefore the plant communities within the study area that have been mapped by the GRFVS were done so at a 90% confidence level (WAPC, 2010).

The GRFVS mapped plant communities for the study area are listed in **Table 5**. The majority of the study area, which consists of cleared pastureland, and in part the Moresby Ranges, falls outside the GRFVS boundary.

Table 5: GRFVS Plant Communities and Representative Beard Vegetation Association (WAPC, 2010)

Beard Vegetation Association	Plant Community	Extent of GRFVS Plant Communities %
359	10 Near Coastal: <i>Acacia rostellifera</i> shrubland	36.63
675	15 Thicket: <i>Melaleuca</i> spp. /mixed spp.	7.61
359	13 Sandplain: <i>Banksia prionotes</i> / <i>Acacia rostellifera</i>	12.23

2.3 Conservation Significant Vegetation

2.3.1 Threatened Ecological Communities

DEC's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database was searched for known occurrences within the vicinity of the study area.

This search relates to TECs listed under the *Wildlife Conservation Act 1950* (as amended). Some TECs have further protection under the *Environmental Protection Biodiversity Conservation (EPBC) Act 1999*. TEC and PEC listings are administered through the DEC Threatened Communities Branch.

No previously known TECs or PECs were identified as occurring within the search area. However DEC advised of the occurrence of a PEC within 10km's of the study area; "*Melaleuca megacephala* and *Hakea pycnoneura* thickets on the Moresby Range.

2.3.2 Threshold Levels for Biodiversity Conservation

To highlight the need for biodiversity protection within the agricultural areas of the Wheatbelt/ Geraldton region – due to high clearing practices - the EPA published *Position Statement 2* (EPA, 2000). According to *Position Statement 2*, for the EPA to support clearing within the Wheatbelt/ Geraldton region, alternative mechanisms need to be put in place that address biodiversity protection.

As a result EPA (2000 & 2008) has adopted two criteria that are to be taken into consideration when assessing a clearing application, these are:

- i. *The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type*
- ii. *A level of 10% of the original extent is regarded as being a level representing “endangered”*

Vegetation below the 30% “threshold level” is deemed to be significant (EPA, 2008).

2.3.3 Areas of High Conservation Value

In addition to the above criteria, *Guidance Statement 33* (EPA, 2008) lists areas of high conservation value that require protection in WA, these are:

- State and regional conservation areas
- Areas where clearing would conflict with the native vegetation clearing principles in schedule 5 of the *Environmental Protection Act 1986*
- Threatened Ecological Communities
- Significant flora and fauna
- Wetlands and buffers
- Rivers and foreshores
- Important landscapes and landforms
- Natural areas of heritage significance
- Other natural areas, such as ecological linkages

2.3.4 Significant Natural Areas

To assist proponents in the identification of significant natural areas, *Guidance Statement 33* (EPA, 2008) outlines methodology used by government agencies within the Perth Metropolitan Region (Del Marco *et al.* 2004). This methodology adopts the following criteria:

- Representation of ecological communities
- Diversity
- Rarity
- Maintaining ecological processes or natural systems
- Scientific or evolutionary importance
- Protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

3.0 METHODS

3.1 Field Survey

An expert botanist conducted a Level 1 Flora Survey of the Moresby Heights study area (Figure 1) in April 2011. The survey methodology was based on a Level 1 Flora Survey as outlined in *Guidance Statement 51* (EPA, 2004).

A Level 1 Survey comprises of:

Background Research or Desktop Study

- i. Gather together background information on the target area.

Reconnaissance Survey

- i. Verify accuracy of the Desktop Study.
- ii. Delineate and characterise the flora and range of vegetation units present in the target area.
- iii. Identify potential impacts

This involves selective, low intensity sampling of flora and vegetation to produce maps of vegetation units and vegetation condition at an appropriate scale. Searches for significant flora (**Table 2**) were also performed within the study area.

A species list was compiled using the latest nomenclature and taxonomic references (*Florabase*, 2011 and Smith, 2010).

3.1.1 Vegetation Sampling

Mapping of each vegetation unit was completed using aerial photographs and on site surveying. Each vegetation unit was defined by the dominant plant species (>2% cover) throughout its extent, using the vegetation structure classes of the WAPC (2000) (**Table 6**).

Table 6: Vegetation Structure Classes

Life Form/ Height Class	Canopy Cover (percentage)			
	100% - 70%	70% - 30%	30% - 10%	10% - 2%
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees <10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Scrub Mallee
Shrubs >2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs <1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

(WAPC, 2000)

3.2 Vegetation Condition

The site was traversed by foot and vehicle to assess the vegetation condition. The Vegetation Condition Scale (Keighery, 1994) recommended in *Bush Forever* (WAPC, 2000) (Table 7) was used to classify the vegetation condition of the study area.

Table 7: Vegetation Condition Scale

Condition	Definition
Pristine	No obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species; weeds are non-aggressive species.
Very Good	Vegetation structure altered; obvious signs of disturbance.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance; basic vegetation structure or ability to regenerate is retained.
Degraded	Basic vegetation structure severely impacted by disturbance; scope for regeneration but not to a state approaching good (sic) condition without intensive management.
Completely Degraded	Vegetation structure not intact; the area completely or almost completely without native species ('parkland cleared').

(WAPC, 2000)

4.0 RESULTS AND DISCUSSION

4.1 Flora

A botanist recorded 81 taxa from 31 plant families across the site; 13 of these taxa are exotic species that are naturalised weeds or landscaping plants. A list of species recorded within the study area is presented in **Appendix A**.

There were a number of taxa that could not be positively identified due to inadequate fruiting or flowering material available at the time of the survey. These are labeled throughout this document with a '?'.

4.1.1 Flora of Conservation Significance

No Threatened Flora species, as listed under subsection (2) of Section 23F of the Western Australian *Wildlife Conservation Act 1950* or governed by the *Environment Protection and Biodiversity Conservation Act 1999* were located within the study area.

Two Priority Flora species as listed by the Department of Environment and Conservation (Smith, 2010) were recorded within the study area. These species were Priority 1 (P1) *Melaleuca huttensis* (**Plate 1**) and Priority 3 (P3) *Grevillea triloba* (**Plate 2**). One individual *Melaleuca huttensis* was recorded within vegetation unit ArAt (**Section 4.2.1**) (**Figure 2**). *Grevillea triloba* was recorded in large numbers (>100) within vegetation units ArAt and EInF (**Section 4.2.1**) (**Figure 2**).

Both Priority Flora species located in this survey (current report) were also recorded in the previous survey of the study area by GHD (2007). GHD also recorded *Geleznovia verrucosa* subsp. *formosa*, which was a P3 species at the time of that survey. This species has since been identified as a taxonomic synonym of *Geleznovia verrucosa* and is no longer a Priority Flora species.



Plate 1: P1 *Melaleuca huttensis*



Plate 2: P3 *Grevillea triloba*

No other flora species of other conservation significance as stated in *Guidance Statement 51* (EPA, 2004) were recorded within the study area.

4.1.2 Introduced Flora (Weeds)

Thirteen introduced flora (weeds and landscaping plants) were recorded from the survey site, representing 16% of the total flora recorded.

The Environmental Weeds Strategy for WA (EWSWA) (CALM, 1999) rated all the weeds known for Western Australia at the time of publication, according to invasiveness, distribution and environmental impact (**Table 8**). Weeds were classified into four categories; High, Moderate, Mild and Low. High rated species are those that all three criteria apply to (**Table 8**) and Moderate to which two criteria apply. The High and Moderate category weeds recorded in the survey area that should be prioritised for control or eradication are listed in **Table 9**.

Table 8: Criteria for Environmental Weeds Strategy Rating

Criteria	Description
Invasiveness	Ability to invade bushland in good to excellent condition or ability to invade waterways.
Distribution	Wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world.
Environmental Impacts	Ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

Table 9: The EWSWA (CALM, 1999) Rating of Weeds at Lot 80 & 81 Moresby Heights, Geraldton

Weed	Rating	Weed	Rating
* <i>Brassica tournefortii</i>	High	* <i>Lycium ferocissimum</i>	High
* <i>Bromus diandrus</i>	High	* <i>Avena barbata</i>	Moderate
* <i>Ehrharta calycina</i>	High	* <i>Briza maxima</i>	Moderate
* <i>Lupinus cosentinii</i>	High	* <i>Ursinia anthemoides</i>	Moderate

4.2 Vegetation

4.2.1 Vegetation Units

An expert botanist defined and mapped 12 vegetation units across the study area, as shown in **Figure 3**. Photographs of some vegetation units and the general study area can be found in **Appendix B**. Descriptions of the vegetation units for the study area are as follows:

1. **EPw** - *Eucalyptus loxophleba*, *E. camaldulensis*, **E.utilis* and *E. sp?* Low Open Woodland over pasture weeds

2. **AAH** - *Acacia tetragonophylla*, *A. rhodophloia* and *Hakea preissii* Tall Open Scrub over *Banksia fraseri* var. *fraseri*, *B. sessilis* var. *flabellifolia*, *Pimelea microcephala* subsp. *microcephala* and *Jacksonia sternbergiana* Shrubland over *Desmocladus asper*, **Avena barbata* and Poaceae sp.? Open Herbland/Grassland.
3. **AtMc** - *Acacia tetragonophylla* and *Melaleuca concreta* Open Heath over *Borya sphaerocephala* Herbland
4. **MrAr** - *Melaleuca rhapsiophylla* Low Woodland over *Acacia rhodophloia*, *A. rostelifera* and *A. tetragonophylla* Shrubland over **Pennisetum setaceum* and Poaceae sp.? Grassland.
5. **EIAr** - Patches of *Eucalyptus loxophleba* and *E. camaldulensis* Low Open Woodland over *Myoporum montanum*, *Acacia rostelifera* and **Schinus terebinthifolius* Tall Open Scrub over *Juncus kraussii* subsp. *kraussii*, **Pennisetum setaceum* and **Avena barbata* Herbland/Grassland
6. **AsAr** - Scattered *Acacia scirpifolia* and *A. rostelifera* over *Pimelea microcephala* subsp. *microcephala* Open Shrubland over **Pennisetum setaceum* and pasture weeds
7. **ArAt** - *Acacia rostelifera* and *A. tetragonophylla* Tall Shrubland over *Grevillea triloba* and *A. scirpifolia* Shrubland over *Desmocladus asper*, *Conostylis aculeata* subsp. *rhipidion* and **Ehrharta calycina* Herbland/Grassland.
8. **EINF** - Scattered *Eucalyptus loxophleba* and *Nuytsia floribunda* over *Allocasuarina campestris* Tall Open Shrubland over *Verticordia ?chrysantha* and variable patches of *Melaleuca concreta*, *Grevillea triloba*, *Banksia fraseri* var. *fraseri* or *Melaleuca megacephala* Open Heath over *Lepidosperma ?tenue*, *?Austrostipa* sp. and *Desmocladus asper* Herbland/ Grassland.
9. **ArAc** - Scattered *Acacia rostelifera* with *Allocasuarina campestris*, *Banksia sessilis* var. *flabellifolia* and *B. fraseri* var. *fraseri* Shrubland over *Lepidosperma? tenue* Herbland
10. **Hp** - *Hakea preissii* Tall Open Scrub at the base of ridge, then *Hakea preissii* *Dodonaea inaequifolia* *Acacia tetragonophylla* *Pittosporum ligustrifolium* and *Banksia sessilis* var. *flabellifolia* Tall Open Scrub to Open Heath on ridge face
11. **Di** - *Dodonaea inaequifolia* Closed Tall Scrub over Poaceae sp.
12. **CP** - Scattered *Eucalyptus loxophleba*, *Acacia rostelifera* and *E. sp?* Over **Avena barbata*, **Briza maxima*, **Bromus diandrus*, **Ehrharta calycina*, **Emex australis* and **Lupinus cosentinii* Closed Grassland/Herbland

4.2.2 Vegetation Condition

The vegetation on site ranged from 'Excellent' to 'Completely Degraded'. The majority of the study area is cleared pastureland in 'Completely Degraded' condition (Figure 3). The north western extent of the study area contains remnant heath

vegetation that has been fenced off from livestock and was assessed as being in 'Excellent' condition. Within close proximity to this are small patches of 'Very Good' and 'Very Good' - 'Good' vegetation. The remainder of the study area has been affected - to varying degrees from grazing, clearing and weeds. Small patches of remnant vegetation exist within the cleared pasturelands, however weeds dominate most of these areas.

4.3 Conservation Significant Vegetation

4.3.1 Biodiversity Threshold Levels

Beard Vegetation Association Extent for WA and the GRFVS Area

Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) are considered Regionally Significant vulnerable vegetation types because they have 10% - 30% of their pre-European extents remaining in WA (WAPC, 2010) (Table 3). In WA these two vegetation types have been cleared below the threshold at which species loss appears to accelerate exponentially at the ecosystem level (EPA, 2000 & 2008).

Within the GRFVS area Beard vegetation association 359 - (Shrublands; *Acacia* and *Banksia* scrub) and 675 - (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have 17.28% and 7.62% respectively remaining (Table 4). Even though the 'threshold extents apply to vegetation associations at state level, it is still important to consider the representation of these two vegetation associations within the GRFVS area in terms of local biodiversity.

It should be noted that these statistics do not take into account remnant size or vegetation condition of the areas represented by these vegetation associations. The majority of the study area has been historically cleared, and small remnants of vegetation within cleared pastureland are generally what is remaining. These remnants are continuing to degrade due to grazing and weed invasion, with the exception of the remnant vegetation represented by vegetation unit E1Nf in the north western corner of the site, rated as being in 'Excellent' condition (Figures 2 & 3).

4.3.2 GRFVS Plant Community Representation

To effectively assess the regional representation of vegetation within the study area and compare it to the dataset of the GRFVS, a 10m x 10m plot based survey followed by a quantitative statistical analysis would need to be done; this would involve a detailed Level 2 Flora and Vegetation survey in accordance with the EPA's Guidance Statement 51 (EPA, 2004). As outlined above in section 2.2.3, no GRFVS plots were established within the study area. The plant communities outlined below for the study area were mapped by the GRFVS at a confidence level of 90% (WAPC, 2010).

Plant Community 10 Near Coastal: *Acacia rostellifera* shrubland

This plant community is represented by vegetation units AAH, E1Ar and AtMc within the study area. The vegetation condition for these units ranged from 'Good' to 'Degraded' (Figure 3). Plant community 10 is thought to have previously included *Banksia prionotes*, but due to disturbance from clearing, grazing, fire and weed invasion it has been reduced to a community dominated by *Acacia rostellifera*.

This community occupies 36.63% of the native vegetation of the GRFVS area (Table 5), and is the most widespread of the plant communities

Plant Community 15 Thicket: *Melaleuca* spp / mixed spp.

This plant community is represented by vegetation units AAH, ElAr, MrAr, and EInF. The vegetation condition for these units ranged from 'Excellent' to 'Degraded' (Figure 3). This community is dominated by *Melaleuca* spp. and is most accurately portrayed in the study area by vegetation unit EInF.

Significant numbers of Threatened and Priority Flora species were recorded in this plant community by the GRFVS. Five out of eight plant community 15 quadrats surveyed by GRFVS contained flora species of conservation significance. This survey (current report) recorded Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 7.61% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area.

Plant Community 13 Sandplain: *Banksia prionotes*/ *Acacia rostellifera*

This plant community is only represented within the study area by vegetation unit ArAt; the condition of this unit was assessed as 'Good'. Species characteristic of this community include *Grevillea candelabroides*, *Melaleuca depressa*, *Hibbertia* spp., *Conostylis* spp., sedges and rushes. This survey (current report) recorded Priority Flora 1 (P1) *Melaleuca huttensis* and Priority Flora 3 (P3) *Grevillea triloba* within this plant community

This community occupies 12.23% of the native vegetation of the GRFVS area (Table 5), and is one of the more widespread of the plant communities in the GRFVS area. The GRFVS (WAPC, 2010) has stated that this community within Beard Association 359 has conservation significance because of the reduced numbers of *Banksia prionotes* due factors such as; fire, *Phytophthora* and grazing. As a result, large areas of this community no longer have this characteristic species present.

4.3.3 Regionally Significant Natural Areas and Areas of High Conservation Value

According to the EPA's *Position Statement 2* (2000) and *Guidance Statement 33* (2008) the study area is a Regionally and Locally Significant Natural Area for the following reasons:

Representation of ecological communities – Beard vegetation association 359 – (Shrublands; *Acacia* and *Banksia* scrub) and 675 – (Shrublands; *Melaleuca* and *Hakea* mixed thicket) have < 30% of their pre-European extents remaining in WA

Diversity – The study area contains natural areas in good or better condition; namely vegetation unit EInF (Figures 2 & 3).

Significant Flora/ Rarity – Two Priority Flora species were recorded with the study area. These species were Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba*. One individual *Melaleuca huttensis* was recorded, whilst *Grevillea triloba* was recorded in densities of 5% and 20% (Figure 3).

Important landscapes and landforms/ Maintaining ecological processes or natural systems and Ecological Linkages - The Moresby Range follows the boundary of the eastern extent of the study area. The Moresby range is an important landscape that is part of a natural system and provides an ecological linkage throughout its extent.

The Moresby Range escarpment within the study area was not covered by the GRFVS (WAPC, 2010), so no plant community was assigned. However, plant assemblages of the Moresby Range system are considered to be synonymous with Beard vegetation association 675 (WAPC, 2010).

5.0 CONCLUSIONS & RECOMMENDATIONS

According to *Guidance Statement 33* (EPA, 2008) and *Position Statement 2* (EPA, 2000) the study area is considered Regionally Significant because:

5. The vegetation associations within the study area have <30% of their present extents remaining within in WA (**Table 3**)
6. The study area contains native vegetation remnants in good or better condition
7. Two Priority Flora species were recorded; Priority 1 (P1) *Melaleuca huttensis* and Priority 3 (P3) *Grevillea triloba* (**Figure 3**)
8. Within the study area boundary lies, in part, the Moresby Range

To assess the proposed development of the study area, in reference to points 1 and 4, some details should be noted:

- The majority of the study area has been historically cleared and is in Completely Degraded condition (**Figure 3**)
- The Moresby Range escarpment of the study area will not be affected by the proposed development, as this area is to be set-aside as an open space.

With regards points 2 and 3 - vegetation in good or better condition, and Priority Flora – the following should be addressed:

- Within vegetation unit ArAt, P1 *Melaleuca huttensis* and P3 *Grevillea triloba* were recorded. This remnant was in Good condition but is small in size (<1ha). It is currently not fenced off from livestock, so without proper management the area will become further degraded. Due to the occurrence of P1 and P3 flora in this portion of remnant vegetation, it is recommended the area be conserved and fenced off from livestock.
- Vegetation unit EInF was in Excellent condition and is just over 10ha in size, with P3 *Grevillea triloba* recorded within this vegetation unit. Under *Guidance Statement 51* (EPA, 2004) the impact of clearing this vegetation would be considered high to moderate, as a result, a Level 2 Flora and Vegetation Survey of vegetation unit EInF would be required. Alternatively, in keeping with *Position Statement 2* (EPA, 2000) and its requirement for alternative mechanisms that address biodiversity protection, it is recommended that this remnant be retained and managed as a conservation area.

6.0 LIMITATIONS

As with any biological survey, additional flora species including potential threatened, priority or other conservation significant species may be detected in subsequent surveys. For example, ephemeral species such as orchids are not always present in each year/season or at the particular time a single botanical survey is conducted. This is a common limitation to all botanical surveys.

Approximately 10% of Western Australian flora species are undescribed, with new species found regularly. The flora identifications for this project were completed in line with the taxonomic resources and expertise available at the time.

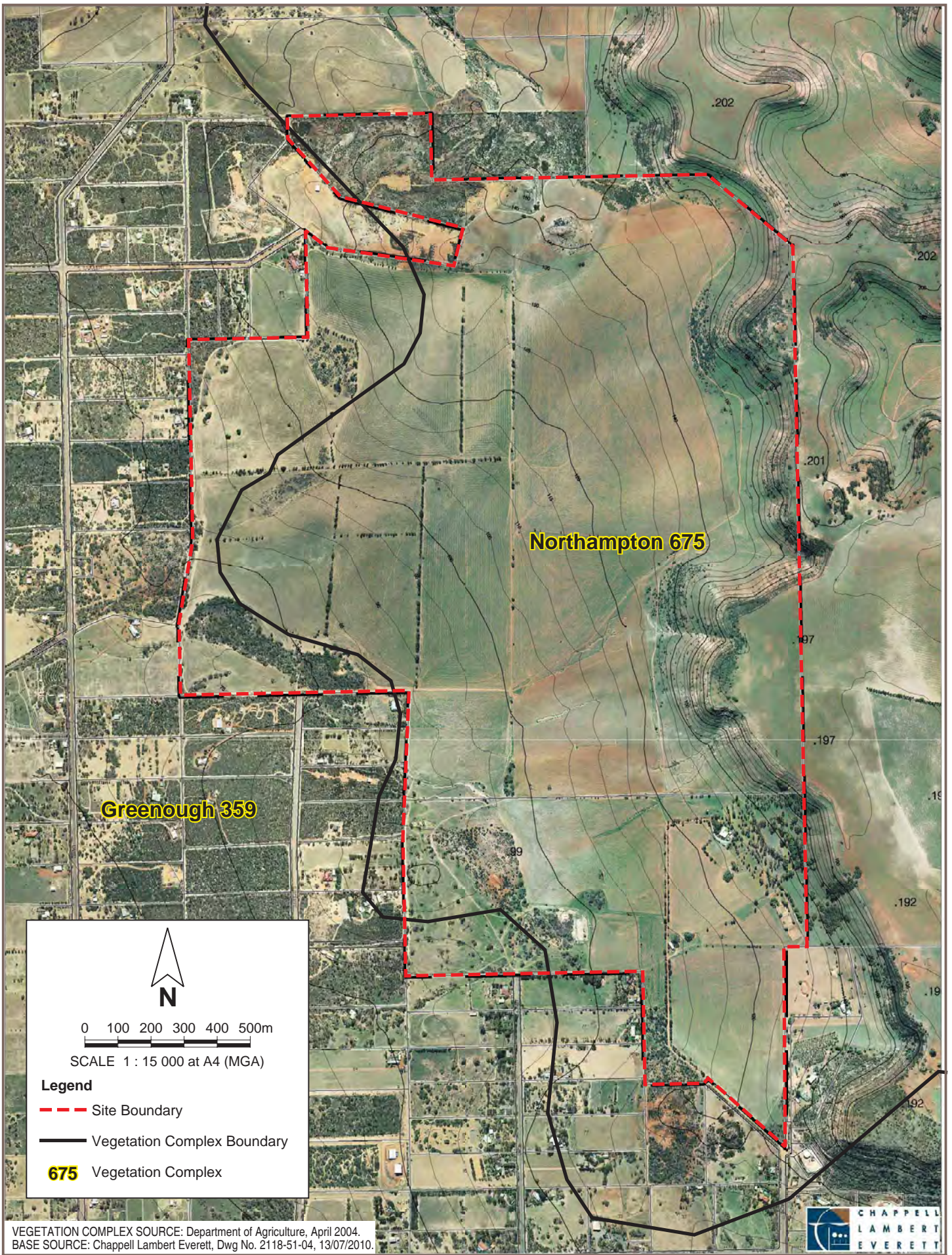
Conservation significant plant communities on site can not be positively confirmed without conducting a plot based survey.

7.0 REFERENCES

- Beard, J (1976), *Vegetation of the Geraldton Area*
- BOM (2011) *Climatic Statistics for Australian Locations*.
http://www.bom.gov.au/climate/averages/tables/cw_008051.shtml Accessed Online, May 2011
- CALM (1999), *Environmental Weed Strategy for Western Australia* Includes weedBase – a digital weed database, Department of Conservation and Land Management, Perth.
- Del Marco, A., Taylor, R., Clarke, K., Savage, K., Cullity, J. and Miles, C. (2004). *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*. Perth Biodiversity Project, Western Australian Local Government Association. West Perth.
- Desmond, A. & Chant, A. (2001) *Geraldton Sandplains 2 (GS2 - Geraldton Hills subregion)*. Department of Environment and Conservation
- Environment Australia. (2000). *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and development of Version 5.1 – Summary Report*. Environment Australia, Canberra
- EPA (2000), *Position Statement No. 2 - Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation with Particular Reference to the Agricultural Area*, Environmental Protection Authority, Perth.
- EPA (2004), *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) No 51 - Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, Environmental Protection Authority, Perth.
- EPA (2008), *Guidance Statement No. 33 - Environmental Guidance for Planning and Development*, Environmental Protection Authority, Western Australia.
- EPA (2010) *Environmental Protection Bulletin No. 10 Geraldton Regional Flora and Vegetation Survey*, Environmental Protection Authority, Western Australia
- Florabase® (2011). Department of Environment, Western Australian Herbarium <http://florabase.calm.wa.gov.au/>. Accessed Online, May 2011.
- GHD (2007) *Lots 80 & 81 Hackett Road, Waggrakine*. Unpublished report.
- Keighery, B (1994), *Bushland Plant Survey – A Guide to Plant Community Survey for the Community*, Wildflower Society of WA (Inc.), Nedlands, Western Australia.
- Noel Schoknecht, N, Tille, P and Purdie, B. (2004) *Soil-landscape mapping in south-western Australia: An overview of methodology and outputs*. Department of Agriculture.
- Smith, M.G. (2010). *Declared Rare and Priority Flora List for Western Australia, 16 September 2010*. Dept of Environment and Conservation. Como, W.A.

- Stuart-Street, A. & Clarke, M. (2005) *Greenough Region Catchment Appraisal*.
Department of Agriculture
- Thackway, R and Cresswell, I (eds.) (1995), *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0*, Australian Nature Conservation Agency, Canberra.
- WAPC (2010) *Geraldton Regional Flora and Vegetation Survey*. Western Australian Planning Commission, Perth.
- WAPC. (2000). *Bush Forever: Volume 2 Directory of Bush Forever Sites*, Perth.

FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-veg-f01.dgn

VEGETATION COMPLEX SOURCE: Department of Agriculture, April 2004.
 BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



COTERRA
 ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers	Date: 19 May 2011
Job: HUMMOR01	Revision: A

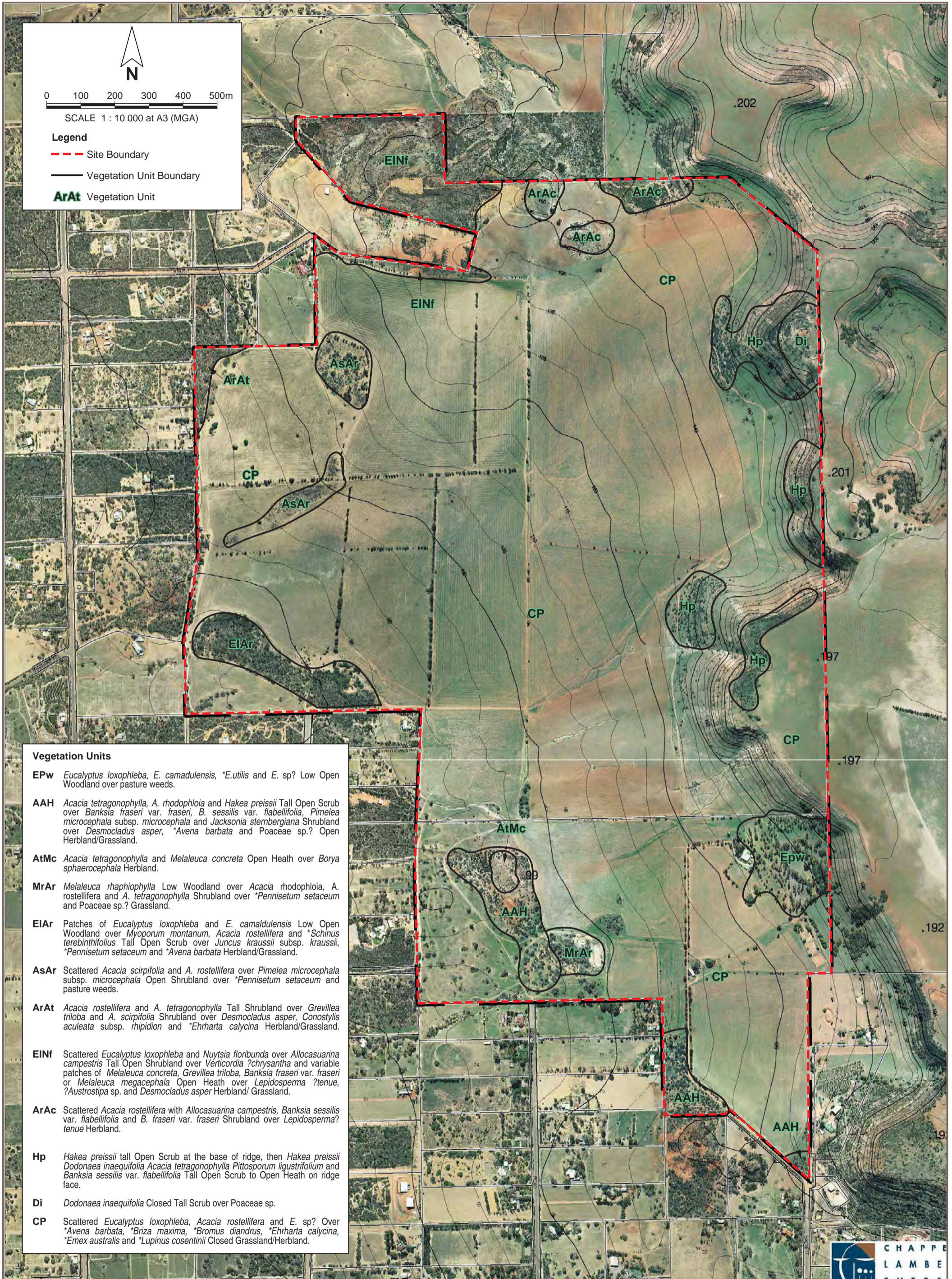
BEARD VEGETATION ASSOCIATIONS

Figure 1

SCALE 1 : 10 000 at A3 (MGA)

Legend

- - - Site Boundary
- Vegetation Unit Boundary
- ArAt Vegetation Unit



Vegetation Units

EPw	<i>Eucalyptus loxophleba</i> , <i>E. camadulensis</i> , * <i>E. utilis</i> and <i>E. sp?</i> Low Open Woodland over pasture weeds.
AAH	<i>Acacia tetragonophylla</i> , <i>A. rhodophloia</i> and <i>Hakea preissii</i> Tall Open Scrub over <i>Banksia fraseri</i> var. <i>fraseri</i> , <i>B. sessilis</i> var. <i>flabellifolia</i> , <i>Pimelea microcephala</i> subsp. <i>microcephala</i> and <i>Jacksonia stembergiana</i> Shrubland over <i>Desmocladius asper</i> , * <i>Avena barbata</i> and <i>Poaceae sp?</i> Open Herbland/Grassland.
AtMc	<i>Acacia tetragonophylla</i> and <i>Melaleuca concreta</i> Open Heath over <i>Borya sphaerocephala</i> Herbland.
MrAr	<i>Melaleuca rhapsiophylla</i> Low Woodland over <i>Acacia rhodophloia</i> , <i>A. rostellifera</i> and <i>A. tetragonophylla</i> Shrubland over * <i>Pennisetum setaceum</i> and <i>Poaceae sp?</i> Grassland.
EIAR	Patches of <i>Eucalyptus loxophleba</i> and <i>E. camadulensis</i> Low Open Woodland over <i>Myoporum montanum</i> , <i>Acacia rostellifera</i> and * <i>Schinus terebinthifolius</i> Tall Open Scrub over <i>Juncus kraussii</i> subsp. <i>kraussii</i> , * <i>Pennisetum setaceum</i> and * <i>Avena barbata</i> Herbland/Grassland.
AsAr	Scattered <i>Acacia scirpifolia</i> and <i>A. rostellifera</i> over <i>Pimelea microcephala</i> subsp. <i>microcephala</i> Open Shrubland over * <i>Pennisetum setaceum</i> and pasture weeds.
ArAt	<i>Acacia rostellifera</i> and <i>A. tetragonophylla</i> Tall Shrubland over <i>Grevillea triloba</i> and <i>A. scirpifolia</i> Shrubland over <i>Desmocladius asper</i> , <i>Conostylis aculeata</i> subsp. <i>rhipidion</i> and * <i>Ehrharta calycina</i> Herbland/Grassland.
EINF	Scattered <i>Eucalyptus loxophleba</i> and <i>Nuytsia floribunda</i> over <i>Allocasuarina campestris</i> Tall Open Shrubland over <i>Verticordia ?chrysantha</i> and variable patches of <i>Melaleuca concreta</i> , <i>Grevillea triloba</i> , <i>Banksia fraseri</i> var. <i>fraseri</i> or <i>Melaleuca megacephala</i> Open Heath over <i>Lepidosperma ?tenuis</i> , * <i>Austrostipa sp.</i> and <i>Desmocladius asper</i> Herbland/Grassland.
ArAc	Scattered <i>Acacia rostellifera</i> with <i>Allocasuarina campestris</i> , <i>Banksia sessilis</i> var. <i>flabellifolia</i> and <i>B. fraseri</i> var. <i>fraseri</i> Shrubland over <i>Lepidosperma? tenue</i> Herbland.
Hp	<i>Hakea preissii</i> tall Open Scrub at the base of ridge, then <i>Hakea preissii Dodonaea inaequifolia</i> <i>Acacia tetragonophylla</i> <i>Pittosporum ligustrifolium</i> and <i>Banksia sessilis</i> var. <i>flabellifolia</i> Tall Open Scrub to Open Heath on ridge face.
Di	<i>Dodonaea inaequifolia</i> Closed Tall Scrub over <i>Poaceae sp.</i>
CP	Scattered <i>Eucalyptus loxophleba</i> , <i>Acacia rostellifera</i> and <i>E. sp?</i> Over * <i>Avena barbata</i> , * <i>Briza maxima</i> , * <i>Bromus diandrus</i> , * <i>Ehrharta calycina</i> , * <i>Emex australis</i> and * <i>Lupinus cosentinii</i> Closed Grassland/Herbland.



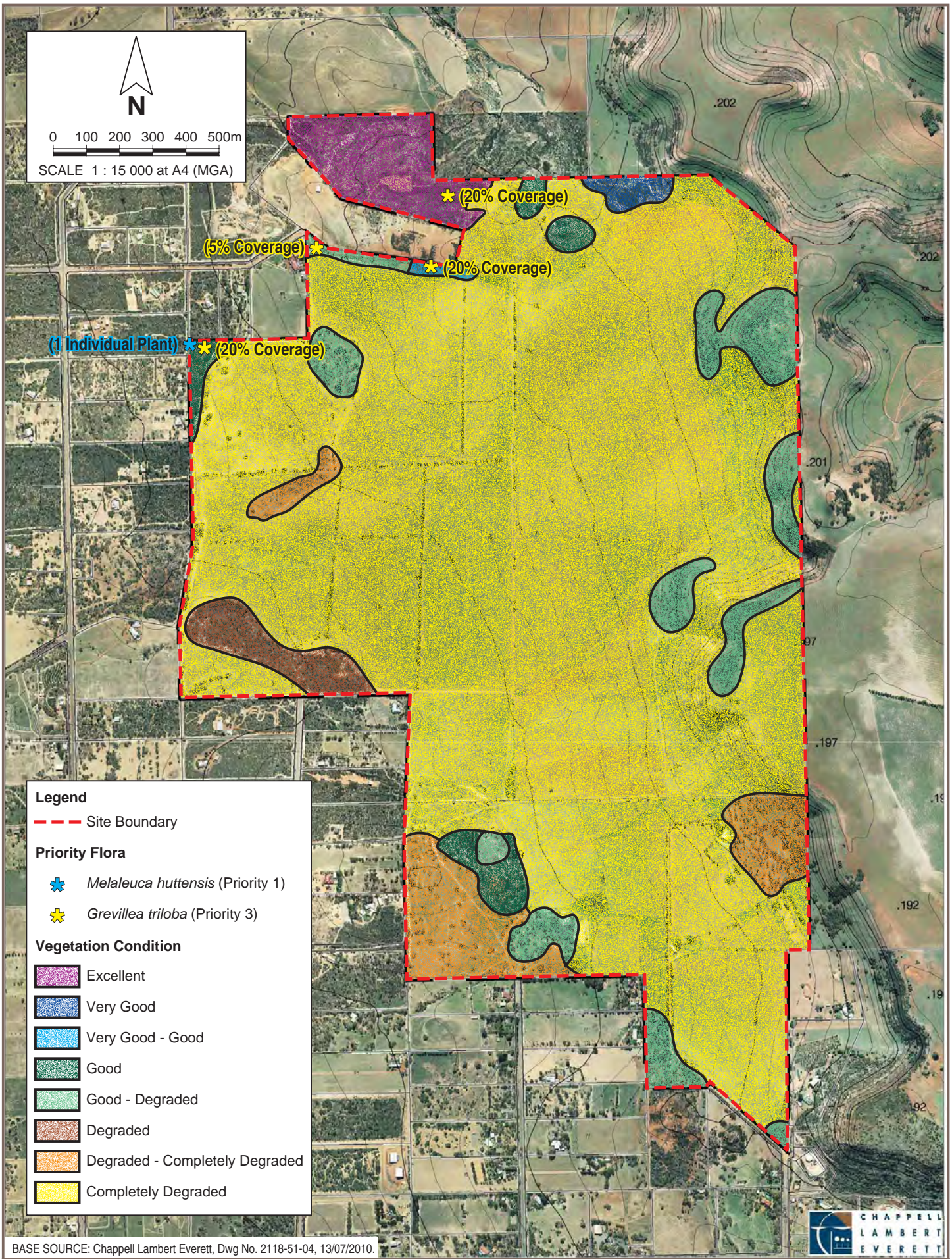
COTERRA ENVIRONMENT

Humfrey Land Developments
 FLORA AND VEGETATION REPORT
 LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON

Drawn: L. Rogers Date: 19 May 2011
 Job: HUMMOR01 Revision: A

VEGETATION UNITS

Figure 2



Legend

- Site Boundary

Priority Flora

- ★ *Melaleuca huttensis* (Priority 1)
- ★ *Grevillea triloba* (Priority 3)

Vegetation Condition

- Excellent
- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

BASE SOURCE: Chappell Lambert Everett, Dwg No. 2118-51-04, 13/07/2010.



PINPOINT CARTOGRAPHICS (08) 9562 7136 HUMMOR01-reg-03.dgn

		Humfrey Land Developments FLORA AND VEGETATION REPORT LOTS 80 & 81 HACKETT ROAD (MORESBY HEIGHTS), GERALDTON	Figure 3
Drawn: L. Rogers	Date: 19 May 2011	VEGETATION CONDITION AND LOCATIONS OF PRIORITY FLORA	
Job: HUMMOR01	Revision: A		

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Flora Species List

APPENDIX A: Species List

* denotes weed species

P1 or P3 denotes Priority Flora 1 or 3

*p denotes planted WA species

Family	Species
ANACARDIACEAE	* <i>Schinus terebinthifolius</i>
ASPARAGACEAE	<i>Acanthocarpus preissii</i>
ASTERACEAE	* <i>Ursinia anthemoides</i>
BORYACEAE	<i>Borya sphaerocephala</i>
BRASSICACEAE	* <i>Brassica tournefortii</i>
CASUARINACEAE	<i>Allocasuarina campestris</i>
CHENOPODIACEAE	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i> <i>Rhagodia preissii</i> subsp. <i>obovata</i>
COLCHICACEAE	<i>Burchardia congesta</i>
CUCURBITACEAE	* <i>Citrullus lanatus</i>
CYPERACEAE	<i>Lepidosperma ? tenue</i> <i>Lepidosperma</i> sp.? <i>Mesomelaena pseudostygia</i>
DIOSCOREACEAE	<i>Dioscorea hastifolia</i>
ERICACEAE	<i>Astroloma serratifolium</i>
FABACEAE	<i>Acacia daphnifolia</i> <i>Acacia oxyclada</i> <i>Acacia rhodophloia</i> <i>Acacia rostelifera</i> <i>Acacia saligna</i> subsp. <i>lindleyi</i> <i>Acacia scirpifolia</i> <i>Acacia tetragonophylla</i> <i>Daviesia divaricata</i> subsp. <i>lanulosa</i> <i>Gastrolobium triangulare</i> <i>Jacksonia sternbergiana</i> * <i>Lupinus cosentinii</i>

Family	Species
GOODENIACEAE	<i>Lechenaultia linarioides</i>
HAEMODORACEAE	<i>Conostylis aculeata</i> subsp. <i>hipidion</i>
HEMEROCALLIDACEAE	<i>Corynotheca micrantha</i> var. <i>micrantha</i> <i>Dianella revoluta</i> var. <i>divaricata</i> <i>Tricoryne elatior</i>
JUNCEAE	<i>Juncus kraussii</i>
LAURACEAE	<i>Cassytha aurea</i>
LORANTHACEAE	<i>Amyema preissii</i> <i>Nuytsia floribunda</i>
MYRTACEAE	<i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> <i>Eucalyptus camaldulensis</i> var. <i>obtusata</i> <i>Eucalyptus loxophleba</i> <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i> *p <i>Eucalyptus utilis</i> <i>Eucalyptus</i> sp.? <i>Melaleuca concreta</i> P1 <i>Melaleuca huttensis</i> <i>Melaleuca megacephala</i> <i>Melaleuca raphiophylla</i> ? <i>Thryptomene</i> sp. <i>Verticordia</i> ? <i>chrysantha</i>
PITTOSPORACEAE	<i>Pittosporum ligustrifolium</i> Pittosporaceae sp.?
POACEAE	<i>Amphipogon caricinus</i> <i>Austrodanthonia</i> sp. ? <i>Austrostipa</i> sp. * <i>Avena barbata</i> * <i>Briza maxima</i> * <i>Bromus diandrus</i> * <i>Ehrharta calycina</i> * <i>Pennisetum setaceum</i> Poaceae sp.
POLYGONACEAE	* <i>Emex australis</i>

Family	Species
PROTEACEAE	<i>Banksia fraseri</i> var. <i>fraseri</i> <i>Banksia prionotes</i> <i>Banksia sessilis</i> var. <i>flabellifolia</i> <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> <i>Grevillea candelabroides</i> P3 <i>Grevillea triloba</i> <i>Hakea preissii</i> <i>Petrophile conifera</i>
RESTIONACEAE	<i>Desmocladius asper</i> <i>Lepidobolus preissianus</i>
SANTALACEAE	<i>Santalum acuminatum</i>
SAPINDACEAE	<i>Dodonaea inaequifolia</i>
SCROPHULARIACEAE	<i>Myoporum montanum</i>
SOLANACEAE	* <i>Lycium ferocissimum</i>
THYMELAEACEAE	<i>Pimelea microcephala</i> subsp. <i>microcephala</i>
VITACEAE	<i>Clematicissus angustissima</i>

LEVEL 1 FLORA AND VEGETATION SURVEY

APPENDIX A – Vegetation Unit Photos

APPENDIX B – Vegetation Unit Photographs



Plate 1: AAH – Good to Degraded Condition



Plate 2: EIAr – Degraded Condition



Plate 3: ArAt – Good Condition



Plate 4: ArAc – Very Good Condition



Plate 5: EINF - Excellent Condition



Plate 6: EINF - Excellent Condition



Plate 7: Epw - Degraded to Completely Degraded Condition



Plate 8: Hp - Good to Degraded Condition

**APPENDIX C - DEC Threatened Flora and Fauna Database Search
Results (Naturemaps, 2011)**

NatureMap Species Report

Created By Guest user on 06/05/2011

Method 'By Circle'

Centre 114°39' 20" E,28°41' 30" S

Buffer 40km

Group By Kingdom

Kingdom	Species	Records
Animalia	597	8627
Chromista	18	33
Fungi	77	114
Plantae	1482	7231
TOTAL	2174	16005

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Animalia				
1.	<i>Ablabesmyia notabilis</i>			
2.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
3.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill (Inland Thornbill))			
4.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
5.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
6.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
7.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
8.	24282 <i>Accipiter fasciatus</i> subsp. <i>fasciatus</i>			
9.	<i>Acercella falcipes</i>			
10.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
11.	-1576 <i>Actitis hypoleucos</i>			
12.	<i>Aedes</i> sp.			
13.	25544 <i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
14.	<i>Agrioptocorixa eurynome</i>			
15.	<i>Agrioptocorixa parvipunctata</i>			
16.	<i>Ainudrilus</i> sp.			Y
17.	<i>Allodessus bistrigatus</i>			
18.	<i>Alona rigidicaudis</i> s.l.			
19.	<i>Alona</i> sp. nov. d (<i>Wicherina</i>)			Y
20.	30833 <i>Amphibolurus longirostris</i>			
21.	24310 <i>Anas castanea</i> (Chestnut Teal)			
22.	24312 <i>Anas gracilis</i> (Grey Teal)			
23.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
24.	25550 <i>Anas rhynchotis</i> subsp. <i>rhynchotis</i>			
25.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
26.	24332 <i>Anhinga melanogaster</i> subsp. <i>novaehollandiae</i>			
27.	-1591 <i>Anhinga novaehollandiae</i>			
28.	<i>Anisops hyperion</i>			
29.	<i>Anisops thienemanni</i>			
30.	25634 <i>Anous stolidus</i> (Common Noddy)			
31.	25635 <i>Anous tenuirostris</i> (Lesser Noddy)			
32.	25241 <i>Antaresia stimsoni</i> subsp. <i>stimsoni</i>			
33.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
34.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
35.	25670 <i>Anthus australis</i> (Australian Pipit)			
36.	-1612 <i>Anthus novaeseelandiae</i>			
37.	<i>Antiporus</i> sp.			
38.	25528 <i>Aphelocephala leucopsis</i> (Southern Whiteface)			
39.	24266 <i>Aphelocephala leucopsis</i> subsp. <i>castaneiventris</i>			
40.	24991 <i>Aprasia repens</i>			
41.	25743 <i>Aptenodytes patagonicus</i> (King Penguin)			
42.	25554 <i>Apus pacificus</i> (Fork-tailed Swift)			
43.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
44.	25538 <i>Aquila morphnoides</i> (Little Eagle)			
45.	25558 <i>Ardea ibis</i> (Cattle Egret)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
46.	-1578 <i>Ardea modesta</i>			
47.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
48.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
49.	-1583 <i>Ardenna carneipes</i>			
50.	-1571 <i>Ardenna pacifica</i>			
51.	24610 <i>Ardeotis australis</i> (Australian Bustard)		P4	
52.	25736 <i>Arenaria interpres</i> (Ruddy Turnstone)			
53.	<i>Arrenurus balladoniensis</i>			
54.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
55.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
56.	<i>Arteria sp. 1</i>			
57.	25236 <i>Aspidites ramsayi</i> (Woma)		S	
58.	<i>Asteron-complex sp. 2</i>			
59.	<i>Atractocerus kreuslerae</i>			
60.	<i>Aulonogyrus strigosus</i>			
61.	<i>Australocyclops australis</i>			
62.	<i>Australutica quaerens</i>			
63.	<i>Austrochiltonia subtenuis</i>			
64.	<i>Austrolestes aridus</i>			
65.	<i>Austrotrombella sp. nov.</i>			
66.	24318 <i>Aythya australis</i> (Hardhead)			
67.	-1633 <i>Barnardius zonarius</i>			
68.	<i>Bennelongia australis</i>			
69.	<i>Berosus approximans</i>			
70.	<i>Berosus australiae</i>			
71.	<i>Bezzia sp. 1</i>			
72.	<i>Bezzia sp. 2</i>			
73.	24319 <i>Biziura lobata</i> (Musk Duck)			
74.	<i>Boeckella triarticulata</i>			
75.	24251 <i>Bos taurus</i> (European Cattle)	Y		
76.	<i>Bostrychopsis jesuita</i>			
77.	34059 <i>Bothriembryon whiteleyi</i>		X	Y
78.	25245 <i>Brachyurophis semifasciata</i>			
79.	24723 <i>Cacatua pastinator</i> subsp. <i>butleri</i> (Butler's Corella)			
80.	24725 <i>Cacatua roseicapilla</i> subsp. <i>assimilis</i>			
81.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
82.	-1686 <i>Cacatua sp.</i>			
83.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
84.	-1590 <i>Cacomantis pallidus</i>			
85.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)			
86.	24780 <i>Calidris alba</i> (Sanderling)			
87.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)			
88.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)			
89.	24790 <i>Calidris tenuirostris</i> (Great Knot)			
90.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
91.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)		T	
92.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo)		T	
93.	<i>Candonocypris sp. 682</i> (? <i>novaezelandiae</i>)			
94.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
95.	24507 <i>Catharacta antarctica</i> subsp. <i>lonnbergi</i>			
96.	<i>Cavasteron sp. 1</i>			
97.	<i>Cephrenes augiades</i> subsp. <i>sperthias</i>			
98.	<i>Cercophonius sp.</i>			
99.	<i>Ceriodaphnia sp. nov. d</i> (Berner sp.#5)			
100.	24564 <i>Certhionyx variegatus</i> (Pied Honeyeater)			
101.	<i>Chaetogaster diastrophus</i>			
102.	-1624 <i>Chalcites basalis</i>			
103.	-1581 <i>Chalcites lucidus</i>			
104.	-1615 <i>Chalcites osculans</i>			
105.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
106.	-1634 <i>Charadrius australis</i>			
107.	25573 <i>Charadrius bicinctus</i> (Double-banded Plover)			
108.	25574 <i>Charadrius dubius</i> (Little Ringed Plover)			
109.	25575 <i>Charadrius leschenaultii</i> (Greater Sand Plover)			
110.	24373 <i>Charadrius melanops</i> (Black-fronted Dotterel)			
111.	25576 <i>Charadrius mongolus</i> (Lesser Sand Plover)			
112.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
113.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck (Wood Duck))			
114.	-1602 <i>Cheramoeca leucosterna</i>			
115.	24488 <i>Cheramoeca leucosternus</i> (White-backed Swallow)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
116.	<i>Chironomus aff. alternans</i> (V24)			
117.	<i>Chironomus tepperi</i>			
118.	-1579 <i>Chlidonias hybrida</i>			
119.	-1637 <i>Chroicocephalus novaehollandiae</i>			
120.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i>			
121.	24833 <i>Cincloramphus cruralis</i> (Brown Songlark)			
122.	24834 <i>Cincloramphus mathewsi</i> (Rufous Songlark)			
123.	-1620 <i>Cinclosoma castanotum</i>			
124.	24288 <i>Circus approximans</i> (Swamp Harrier)			
125.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
126.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
127.	24396 <i>Climacteris rufa</i> (Rufous Treecreeper)			
128.	<i>Cloeon</i> sp.			
129.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
130.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
131.	<i>Colurella coluris</i>			
132.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
133.	24416 <i>Corvus bennetti</i> (Little Crow)			
134.	25592 <i>Corvus coronoides</i> (Australian Raven)			
135.	24417 <i>Corvus coronoides</i> subsp. <i>perplexus</i>			
136.	25593 <i>Corvus orru</i> (Torresian Crow)			
137.	-1666 <i>Corvus</i> sp.			
138.	<i>Corynoneura</i> sp. (V49)			
139.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
140.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
141.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
142.	24422 <i>Cracticus tibicen</i> subsp. <i>dorsalis</i> (White-backed Magpie)			
143.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
144.	24918 <i>Crenadactylus ocellatus</i> subsp. <i>ocellatus</i>			
145.	25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet)			
146.	<i>Croitana croites</i>			
147.	30893 <i>Cryptoblepharus buchanani</i>			
148.	25020 <i>Cryptoblepharus plagioccephalus</i>			
149.	<i>Cryptochironomus griseidorsum</i>			
150.	24881 <i>Ctenophorus maculatus</i> subsp. <i>maculatus</i>			
151.	24886 <i>Ctenophorus reticulatus</i> (Western Nettle Dragon)			
152.	25027 <i>Ctenotus australis</i>			
153.	25039 <i>Ctenotus fallens</i>			
154.	25065 <i>Ctenotus pantherinus</i> subsp. <i>pantherinus</i>			
155.	<i>Culex (culex) australicus</i>			
156.	<i>Culicoides</i> sp.			
157.	25086 <i>Cyclodomorphus branchialis</i>		T	
158.	25087 <i>Cyclodomorphus celatus</i>			
159.	24322 <i>Cygnus atratus</i> (Black Swan)			
160.	<i>Cypretta baylyi</i>			
161.	<i>Cypretta</i> sp. 527			
162.	<i>Cypricerus</i> sp. 442			
163.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
164.	<i>Daphnia cf. cephalata</i>			
165.	24995 <i>Delma australis</i>			
166.	24997 <i>Delma butleri</i>			
167.	25766 <i>Delma fraseri</i>			
168.	24999 <i>Delma grayii</i>			
169.	<i>Delma</i> sp ? nov SAP			Y
170.	25004 <i>Delma tincta</i>			
171.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i>			
172.	25346 <i>Dermodochelys coriacea</i> (Leatherback Turtle)		T	
173.	<i>Dero furcata</i>			
174.	<i>Dero nivea</i>			
175.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
176.	<i>Diplacodes bipunctata</i>			
177.	25469 <i>Diplodactylus granariensis</i>			
178.	24929 <i>Diplodactylus granariensis</i> subsp. <i>granariensis</i>			
179.	24938 <i>Diplodactylus ornatus</i>			
180.	24940 <i>Diplodactylus pulcher</i>			
181.	25359 <i>Disteira major</i>			
182.	<i>Doratifera</i> sp.			
183.	24470 <i>Dromaius novaehollandiae</i> (Emu)			
184.	<i>Ecnomus pansus/turgidus</i>			
185.	-1623 <i>Egretta garzetta</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
186.	-1577 <i>Egretta novaehollandiae</i>			
187.	-1647 <i>Egretta sacra</i>			
188.	-1600 <i>Elanus axillaris</i>			
189.	25250 <i>Elapognathus coronatus</i> (Crowned Snake)			
190.	-1573 <i>Eiseyornis melanops</i>			
191.	<i>Enoplognatha</i> sp.			
192.	-1569 <i>Eolophus roseicapillus</i>			
193.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
194.	-1629 <i>Eopsaltria griseogularis</i>			
195.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
196.	24568 <i>Epthianura aurifrons</i> (Orange Chat)			
197.	24570 <i>Epthianura tricolor</i> (Crimson Chat)			
198.	25109 <i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)			
199.	24379 <i>Erythrogonys cinctus</i> (Red-kneed Dotterel)			
200.	<i>Eucyclops australiensis</i>			
201.	<i>Eucypris virens</i>			
202.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
203.	<i>Euryopsis</i> sp. 7			
204.	<i>Euryopsis</i> sp. 9			
205.	24415 <i>Eurystomus orientalis</i> subsp. <i>pacificus</i>			
206.	<i>Eylais</i> sp.			
207.	25621 <i>Falco berigora</i> (Brown Falcon)			
208.	25622 <i>Falco cenchroides</i> (Australian Kestrel)			
209.	24472 <i>Falco cenchroides</i> subsp. <i>cenchrroides</i>			
210.	25623 <i>Falco longipennis</i> (Australian Hobby)			
211.	24474 <i>Falco longipennis</i> subsp. <i>longipennis</i>			
212.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
213.	24475 <i>Falco peregrinus</i> subsp. <i>macropus</i>		S	
214.	24041 <i>Felis catus</i> (Cat)	Y		
215.	25727 <i>Fulica atra</i> (Eurasian Coot)			
216.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
217.	24765 <i>Gallirallus philippensis</i> subsp. <i>mellori</i>			
218.	<i>Gamasomorpha</i> sp. 7			
219.	<i>Gamasomorpha</i> sp. 8			
220.	24959 <i>Gehyra variegata</i>			
221.	-1614 <i>Gelochelidon nilotica</i>			
222.	Gen. 1 sp. 1			
223.	Gen. 1 sp. 1			
224.	Gen. 1 sp. 1			
225.	Gen. 1 sp. 1			
226.	Gen. 1 sp. 1			
227.	Gen. 1 sp. 1			
228.	Gen. 1 sp. 1			
229.	Gen. 1 sp. 1			
230.	Gen. 1 sp. 1			
231.	Gen. 1 sp. 1			
232.	Gen. 1 sp. 1			
233.	Gen. 1 sp. 1			
234.	Gen. 1 sp. 2			
235.	Gen. 1 sp. 2			
236.	Gen. 1 sp. 2			
237.	Gen. 1 sp. 2			
238.	Gen. 1 sp. 2			
239.	Gen. 1 sp. 2			
240.	Gen. 1 sp. 2			
241.	Gen. 1 sp. 2			
242.	Gen. 1 sp. 2			
243.	Gen. 12 sp. 2			
244.	Gen. 12 sp. 4			
245.	Gen. 2 sp. 1			
246.	Gen. 2 sp. 1			
247.	Gen. 2 sp. 1			
248.	Gen. 2 sp. 1			
249.	Gen. 2 sp. 1			
250.	Gen. 2 sp. 1			
251.	Gen. 2 sp. 1			
252.	Gen. 2 sp. 1			
253.	Gen. 3 sp. 1			
254.	Gen. 3 sp. 1			
255.	Gen. 3 sp. 1			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
256.	Gen. 3 sp. 1			
257.	Gen. 3 sp. 1			
258.	Gen. 3 sp. 1			
259.	Gen. 3 sp. 1			
260.	Gen. 3 sp. 10			
261.	Gen. 3 sp. 11			
262.	Gen. 3 sp. 12			
263.	Gen. 3 sp. 3			
264.	Gen. 3 sp. 3			
265.	Gen. 5 sp. 1			
266.	Gen. 5 sp. 1			
267.	Gen. 5 sp. 1			
268.	Gen. 6 sp. 1			
269.	Gen. 6 sp. 1			
270.	Gen. ?? sp. 12			
271.	Gen. ?? sp. 12			
272.	Gen. A sp.			
273.	-1684 Genus sp.			
274.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
275.	25585 <i>Geopelia striata</i> (Peaceful Dove)			
276.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
277.	-1596 <i>Glyciphila melanops</i>			
278.	<i>Gmogola</i> sp. B			
279.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
280.	<i>Grayenulla australensis</i>			
281.	<i>Grymeus</i> sp. 10			
282.	<i>Grymeus</i> sp. 4			
283.	<i>Grymeus</i> sp. 9			
284.	<i>Gymnometriocnemus</i> sp. A			
285.	<i>Habronestes</i> sp. 15			
286.	<i>Habronestes</i> sp. 27			Y
287.	<i>Habronestes</i> sp. 5			
288.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
289.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
290.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
291.	<i>Haliplus gibbus</i>			
292.	24689 <i>Halobaena caerulea</i> (Blue Petrel)			
293.	24297 <i>Hamirostra melanosternon</i> (Black-breasted Buzzard)			
294.	<i>Harrisius</i> sp. A			
295.	25408 <i>Heleioporus albopunctatus</i> (Western Spotted Frog)			
296.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
297.	25412 <i>Heleioporus psammophilus</i> (Sand Frog)			
298.	<i>Helobdella papillornata</i>			
299.	<i>Hemianax papuensis</i>			
300.	<i>Hemicordulia tau</i>			
301.	<i>Heterocypris tatei</i>			
302.	24961 <i>Heteronotia binoei</i> (Bynoe's Gecko)			
303.	-1601 <i>Hieraaetus morphnoides</i>			
304.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
305.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
306.	25629 <i>Hirundo nigricans</i> (Tree Martin)			
307.	<i>Hyderodes crassus</i>			
308.	25366 <i>Hydrophis elegans</i>			
309.	-1642 <i>Hydroprogne caspia</i>			
310.	24075 <i>Hyperoodon planifrons</i> (Southern Bottlenose Whale)			Y
311.	<i>Hyphydrus elegans</i>			
312.	<i>Hypochrysops halyaetus</i>			
313.	33917 <i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)		T	
314.	<i>Ilyodromus</i> sp. 566 (aff. <i>amplicolis</i>)			
315.	<i>Ischnura aurora aurora</i>			
316.	<i>Isidorella</i> sp.			
317.	<i>Kerasteron</i> sp. 1			
318.	<i>Keratella procurva</i>			
319.	<i>Kiefferulus intertinctus</i>			
320.	-1641 <i>Lalage sueurii</i>			
321.	<i>Lampona cylindrata</i>			
322.	<i>Larsia ? albiceps</i>			
323.	25638 <i>Larus pacificus</i> (Pacific Gull)			
324.	<i>Latrodectus hasseltii</i>			
325.	<i>Lecane aculeata</i>			Y

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
326.	<i>Lecane bulla</i>			
327.	<i>Lecane closterocerca</i>			
328.	<i>Lecane hamata</i>			
329.	<i>Lecane ludwigii</i>			
330.	<i>Lecane luna</i>			
331.	<i>Lecane papuana</i>			
332.	24218 <i>Leporillus apicalis</i> (Lesser Stick-nest Rat)		X	
333.	25131 <i>Lerista distinguenda</i>			
334.	25133 <i>Lerista elegans</i>			
335.	25137 <i>Lerista gerrardii</i>			
336.	25147 <i>Lerista lineata</i>		P3	
337.	25148 <i>Lerista lineopunctulata</i>			
338.	25160 <i>Lerista planiventralis</i> subsp. <i>decora</i>			
339.	25165 <i>Lerista praepedita</i>			
340.	25005 <i>Lialis burtonis</i>			
341.	24575 <i>Lichenostomus keartlandi</i> (Grey-headed Honeyeater)			
342.	25659 <i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
343.	24577 <i>Lichenostomus ornatus</i> (Yellow-plumed Honeyeater)			
344.	24578 <i>Lichenostomus penicillatus</i> (White-plumed Honeyeater)			
345.	24579 <i>Lichenostomus plumulus</i> (Grey-fronted Honeyeater)			
346.	24581 <i>Lichenostomus virescens</i> (Singing Honeyeater)			
347.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
348.	<i>Limnocythere porphyretica</i>			
349.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
350.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)			
351.	25741 <i>Limosa limosa</i> (Black-tailed Godwit)			
352.	<i>Liodessus inornatus</i>			
353.	<i>Liparetrus</i> sp.			
354.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
355.	<i>Lophocharis salpina</i>			
356.	-1635 <i>Lophochroa leadbeateri</i>			
357.	<i>Lychas</i> sp. 3			
358.	<i>Lycidas chrysomelas</i>			
359.	<i>Lycidas</i> sp. 21			Y
360.	<i>Lycidas</i> sp. 3			
361.	<i>Lycidas</i> sp. 4			
362.	<i>Lycosa forresti</i>			
363.	<i>Lycosa</i> sp. 1			
364.	<i>Lycosa</i> sp. 10			
365.	<i>Lycosa</i> sp. 14			
366.	<i>Lycosa</i> sp. 17			
367.	<i>Lycosa</i> sp. 6			
368.	<i>Lycosa</i> sp. 8			
369.	<i>Lynceus</i> sp.			
370.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		T	
371.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
372.	24133 <i>Macropus irma</i> (Western Brush Wallaby)		P4	
373.	25489 <i>Macropus robustus</i>			
374.	24135 <i>Macropus robustus</i> subsp. <i>erubescens</i> (Euro, Biggada)			
375.	<i>Macrothrix breviseta</i>			
376.	<i>Macrothrix schauinslandi</i>			
377.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
378.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
379.	24544 <i>Malurus lamberti</i> subsp. <i>assimilis</i>			
380.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
381.	24551 <i>Malurus pulcherrimus</i> (Blue-breasted Fairy-wren)			
382.	-1674 <i>Malurus</i> sp.			
383.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
384.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
385.	<i>Maratus pavonis</i>			
386.	<i>Matilda</i> sp. 1			
387.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
388.	<i>Megaporus</i> sp.			
389.	24051 <i>Megaptera novaeangliae</i> (Humpback Whale)		T	
390.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
391.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
392.	25184 <i>Menetia greyii</i>			
393.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
394.	<i>Mesocyclops brooksi</i>			
395.	-1636 <i>Microcarbo melanoleucos</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
396.	25693 <i>Microeca fascinans</i> (Jacky Winter)			
397.	<i>Micronecta gracilis</i>			
398.	<i>Micronecta robusta</i>			
399.	25542 <i>Milvus migrans</i> (Black Kite)			
400.	<i>Missulena</i> sp. 5			
401.	<i>Missulena</i> sp. 6			
402.	24904 <i>Moloch horridus</i> (Thorny Devil)			
403.	<i>Monohelea</i> sp. 3			
404.	25240 <i>Morelia spilota</i> subsp. <i>imbricata</i> (Carpet Python)		S	
405.	25191 <i>Morethia lineocellata</i>			
406.	25192 <i>Morethia obscura</i>			
407.	-1595 <i>Morus serrator</i>			
408.	24601 <i>Motacilla alba</i> subsp. <i>ocularis</i>			Y
409.	24223 <i>Mus musculus</i> (House Mouse)	Y		
410.	25610 <i>Myiagra inquieta</i> (Restless Flycatcher)			
411.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
412.	<i>Myrmopopaea</i> sp.			
413.	<i>Necterosoma</i> sp.			
414.	<i>Necterosoma wollastoni</i>			
415.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
416.	25425 <i>Neobatrachus kunapalari</i> (Kunapalari Frog)			
417.	25426 <i>Neobatrachus pelobatoides</i> (Humming Frog)			
418.	25428 <i>Neobatrachus wilmorei</i> (Plonking Frog)			
419.	24210 <i>Neophoca cinerea</i> (Australian Sea Lion)		S	
420.	<i>Neostorena</i> sp. 12			
421.	<i>Neostorena</i> sp. 4			
422.	24968 <i>Nephurus levis</i> subsp. <i>occidentalis</i>			
423.	30941 <i>Nephurus millii</i> (Barking Gecko)			
424.	<i>Nilobezzia</i> sp. 1			
425.	25748 <i>Ninox novaeseelandiae</i> (Boobook Owl)			
426.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
427.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
428.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
429.	24495 <i>Oceanites marinus</i> subsp. <i>dulciae</i>			
430.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
431.	<i>Oecetis</i> sp.			
432.	-1606 <i>Onychoprion anaethetus</i>			
433.	-1656 <i>Onychoprion fuscata</i>			
434.	<i>Opopaea</i> sp. 1			
435.	<i>Opopaea</i> sp. 10			
436.	<i>Opopaea</i> sp. 11			
437.	<i>Opopaea</i> sp. 12			
438.	<i>Opopaea</i> sp. 2			
439.	<i>Opopaea</i> sp. 3			
440.	<i>Opopaea</i> sp. 4			
441.	<i>Opopaea</i> sp. 7			
442.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
443.	<i>Orthetrum caledonicum</i>			
444.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
445.	34016 <i>Ovis aries</i> (Sheep)			
446.	24328 <i>Oxyura australis</i> (Blue-billed Duck)			
447.	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
448.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
449.	-1611 <i>Pandion cristatus</i>			
450.	<i>Parachironomus</i> sp. 1 (VSCL35)			
451.	<i>Paracyclops chiltoni</i>			
452.	<i>Parakiefferiella</i> sp. A			
453.	<i>Paramerina levidensis</i>			
454.	<i>Paramerina</i> sp.a			
455.	<i>Pararchaea</i> sp. 2			
456.	25254 <i>Parasuta monachus</i>			
457.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
458.	25687 <i>Passer domesticus</i> (House Sparrow)	Y		
459.	24642 <i>Passer montanus</i> (Eurasian Tree Sparrow)	Y		
460.	-1631 <i>Pelagodroma marina</i>			
461.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
462.	-1638 <i>Petrochelidon ariel</i>			
463.	-1640 <i>Petrochelidon nigricans</i>			
464.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
465.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
466.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
467.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
468.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
469.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
470.	<i>Phenasteron longiconductor</i>			
471.	<i>Philodina</i> sp.			Y
472.	<i>Phoracantha lata</i>			
473.	<i>Phoracantha rugithoracica</i>			
474.	-1643 <i>Phylidonyris niger</i>			
475.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
476.	24073 <i>Physeter macrocephalus</i> (Sperm Whale)		P4	
477.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
478.	25721 <i>Platycercus zonarius</i> (Australian Ringneck (Ring-necked Parrot))			
479.	<i>Platynectes decempunctatus</i> var. <i>polygrammus</i>			
480.	<i>Platynectes</i> sp.			
481.	<i>Platyomopsis</i> sp.			
482.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)			
483.	25509 <i>Pletholax gracilis</i> (Keeled Legless Lizard)			
484.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i>			
485.	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)			
486.	24383 <i>Pluvialis squatarola</i> (Grey Plover)			
487.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
488.	25510 <i>Pogona minor</i>			
489.	24907 <i>Pogona minor</i> subsp. <i>minor</i>			
490.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
491.	<i>Polypedilum nubifer</i>			
492.	<i>Polypedilum watsoni</i>			
493.	30854 <i>Polytelis anthopeplus</i> subsp. <i>westralis</i>			
494.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
495.	34013 <i>Pomatostomus superciliosus</i> subsp. <i>ashbyi</i> (White-browed Babbler (western wheatbelt))		P4	
496.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
497.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
498.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
499.	<i>Pristina jenkiniae</i>			
500.	<i>Procladius paludicola</i>			
501.	33991 <i>Psacodonotus seriatus</i> ((cricket))		P1	Y
502.	-1655 <i>Psephotus varius</i>			
503.	25261 <i>Pseudechis australis</i> (Mulga Snake)			
504.	24230 <i>Pseudomys albocinereus</i> (Ash-grey Mouse)			
505.	25263 <i>Pseudonaja modesta</i> (Ringed Brown Snake)			
506.	25264 <i>Pseudonaja nuchalis</i> (Gwardar)			
507.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
508.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill (Chiming Wedgebill))			
509.	24173 <i>Pteropus scapulatus</i> (Little Red Flying-fox)			
510.	-1625 <i>Purnella albifrons</i>			
511.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
512.	25009 <i>Pygopus nigriceps</i>			
513.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
514.	25271 <i>Ramphotyphlops australis</i>			
515.	25279 <i>Ramphotyphlops hamatus</i>			
516.	25281 <i>Ramphotyphlops leptosoma</i>			
517.	25285 <i>Ramphotyphlops pinguis</i>			
518.	25288 <i>Ramphotyphlops waitii</i>			
519.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
520.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
521.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
522.	<i>Rhantus</i> sp.			
523.	-1654 <i>Rhipidura albiscapa</i>			
524.	25613 <i>Rhipidura fuliginosa</i> (Grey Fantail)			
525.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
526.	<i>Sarscyridopsis aculeata</i>			
527.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
528.	24279 <i>Sericornis frontalis</i> subsp. <i>maculatus</i>			
529.	<i>Simocephalus elizabethae</i>			
530.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
531.	25267 <i>Simoselaps littoralis</i> (West Coast Banded Snake)			
532.	<i>Simulium ornatipes</i>			
533.	30948 <i>Smicromis brevirostris</i> (Weebill)			
534.	24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
535.	24109 <i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			
536.	24112 <i>Sminthopsis granulipes</i> (White-tailed Dunnart)			
537.	<i>Sondra</i> sp. 1			
538.	<i>Steatoda</i> sp. 1			
539.	-1574 <i>Stercorarius antarcticus</i>			
540.	-1619 <i>Stercorarius maccormicki</i>			Y
541.	24517 <i>Stercorarius parasiticus</i> (Arctic Skua)			
542.	25640 <i>Sterna dougallii</i> (Roseate Tern)			
543.	24530 <i>Sterna nereis</i> subsp. <i>nereis</i>			
544.	-1599 <i>Sternula nereis</i>			
545.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
546.	24426 <i>Strepera versicolor</i> subsp. <i>plumbea</i>			
547.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
548.	30950 <i>Streptopelia senegalensis</i> subsp. <i>senegalensis</i>	Y		
549.	25518 <i>Strophurus spinigerus</i>			
550.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
551.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe (Black-throated Grebe))			
552.	24207 <i>Tachyglossus aculeatus</i> (Echidna)			
553.	24185 <i>Tadarida australis</i> (White-striped Freetail-bat)			
554.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck (Mountain Duck))			
555.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
556.	30871 <i>Taeniopygia guttata</i> subsp. <i>castanotis</i>			
557.	<i>Tanytarsus fuscithorax/semibarbitarsus</i>			
558.	<i>Tanytarsus</i> sp. F			Y
559.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
560.	<i>Tasmanocoenis tillyardi</i>			
561.	<i>Textracella</i> sp. 1			
562.	34135 <i>Thalassarche cauta</i> (Shy Albatross)		T	
563.	34007 <i>Thalassarche chlororhynchos</i> (Atlantic Yellow-nosed Albatross)		T	
564.	-1582 <i>Thalassarche melanophris</i>			
565.	-1622 <i>Thalasseus bergii</i>			
566.	<i>Thienemanniella</i> sp. (V19)			
567.	24844 <i>Threskiornis molucca</i> (Australian White Ibis)			
568.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
569.	25203 <i>Tiliqua occipitalis</i> (Western Bluetongue)			
570.	25519 <i>Tiliqua rugosa</i>			
571.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
572.	24308 <i>Todiramphus pyrrhopygia</i> (Red-backed Kingfisher)			
573.	-1613 <i>Todiramphus pyrrhopygius</i>			
574.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
575.	-1617 <i>Tribonyx ventralis</i>			
576.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
577.	24803 <i>Tringa brevipes</i> (Grey-tailed Tattler)			
578.	24806 <i>Tringa glareola</i> (Wood Sandpaper)			
579.	24808 <i>Tringa nebularia</i> (Common Greenshank)			
580.	<i>Triplectides australis</i>			
581.	24851 <i>Turnix velox</i> (Little Button-quail)			
582.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
583.	24852 <i>Tyto alba</i> subsp. <i>delicatula</i>			
584.	-1626 <i>Tyto javanica</i>			
585.	24855 <i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i>		P3	
586.	24983 <i>Underwoodisaurus millii</i> (Barking Gecko)			
587.	<i>Urodacus</i> sp. 1			
588.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
589.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
590.	25227 <i>Varanus tristis</i> subsp. <i>tristis</i> (Racehorse Monitor)			
591.	<i>Venatrix pullastra</i>			
592.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
593.	<i>Xanthagrion erythroneurum</i>			
594.	-1639 <i>Xenus cinereus</i>			
595.	<i>Zillimata scintillans</i>			
596.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye (Silvereye))			
597.	24856 <i>Zosterops lateralis</i> subsp. <i>gouldi</i>			
Chromista				
598.	26586 <i>Caulocystis uvifera</i>			
599.	26731 <i>Cystoseira trinodis</i>			
600.	26766 <i>Dictyopteris muelleri</i>			
601.	26767 <i>Dictyopteris plagiogramma</i>			
602.	29537 <i>Dictyota fastigiata</i>			
603.	29939 <i>Dictyota moniliformis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
604.	35216 <i>Dictyota paniculata</i>			
605.	26946 <i>Hormophysa cuneiformis</i>			
606.	27043 <i>Lobophora variegata</i>			
607.	27090 <i>Myriodesma quercifolium</i>			
608.	27118 <i>Padina sanctae-crucis</i>			
609.	27123 <i>Perithalia caudata</i>			
610.	-9620 <i>Sargassum cinctum</i>			Y
611.	27236 <i>Sargassum decurrens</i>			
612.	27245 <i>Sargassum ilicifolium</i>			
613.	27264 <i>Scaberia agardhii</i>			
614.	27273 <i>Scytothalia dorycarpa</i>			
615.	27373 <i>Zonaria turneriana</i>			

Fungi

616.	27574 <i>Acarospora citrina</i>			
617.	-10227 <i>Alternaria brassicae</i>			Y
618.	-11461 <i>Alternaria japonica</i>			Y
619.	-4469 <i>Alternaria solani</i>			
620.	-13185 <i>Ascochyta rabiei</i>			
621.	27587 <i>Aspicilia calcarea</i>			
622.	27593 <i>Buellia alboatra</i>			
623.	-5725 <i>Buellia</i> sp.			
624.	-5296 <i>Caloplaca burneimensis</i>			
625.	27625 <i>Caloplaca cinnabarina</i>			
626.	27628 <i>Caloplaca erythrostricta</i>			
627.	-12556 <i>Caloplaca kaernefeltii</i>			
628.	31099 <i>Caloplaca kantvilasii</i>			
629.	27638 <i>Caloplaca marina</i>			
630.	-3957 <i>Caloplaca mereschkowskiana</i>			
631.	-11616 <i>Caloplaca michelagoensis</i>			
632.	31095 <i>Caloplaca montisfracti</i>			
633.	-12902 <i>Caloplaca</i> sp.			
634.	-6058 <i>Caloplaca yorkensis</i>			Y
635.	27645 <i>Candelariella xanthostigmoides</i>			
636.	27649 <i>Canoparmelia pruinata</i>			
637.	-8172 <i>Cercospora echii</i>			Y
638.	-13018 <i>Cladosporium herbarum</i>			Y
639.	-4180 <i>Cochliobolus victoriae</i>			
640.	-8329 <i>Colletotrichum gloeosporioides</i>			
641.	-7183 <i>Colletotrichum orbiculare</i>			Y
642.	27718 <i>Diploschistes euganeus</i>			
643.	-3855 <i>Drechslera teres</i>			
644.	27741 <i>Endocarpon simplicatum</i>			
645.	-9728 <i>Endocarpon</i> sp.			
646.	27748 <i>Flavoparmelia rutidota</i>			
647.	-9847 <i>Flavoparmelia</i> sp.			
648.	-4702 <i>Fusarium equiseti</i>			
649.	-12094 <i>Fusarium oxysporum</i>			Y
650.	-6320 <i>Gaeumannomyces graminis</i> var. <i>tritici</i>			
651.	-11951 <i>Graphis</i> sp.			
652.	-11257 <i>Hyperphyscia</i> sp.			
653.	-11223 <i>Leptosphaeria nodorum</i>			
654.	-5611 <i>Mycosphaerella capsellae</i>			Y
655.	27956 <i>Pertusaria thiospoda</i>			
656.	20167 <i>Pertusaria trachyspora</i>		P2	
657.	-9407 <i>Phaeogyroporus portentosus</i>			
658.	27972 <i>Physcia jackii</i>			
659.	-9592 <i>Physoderma trifolii</i>			
660.	-10822 <i>Placidium lacinulatum</i>			
661.	-3905 <i>Placidium</i> sp.			
662.	27998 <i>Psora crenata</i>			
663.	-7216 <i>Puccinia coronata</i>			
664.	-5068 <i>Puccinia graminis</i>			
665.	-6842 <i>Puccinia graminis</i> forma <i>avenae</i>			
666.	-12538 <i>Puccinia graminis</i> forma <i>tritici</i>			
667.	-12188 <i>Puccinia haemodori</i>			
668.	28007 <i>Punctelia subalbicans</i>			
669.	28017 <i>Pyxine cocoes</i>			
670.	28052 <i>Rinodina thiomela</i>			
671.	-12715 <i>Septoria lycopersici</i>			Y
672.	28060 <i>Siphula coriacea</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
673.	28065 <i>Teloschistes chrysophthalmus</i>			
674.	28075 <i>Toninia glaucocarpa</i>			
675.	-9750 <i>Toninia</i> sp.			
676.	28080 <i>Trapeliopsis psammophila</i>			
677.	-6370 <i>Uromyces polygoni-aviculariae</i>			
678.	-8367 <i>Uromycladium tepperianum</i>			
679.	28102 <i>Xanthoparmelia alternata</i>			
680.	28104 <i>Xanthoparmelia amplexula</i>			
681.	28145 <i>Xanthoparmelia isidiosa</i>			
682.	29019 <i>Xanthoparmelia kondininensis</i>		P2	
683.	28156 <i>Xanthoparmelia nana</i>			
684.	29964 <i>Xanthoparmelia sargentii</i>		P1	
685.	28180 <i>Xanthoparmelia succedans</i>			
686.	28181 <i>Xanthoparmelia taractica</i>			
687.	28192 <i>Xanthoparmelia yowaensis</i>			
688.	-10456 <i>Xanthoria ectanea</i>			
689.	30455 <i>Xanthoria elixii</i>			
690.	28193 <i>Xanthoria ligulata</i>			
691.	28194 <i>Xanthoria parietina</i>			
692.	-3959 <i>Xanthoria parietinoides</i>			Y

Plantae

693.	4889 <i>Abutilon cryptopetalum</i>			
694.	-4675 <i>Acacia Plurinerves-Microneurae Phyllodes >8-nerved, terete(Misc.- SW)</i>			
695.	3197 <i>Acacia aciphylla</i>			
696.	3199 <i>Acacia acuaria</i>			
697.	3200 <i>Acacia acuminata (Jam)</i>			
698.	3207 <i>Acacia alata (Winged Wattle)</i>			
699.	16111 <i>Acacia alata var. biglandulosa</i>			
700.	3225 <i>Acacia ashbyae</i>			
701.	3238 <i>Acacia bidentata</i>			
702.	3242 <i>Acacia blakelyi</i>			
703.	15471 <i>Acacia brumalis</i>			
704.	3265 <i>Acacia comans</i>			
705.	-10495 <i>Acacia comans Variant No. 1</i>			
706.	15473 <i>Acacia congesta subsp. congesta</i>			
707.	3269 <i>Acacia coolgardiensis (Spinifex Wattle)</i>			
708.	3282 <i>Acacia cyclops (Coastal Wattle)</i>			
709.	20435 <i>Acacia daphnifolia</i>			
710.	3301 <i>Acacia dielsii</i>			
711.	3323 <i>Acacia ericifolia</i>			
712.	3358 <i>Acacia guinetii (Guinet's Wattle)</i>		P4	Y
713.	3376 <i>Acacia idiomorpha</i>			
714.	3391 <i>Acacia jacksonioides</i>			
715.	-8604 <i>Acacia lasiocarpa var. *</i>			
716.	-4811 <i>Acacia lasiocarpa var. ?</i>			
717.	11611 <i>Acacia lasiocarpa var. lasiocarpa</i>			
718.	-4667 <i>Acacia lasiocarpa var. lasiocarpa (flat pinnule variant)</i>			
719.	15721 <i>Acacia lasiocarpa var. sedifolia</i>			
720.	3412 <i>Acacia latipes</i>			
721.	-10506 <i>Acacia latipes Variant No. 2</i>			
722.	15476 <i>Acacia latipes subsp. latipes</i>			
723.	11448 <i>Acacia leptospermoides subsp. leptospermoides</i>			
724.	-5526 <i>Acacia leptospermoides subsp. leptospermoides/psammophila</i>			
725.	11330 <i>Acacia leptospermoides subsp. psammophila</i>		P3	
726.	3419 <i>Acacia ligulata (Umbrella Bush)</i>			
727.	3437 <i>Acacia megacephala</i>		P2	
728.	15290 <i>Acacia neurophylla subsp. erugata</i>			
729.	15291 <i>Acacia neurophylla subsp. neurophylla</i>			
730.	3466 <i>Acacia oldfieldii</i>			
731.	3470 <i>Acacia orbifolia</i>			
732.	3474 <i>Acacia oxyclada</i>			
733.	14134 <i>Acacia pelophila</i>		P1	
734.	3515 <i>Acacia restiacea</i>			
735.	3525 <i>Acacia rostellifera (Summer-scented Wattle)</i>			
736.	-12473 <i>Acacia rostellifera x xanthina</i>			
737.	3527 <i>Acacia saligna (Orange Wattle)</i>			
738.	30033 <i>Acacia saligna subsp. lindleyi</i>			
739.	-8016 <i>Acacia saligna x xanthina</i>			Y
740.	3532 <i>Acacia scirpifolia</i>			
741.	3534 <i>Acacia sclerosperma (Limestone Wattle)</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
742.	3541 <i>Acacia sessilis</i>			
743.	3546 <i>Acacia signata</i>			
744.	-6755 <i>Acacia</i> sp.			
745.	20344 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798)			
746.	29118 <i>Acacia</i> sp. small seed (B.R. Maslin 7830)			
747.	-11839 <i>Acacia</i> sp. Northampton (B.R. Maslin 7798) subsp.			
748.	8951 <i>Acacia spathulata</i>			
749.	3549 <i>Acacia spathulifolia</i>			
750.	15484 <i>Acacia sphacelata</i> subsp. <i>sphacelata</i>			
751.	12268 <i>Acacia sphenophylla</i>			
752.	15294 <i>Acacia stereophylla</i> var. <i>stereophylla</i>			
753.	3577 <i>Acacia tetragonophylla</i> (Kurara)			
754.	3581 <i>Acacia trigonophylla</i>			
755.	3587 <i>Acacia ulicina</i>			
756.	3604 <i>Acacia xanthina</i> (White-stemmed Wattle)			
757.	1205 <i>Acanthocarpus canaliculatus</i>			
758.	1207 <i>Acanthocarpus parviflorus</i>		P3	
759.	1208 <i>Acanthocarpus preissii</i>			
760.	1209 <i>Acanthocarpus robustus</i>			
761.	-9369 <i>Acanthocarpus</i> sp.			
762.	20797 <i>Acanthocarpus</i> sp. <i>Ajana</i> (C.A. Gardner 8596)			
763.	26441 <i>Acanthopora spicifera</i>			
764.	32310 <i>Acaulon triquetrum</i>			Y
765.	26447 <i>Acrothamnion preissii</i>			
766.	19901 <i>Actinobole oldfieldianum</i>			
767.	7817 <i>Actinobole uliginosum</i> (Flannel Cudweed)			
768.	7818 <i>Actites megalocarpus</i> (Dune Thistle)			
769.	11837 <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> (Common Woollybush)			
770.	4582 <i>Adriana quadripartita</i> (Bitter Bush)			
771.	20331 <i>Aeonium arboreum</i>	Y		
772.	176 <i>Agrostis avenacea</i> (Blowgrass)			
773.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
774.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
775.	1376 <i>Allium orientale</i>	Y		
776.	-7430 <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> / <i>prinsepiana</i>			
777.	1721 <i>Allocasuarina campestris</i>			
778.	1725 <i>Allocasuarina dielsiana</i> (Northern Sheoak)			
779.	1731 <i>Allocasuarina huegeliana</i> (Rock Sheoak)			
780.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
781.	-6080 <i>Allocasuarina</i> sp.			
782.	1739 <i>Allocasuarina thuyoides</i> (Horned Sheoak)			
783.	2652 <i>Alternanthera nodiflora</i> (Common Joyweed)			
784.	19465 <i>Aluta aspera</i> subsp. <i>hesperia</i>			
785.	20173 <i>Alyogyne coronopifolia</i>			
786.	-7864 <i>Alyogyne coronopifolia</i> x <i>purpurea</i>			Y
787.	4905 <i>Alyogyne hakeifolia</i>			
788.	4906 <i>Alyogyne huegelii</i> (Lilac Hibiscus)			
789.	17975 <i>Alyogyne huegelii</i> var. <i>grossulariifolia</i>			
790.	15458 <i>Alyogyne huegelii</i> var. <i>huegelii</i>			
791.	15459 <i>Alyogyne huegelii</i> var. <i>wrayae</i>			
792.	4907 <i>Alyogyne pinoniana</i> (Sand Hibiscus)			
793.	20082 <i>Alyogyne purpurea</i>			
794.	20078 <i>Alyogyne wrayae</i>			
795.	6565 <i>Alyxia buxifolia</i> (Dysentery Bush)			
796.	2671 <i>Amaranthus viridis</i> (Green Amaranth)	Y		
797.	6209 <i>Ammi majus</i> (Bishop's Weed)	Y		
798.	126 <i>Amphibolis antarctica</i> (Sea Nymph)			
799.	127 <i>Amphibolis griffithii</i>			
800.	196 <i>Amphipogon caricinus</i> (Long Greybeard Grass)			
801.	-3593 <i>Amphipogon caricinus</i> - <i>strictus</i> complex			
802.	12025 <i>Amphipogon caricinus</i> var. <i>caricinus</i>			
803.	26463 <i>Amphiroa gracilis</i>			
804.	2372 <i>Amyema fitzgeraldii</i> (Pincushion Mistletoe)			
805.	13266 <i>Amyema miraculosa</i> subsp. <i>miraculosa</i>			
806.	-11696 <i>Amyema miraculosum</i>			Y
807.	2383 <i>Amyema preissii</i> (Wireleaf Mistletoe)			
808.	6480 <i>Anagallis arvensis</i> (Pimpernel)	Y		
809.	7827 <i>Angianthus cunninghamii</i> (Coast Angianthus)			
810.	-4422 <i>Angianthus</i> sp.			
811.	7836 <i>Angianthus tomentosus</i> (Camel-grass)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
812.	1409 <i>Anigozanthos humilis</i> (Catspaw)			
813.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
814.	1411 <i>Anigozanthos manglesii</i> (Mangles Kangaroo Paw)			
815.	11565 <i>Anigozanthos manglesii</i> subsp. <i>quadrans</i>			
816.	2332 <i>Anthobolus foveolatus</i>			
817.	11725 <i>Anthocercis ilicifolia</i> subsp. <i>ilicifolia</i>			
818.	6948 <i>Anthocercis intricata</i>		P3	
819.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
820.	-7127 <i>Anthoceros</i> sp.			
821.	6953 <i>Anthotroche walcottii</i>			
822.	3180 <i>Aphanopetalum clematideum</i>			
823.	1117 <i>Aphelia cyperoides</i>			
824.	12040 <i>Apium prostratum</i> var. <i>prostratum</i> (Sea Celery)			
825.	7838 <i>Arctotheca calendula</i> (Cape Weed)	Y		
826.	7839 <i>Arctotheca populifolia</i> (Dune Arctotheca)	Y		
827.	17797 <i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	Y		
828.	207 <i>Aristida contorta</i> (Bunched Kerosene Grass)			
829.	210 <i>Aristida holathera</i>			
830.	12063 <i>Aristida holathera</i> var. <i>holathera</i>			
831.	11542 <i>Arrhenatherum elatius</i> var. <i>bulbosum</i> (Onion Twitch)	Y		
832.	1266 <i>Arthropodium dyeri</i>			
833.	-11798 <i>Arthropodium</i> sp.			
834.	6580 <i>Asclepias curassavica</i> (Redhead Cottonbush)	Y		
835.	-10279 <i>Asterella</i> sp.			
836.	7845 <i>Asteridea asteroides</i>			
837.	7850 <i>Asteridea nivea</i>			
838.	6328 <i>Astroloma glaucescens</i>			
839.	6332 <i>Astroloma microdonta</i> (Sandplain Cranberry)			
840.	16941 <i>Astroloma pedicellatum</i>			
841.	6336 <i>Astroloma serratifolium</i> (Kondrung)			
842.	2450 <i>Atriplex amnicola</i> (Swamp Saltbush)			
843.	2452 <i>Atriplex cinerea</i> (Grey Saltbush)			
844.	2463 <i>Atriplex isatidea</i> (Coast Saltbush)			
845.	2476 <i>Atriplex semilunaris</i> (Annual Saltbush)			
846.	-8696 <i>Atriplex</i> sp.			
847.	2479 <i>Atriplex stipitata</i> (Mallee Saltbush)			
848.	17951 <i>Austrodanthonia acerosa</i>			
849.	17950 <i>Austrodanthonia caespitosa</i>			
850.	17945 <i>Austrodanthonia setacea</i>			
851.	-3439 <i>Austrodanthonia setacea</i> group			
852.	-8365 <i>Austrodanthonia</i> sp.			
853.	17234 <i>Austrostipa compressa</i>			
854.	17235 <i>Austrostipa crinita</i>			
855.	17237 <i>Austrostipa elegantissima</i>			
856.	17239 <i>Austrostipa exilis</i>			
857.	17240 <i>Austrostipa flavescens</i>			
858.	17241 <i>Austrostipa hemipogon</i>			
859.	17244 <i>Austrostipa macalpinei</i>			
860.	17246 <i>Austrostipa nitida</i>			
861.	17251 <i>Austrostipa scabra</i>			
862.	37421 <i>Austrostipa</i> sp. <i>Marchagee</i> (B.R. Maslin 1407)			
863.	17254 <i>Austrostipa tenuifolia</i>			
864.	17255 <i>Austrostipa trichophylla</i>			
865.	17257 <i>Austrostipa variabilis</i>			
866.	231 <i>Avellinia michelii</i>	Y		
867.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
868.	234 <i>Avena fatua</i> (Wild Oat)	Y		
869.	5341 <i>Baeckea crispiflora</i>			
870.	5350 <i>Baeckea grandiflora</i> (Large-flowered Baeckea)			
871.	16815 <i>Baeckea</i> sp. <i>Mingenew</i> (M.E. Trudgen 12029)			
872.	14476 <i>Baeckea</i> sp. <i>Walkaway</i> (A.S. George 11249)		P3	
873.	5366 <i>Baeckea staminosa</i>		P1	
874.	1799 <i>Banksia ashbyi</i> (Ashby's Banksia)			
875.	1800 <i>Banksia attenuata</i> (Slender Banksia)			
876.	32623 <i>Banksia carlinoides</i> (Pink Dryandra)			
877.	32576 <i>Banksia dallanneyi</i> (Couch Honeypot)			
878.	1816 <i>Banksia elegans</i> (Elegant Banksia)		P4	
879.	32524 <i>Banksia fraseri</i> var. <i>ashbyi</i>			
880.	32523 <i>Banksia fraseri</i> var. <i>fraseri</i>			
881.	1828 <i>Banksia leptophylla</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
882.	11386 <i>Banksia leptophylla</i> var. <i>melletica</i>			
883.	1829 <i>Banksia lindleyana</i> (Porcupine Banksia)			
884.	-1257 <i>Banksia menz_ellii</i>			
885.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
886.	1842 <i>Banksia prionotes</i> (Acorn Banksia)			
887.	1846 <i>Banksia scabrella</i> (Burma Road Banksia)		P4	
888.	1847 <i>Banksia sceptrum</i> (Sceptre Banksia)			
889.	32079 <i>Banksia sessilis</i> var. <i>flabellifolia</i>			
890.	32080 <i>Banksia sessilis</i> var. <i>sessilis</i>			
891.	1855 <i>Banksia victoriae</i> (Woolly Orange Banksia)			
892.	32315 <i>Barbula calycina</i>			
893.	15037 <i>Bartsia trixago</i>	Y		
894.	2482 <i>Bassia scoparia</i>	Y		
895.	740 <i>Baumea arthropophylla</i>			
896.	743 <i>Baumea juncea</i> (Bare Twigrush)			
897.	17761 <i>Beaufortia aestiva</i>			
898.	-4152 <i>Beaufortia</i> sp.			
899.	4601 <i>Beyeria viscosa</i> (Pinkwood)			
900.	20815 <i>Biserrula pelecinus</i>	Y		Y
901.	31606 <i>Blackallia nudiflora</i> (Wedge-leaved Cryptandra)		P3	
902.	7856 <i>Blennochora drummondii</i>			
903.	2770 <i>Boerhavia coccinea</i> (Tar Vine)			
904.	-5923 <i>Boerhavia</i> sp.			
905.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
906.	6609 <i>Bonamia rosea</i> (Felted Bellflower)			
907.	-4800 <i>Bonamia</i> sp.			
908.	4409 <i>Boronia coerulescens</i>			
909.	11498 <i>Boronia coerulescens</i> subsp. <i>spicata</i>			
910.	11274 <i>Boronia coerulescens</i> subsp. <i>spinescens</i>			
911.	4414 <i>Boronia cymosa</i> (Granite Boronia)			
912.	4438 <i>Boronia ramosa</i>			
913.	11381 <i>Boronia ramosa</i> subsp. <i>anethifolia</i>			
914.	16639 <i>Boronia scabra</i> subsp. <i>scabra</i>			
915.	-4748 <i>Boronia</i> sp.			
916.	1273 <i>Borya sphaerocephala</i> (Pincushions)			
917.	30232 <i>Bossiaea calcicola</i>		P3	
918.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
919.	3719 <i>Bossiaea spinescens</i>			
920.	240 <i>Bothriochloa ewartiana</i> (Desert Bluegrass)			
921.	15000 <i>Brachychiton populneus</i> subsp. <i>populneus</i>	Y		
922.	30132 <i>Brachyloma pirara</i>			
923.	8661 <i>Brachypodium distachyon</i> (False Brome)	Y		
924.	7870 <i>Brachyscome cheilocarpa</i>			
925.	7871 <i>Brachyscome ciliaris</i>			
926.	7872 <i>Brachyscome ciliocarpa</i>			
927.	7878 <i>Brachyscome iberidifolia</i>			
928.	7881 <i>Brachyscome oncocarpa</i>			
929.	7882 <i>Brachyscome perpusilla</i>			
930.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
931.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
932.	245 <i>Briza minor</i> (Shivery Grass)	Y		
933.	248 <i>Bromus catharticus</i> (Prairie Grass)	Y		
934.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
935.	250 <i>Bromus hordeaceus</i> (Soft Brome)	Y		
936.	252 <i>Bromus madritensis</i> (Madrid Brome)	Y		
937.	253 <i>Bromus rubens</i> (Red Brome)	Y		
938.	7413 <i>Brunonia australis</i> (Native Cornflower)			
939.	6675 <i>Buglossoides arvensis</i> (Corn Gromwell)	Y		
940.	12770 <i>Burchardia congesta</i>			
941.	3167 <i>Bursaria occidentalis</i>			
942.	15445 <i>Caesia alfordii</i>			
943.	1276 <i>Caesia micrantha</i> (Pale Grass-lily)			
944.	29439 <i>Caesia</i> sp. <i>Wongan</i> (K.F. Kenneally 8820)			
945.	3002 <i>Cakile maritima</i> (Sea Rocket)	Y		
946.	15337 <i>Caladenia bryceana</i> subsp. <i>cracens</i>		T	
947.	1584 <i>Caladenia deformis</i> (Blue Fairy Orchid)			
948.	11136 <i>Caladenia denticulata</i>			
949.	13618 <i>Caladenia elegans</i>		T	
950.	1592 <i>Caladenia flava</i> (Cowslip Orchid)			
951.	15348 <i>Caladenia flava</i> subsp. <i>flava</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
952.	15349 <i>Caladenia flava</i> subsp. <i>maculata</i>			
953.	15502 <i>Caladenia footeana</i>			
954.	13857 <i>Caladenia hoffmanii</i>		T	
955.	-11348 <i>Caladenia hoffmanii</i> x <i>longicauda</i>			
956.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
957.	1602 <i>Caladenia longicauda</i> (Common White Spider Orchid)			
958.	15360 <i>Caladenia longicauda</i> subsp. <i>borealis</i>			
959.	1603 <i>Caladenia longiclavata</i> (Clubbed Spider Orchid)			
960.	17760 <i>Caladenia nobilis</i>			
961.	1611 <i>Caladenia radialis</i> (Drooping Spider Orchid)			
962.	15378 <i>Caladenia reptans</i> subsp. <i>impensa</i>			
963.	1620 <i>Caladenia wanosa</i> (Kalbarri Spider Orchid)		T	
964.	2845 <i>Calandrinia brevipedata</i> (Short-stalked Purslane)			
965.	2846 <i>Calandrinia calyptrata</i> (Pink Purslane)			
966.	2848 <i>Calandrinia corrigioloides</i> (Strap Purslane)			
967.	2854 <i>Calandrinia granulifera</i> (Pygmy Purslane)			
968.	2855 <i>Calandrinia lehmannii</i>			
969.	2860 <i>Calandrinia polyandra</i> (Parakeelya)			
970.	2867 <i>Calandrinia remota</i>			
971.	-3613 <i>Calandrinia</i> sp.			
972.	20478 <i>Calandrinia</i> sp. Blackberry (D.M. Porter 171)			
973.	19832 <i>Calandrinia</i> sp. Ongerup (K.R. Newbey 11834)			
974.	20477 <i>Calandrinia</i> sp. SW coastal (J. Dodd 753)			
975.	19304 <i>Calectasia browneana</i>		P2	
976.	5395 <i>Callistemon phoeniceus</i> (Lesser Bottlebrush)			
977.	36560 <i>Callitris arenaria</i> (Sandplain Cypress)			
978.	26533 <i>Callophycus costatus</i>			
979.	26536 <i>Callophycus oppositifolius</i>			
980.	5401 <i>Calothamnus blepharospermus</i>			
981.	34196 <i>Calothamnus chrysanthereus</i> (Claw Flower)			
982.	35856 <i>Calothamnus glaber</i>			
983.	35696 <i>Calothamnus phellosus</i>			
984.	35756 <i>Calothamnus quadrifidus</i> subsp. <i>angustifolius</i>			
985.	35758 <i>Calothamnus quadrifidus</i> subsp. <i>homalophyllus</i> (Murchison Clawflower)			
986.	35759 <i>Calothamnus quadrifidus</i> subsp. <i>obtusus</i>			
987.	5429 <i>Calothamnus sanguineus</i> (Silky-leaved Blood flower)			
988.	7903 <i>Calotis hispidula</i> (Bindy Eye)			
989.	7905 <i>Calotis multicaulis</i> (Many-stemmed Burr-daisy)			
990.	-12966 <i>Calotis</i> sp.			
991.	5443 <i>Calytrix brevifolia</i>			
992.	5450 <i>Calytrix depressa</i>			
993.	5462 <i>Calytrix gracilis</i>			
994.	5465 <i>Calytrix leschenaultii</i>			
995.	5468 <i>Calytrix oldfieldii</i>			
996.	19978 <i>Calytrix pimeleoides</i>		P3	
997.	5475 <i>Calytrix purpurea</i>		P2	
998.	5479 <i>Calytrix strigosa</i>			
999.	5485 <i>Calytrix variabilis</i>			
1000.	2796 <i>Carpobrotus modestus</i> (Inland Pigface)			
1001.	-7790 <i>Carpobrotus praecox</i>			Y
1002.	2798 <i>Carpobrotus virescens</i> (Coastal Pigface)			
1003.	7911 <i>Carthamus lanatus</i> (Saffron Thistle)	Y		
1004.	7913 <i>Carthamus tinctorius</i>	Y		
1005.	12073 <i>Cassytha aurea</i> var. <i>aurea</i>			
1006.	11351 <i>Cassytha aurea</i> var. <i>hirta</i>			
1007.	2952 <i>Cassytha glabella</i> (Tangled Dodder Laurel)			
1008.	11211 <i>Cassytha glabella</i> forma <i>dispar</i>			
1009.	11857 <i>Cassytha glabella</i> forma <i>glabella</i>			
1010.	2956 <i>Cassytha pomiformis</i> (Dodder Laurel)			
1011.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
1012.	11242 <i>Cassytha racemosa</i> forma <i>pilosa</i>			
1013.	11799 <i>Cassytha racemosa</i> forma <i>racemosa</i>			
1014.	-9051 <i>Cassytha</i> sp.			
1015.	1742 <i>Casuarina obesa</i> (Swamp Sheoak)			
1016.	13685 <i>Catapodium rigidum</i> (Rigid Fescue)	Y		
1017.	26555 <i>Caulerpa brownii</i>			
1018.	26556 <i>Caulerpa cactoides</i>			
1019.	26557 <i>Caulerpa cliftonii</i>			
1020.	26560 <i>Caulerpa distichophylla</i>			
1021.	27380 <i>Caulerpa flexilis</i> var. <i>muelleri</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1022.	26573 <i>Caulerpa racemosa</i>			
1023.	26578 <i>Caulerpa simpliciuscula</i>			
1024.	258 <i>Cenchrus ciliaris</i> (Buffel Grass)	Y		
1025.	259 <i>Cenchrus echinatus</i> (Burrgrass)	Y		
1026.	262 <i>Cenchrus longispinus</i> (Spiny Burrgrass)	Y		
1027.	29721 <i>Cenchrus setiger</i> (Birdwood Grass)	Y		
1028.	6539 <i>Centaurium erythraea</i> (Common Centaury)	Y		
1029.	6542 <i>Centaurium tenuiflorum</i>	Y		
1030.	6214 <i>Centella asiatica</i>			
1031.	19759 <i>Centipeda crateriformis</i> subsp. <i>crateriformis</i>			
1032.	26587 <i>Centroceras clavulatum</i>			
1033.	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
1034.	1124 <i>Centrolepis cephaliformis</i>			
1035.	1125 <i>Centrolepis drummondiana</i>			
1036.	1131 <i>Centrolepis inconspicua</i>			
1037.	1133 <i>Centrolepis pilosa</i>			
1038.	1134 <i>Centrolepis polygyna</i> (Wiry Centrolepis)			
1039.	7922 <i>Cephalopterum drummondii</i> (Pompom Head)			
1040.	7923 <i>Cephalosorus carpesioides</i>			
1041.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
1042.	7924 <i>Ceratogyne obionoides</i> (Wingwort)			
1043.	17685 <i>Chaetanthus aristatus</i>			
1044.	18156 <i>Chamaecytisus palmensis</i> (Tagasaste)	Y		
1045.	11299 <i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>			
1046.	-3963 <i>Chamaescilla</i> sp.			
1047.	8788 <i>Chamaescilla versicolor</i>			
1048.	14808 <i>Chamelaucium drummondii</i> subsp. <i>drummondii</i>			
1049.	5496 <i>Chamelaucium micranthum</i>			
1050.	5497 <i>Chamelaucium pauciflorum</i>			
1051.	35596 <i>Chamelaucium</i> sp. <i>Yuna</i> (A.C. Burns 53)		P2	
1052.	5498 <i>Chamelaucium uncinatum</i> (Geraldton Wax)			
1053.	1513 <i>Chasmanthe floribunda</i> (African Cornflag)	Y		
1054.	12796 <i>Cheilanthes adiantoides</i>			
1055.	31 <i>Cheilanthes austrotenuifolia</i>			
1056.	12818 <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			
1057.	31768 <i>Cheiranthra simplicifolia</i>			
1058.	2489 <i>Chenopodium gaudichaudianum</i> (Cottony Saltbush)			
1059.	2494 <i>Chenopodium murale</i> (Nettle-leaf Goosefoot)	Y		
1060.	270 <i>Chloris pumilio</i>			
1061.	271 <i>Chloris truncata</i> (Windmill Grass)			
1062.	7925 <i>Chondrilla juncea</i> (Skeleton Weed)	Y		
1063.	763 <i>Chorizandra enodis</i> (Black Bristlerush)			
1064.	13111 <i>Chorizema aciculare</i> subsp. <i>laxum</i>			
1065.	13115 <i>Chorizema humile</i>		T	
1066.	13114 <i>Chorizema racemosum</i>			
1067.	11900 <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Y		
1068.	7928 <i>Chrysanthemum coronarium</i>	Y		
1069.	12612 <i>Chrysocephalum apiculatum</i>			
1070.	7933 <i>Chthonocephalus pseudevax</i> (Woolly Groundheads)			
1071.	-9828 <i>Chthonocephalus</i> sp.			
1072.	6543 <i>Cicendia filiformis</i> (Slender Cicendia)	Y		
1073.	7936 <i>Cirsium arvense</i> (Canada Thistle)	Y		Y
1074.	-7982 <i>Cirsium</i> sp.			Y
1075.	7370 <i>Citrullus lanatus</i> (Pie Melon)	Y		
1076.	26659 <i>Cladophora valonioides</i>			
1077.	26663 <i>Cladurus elatus</i>			
1078.	26665 <i>Clavicleonium ovatum</i>			
1079.	4853 <i>Clematicissus angustissima</i>			
1080.	10804 <i>Clematis linearifolia</i>			
1081.	26677 <i>Codium mamillosum</i>			
1082.	2778 <i>Codonocarpus cotinifolius</i> (Native Poplar)			
1083.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
1084.	4555 <i>Comesperma integerrimum</i>			
1085.	4560 <i>Comesperma rhadinocarpum</i> (Slender-fruited Comesperma)		P2	
1086.	4561 <i>Comesperma scoparium</i> (Broom Milkwort)			
1087.	4563 <i>Comesperma spinosum</i> (Spiny Milkwort)			
1088.	4564 <i>Comesperma virgatum</i> (Milkwort)			
1089.	20541 <i>Commersonia bivillosa</i>		P1	
1090.	5002 <i>Commersonia gaudichaudii</i>			
1091.	5004 <i>Commersonia microphylla</i>		P2	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1092.	2776 <i>Commicarpus australis</i> (Perennial Tar Vine)			
1093.	15608 <i>Conospermum acerosum</i> subsp. <i>hirsutum</i>			
1094.	15512 <i>Conospermum boreale</i> subsp. <i>ascendens</i>			
1095.	15513 <i>Conospermum boreale</i> subsp. <i>boreale</i>			
1096.	1876 <i>Conospermum incurvum</i> (Plume Smokebush)			
1097.	16849 <i>Conospermum microflorum</i>			
1098.	1882 <i>Conospermum stoechadis</i> (Common Smokebush)			
1099.	15611 <i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> (Common Smokebush)			
1100.	15523 <i>Conospermum wycherleyi</i>			
1101.	15522 <i>Conospermum wycherleyi</i> subsp. <i>wycherleyi</i>			
1102.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
1103.	11641 <i>Conostylis aculeata</i> subsp. <i>rhipidion</i>			
1104.	-8419 <i>Conostylis aculeata</i> x <i>prolifera</i> subsp. <i>rhipidion</i>			Y
1105.	1420 <i>Conostylis androstemma</i> (Trumpets)			
1106.	1423 <i>Conostylis aurea</i> (Golden Conostylis)			
1107.	12027 <i>Conostylis candicans</i> subsp. <i>calcicola</i>			
1108.	-6130 <i>Conostylis candicans</i> x <i>robusta</i>			
1109.	-12821 <i>Conostylis candicans</i> x <i>stylioides</i>			
1110.	1442 <i>Conostylis neocymosa</i>			
1111.	1446 <i>Conostylis prolifera</i> (Mat Cottonheads)			
1112.	1448 <i>Conostylis resinosa</i>			
1113.	1450 <i>Conostylis robusta</i>			
1114.	1456 <i>Conostylis stylioides</i>			
1115.	5502 <i>Conothamnus trinervis</i>			
1116.	6614 <i>Convolvulus remotus</i>			
1117.	7938 <i>Conyza albida</i> (Tall Fleabane)	Y		
1118.	7939 <i>Conyza bonariensis</i> (Flaxleaf Fleabane)	Y		
1119.	2891 <i>Corrigiola litoralis</i> (Strapwort)	Y		
1120.	17104 <i>Corymbia calophylla</i> (Marri)			
1121.	11834 <i>Corynotheca micrantha</i> var. <i>acanthoclada</i>			
1122.	11283 <i>Corynotheca micrantha</i> var. <i>micrantha</i>			
1123.	7943 <i>Cotula australis</i> (Common Cotula)			
1124.	7944 <i>Cotula bipinnata</i> (Ferry Cotula)	Y		
1125.	7945 <i>Cotula coronopifolia</i> (Waterbuttons)	Y		
1126.	3136 <i>Crassula alata</i>	Y		
1127.	17701 <i>Crassula closiana</i>			
1128.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
1129.	11709 <i>Crassula colorata</i> var. <i>acuminata</i>			
1130.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
1131.	3138 <i>Crassula decumbens</i> (Rufous Stonecrop)			
1132.	11349 <i>Crassula decumbens</i> var. <i>decumbens</i>			
1133.	3142 <i>Crassula natans</i>	Y		
1134.	19861 <i>Cristonia biloba</i>			
1135.	35839 <i>Cristonia stenophylla</i>			
1136.	4792 <i>Cryptandra arbutiflora</i> (Waxy Cryptandra)			
1137.	16018 <i>Cryptandra arbutiflora</i> var. <i>borealis</i>			
1138.	31614 <i>Cryptandra multispina</i>			
1139.	4802 <i>Cryptandra mutila</i>			
1140.	9076 <i>Cryptandra myriantha</i>			
1141.	4809 <i>Cryptandra pungens</i>			
1142.	-7517 <i>Cryptandra</i> sp.			
1143.	4811 <i>Cryptandra spyridioides</i>			
1144.	9077 <i>Cryptandra wichurae</i>			Y
1145.	26709 <i>Cryptonemia undulata</i>			
1146.	29599 <i>Cryptostegia grandiflora</i>	Y		
1147.	6663 <i>Cuscuta epithymum</i> (Lesser Dodder)	Y		
1148.	11021 <i>Cuscuta planiflora</i>	Y		
1149.	-11671 <i>Cuscuta</i> sp.			
1150.	15114 <i>Cyanicula gemmata</i>			
1151.	6216 <i>Cyclosporum leptophyllum</i>	Y		
1152.	281 <i>Cymbopogon obtectus</i> (Silkyheads)			
1153.	-12436 <i>Cymbopogon</i> sp.			
1154.	6584 <i>Cynanchum floribundum</i> (Dumara Bush)			
1155.	283 <i>Cynodon dactylon</i> (Couch)	Y		
1156.	786 <i>Cyperus cunninghamii</i>			
1157.	789 <i>Cyperus difformis</i> (Rice Sedge)			
1158.	794 <i>Cyperus gymnocaulos</i> (Spiny Flat-sedge)			
1159.	809 <i>Cyperus rigidellus</i>			
1160.	810 <i>Cyperus rotundus</i> (Nut Grass)	Y		
1161.	-13069 <i>Cyperus</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1162.	815 <i>Cyperus tenellus</i> (Tiny Flatsedge)	Y		
1163.	818 <i>Cyperus vaginatus</i> (Stiffleaf Sedge)			
1164.	10916 <i>Cyrtostylis huegelii</i>			
1165.	7421 <i>Dampiera altissima</i> (Tall Dampiera)			
1166.	7443 <i>Dampiera haematotricha</i>			
1167.	7448 <i>Dampiera incana</i> (Hoary Dampiera)			
1168.	11326 <i>Dampiera incana</i> var. <i>fuscescens</i>			
1169.	7453 <i>Dampiera lindleyi</i>			
1170.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
1171.	7459 <i>Dampiera oligophylla</i> (Sparse-leaved Dampiera)			
1172.	-10054 <i>Dampiera</i> sp.			
1173.	7475 <i>Dampiera spicigera</i> (Spiked Dampiera)			
1174.	5522 <i>Darwinia pauciflora</i>			
1175.	26738 <i>Dasya elongata</i>			
1176.	26752 <i>Dasyclonium incisum</i>			
1177.	26753 <i>Dasyphila preissii</i>			
1178.	10823 <i>Datura innoxia</i>	Y		
1179.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
1180.	3797 <i>Daviesia cardiophylla</i>			
1181.	3807 <i>Daviesia divaricata</i> (Marmo)			
1182.	18561 <i>Daviesia divaricata</i> subsp. <i>lanulosa</i>			
1183.	3814 <i>Daviesia hakeoides</i>			
1184.	11879 <i>Daviesia hakeoides</i> subsp. <i>hakeoides</i>			
1185.	3831 <i>Daviesia pedunculata</i>			
1186.	3832 <i>Daviesia physodes</i>			
1187.	17663 <i>Desmocladius asper</i>			
1188.	17624 <i>Desmocladius glomeratus</i>		P2	Y
1189.	17662 <i>Desmocladius lateriticus</i>			
1190.	17846 <i>Desmocladius parthenicus</i>			
1191.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
1192.	11636 <i>Dianella revoluta</i> var. <i>divaricata</i>			
1193.	1287 <i>Dichopogon capillipes</i>			
1194.	-5372 <i>Dichopogon</i> sp.			
1195.	26758 <i>Dicranema revolutum</i>			
1196.	6760 <i>Dicrastylis fulva</i>			
1197.	26762 <i>Dictyomenia sonderi</i>			
1198.	-5123 <i>Dictyomenia</i> sp.			
1199.	26763 <i>Dictyomenia tridens</i>			
1200.	26782 <i>Digenea simplex</i>			
1201.	311 <i>Digitaria ciliaris</i> (Summer Grass)	Y		
1202.	1509 <i>Dioscorea hastifolia</i> (Warrine)			
1203.	15270 <i>Diplolaena geraldtonensis</i>			
1204.	-10113 <i>Diplolaena geraldtonensis</i> x <i>grandiflora</i>			Y
1205.	4456 <i>Diplolaena grandiflora</i> (Wild Rose)			
1206.	15273 <i>Diplolaena leemaniana</i>			
1207.	18541 <i>Diplopeltis huegelii</i> subsp. <i>huegelii</i>			
1208.	18542 <i>Diplopeltis huegelii</i> subsp. <i>subintegra</i>			
1209.	4748 <i>Diplopeltis petiolaris</i>			
1210.	7961 <i>Dittrichia graveolens</i> (Stinkwort)	Y		
1211.	11049 <i>Diuris corymbosa</i>			
1212.	1634 <i>Diuris laxiflora</i> (Bee Orchid)			
1213.	12936 <i>Diuris recurva</i>		P4	
1214.	-8553 <i>Diuris refracta</i>			
1215.	1638 <i>Diuris setacea</i> (Bristly Donkey Orchid)			
1216.	19457 <i>Diuris</i> sp. <i>Eneabba</i> (A.H. Burbidge 3941)			
1217.	4754 <i>Dodonaea aptera</i> (Coast Hop-bush)			
1218.	4761 <i>Dodonaea ericoides</i>			
1219.	4766 <i>Dodonaea inaequifolia</i>			
1220.	4768 <i>Dodonaea larreoides</i>			
1221.	13633 <i>Drakaea concolor</i>		T	
1222.	3092 <i>Drosera bulbosa</i> (Red-leaved Sundew)			
1223.	13219 <i>Drosera bulbosa</i> subsp. <i>bulbosa</i>			
1224.	13220 <i>Drosera bulbosa</i> subsp. <i>major</i>			
1225.	3098 <i>Drosera glanduligera</i> (Pimpernel Sundew)			
1226.	8910 <i>Drosera humilis</i>			
1227.	3106 <i>Drosera macrantha</i> (Bridal Rainbow)			
1228.	14298 <i>Drosera macrantha</i> subsp. <i>macrantha</i>			
1229.	3107 <i>Drosera macrophylla</i> (Showy Sundew)			
1230.	11196 <i>Drosera menziesii</i> subsp. <i>thysanosepala</i>			
1231.	11246 <i>Drosera neesii</i> subsp. <i>borealis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1232.	3116 <i>Drosera omissa</i> (Bright Sundew)			
1233.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
1234.	3127 <i>Drosera radicans</i>			
1235.	8911 <i>Drosera rosulata</i>			
1236.	3131 <i>Drosera stolonifera</i> (Leafy Sundew)			
1237.	4458 <i>Drummondita ericoides</i> (Moresby Range Drummondita)		T	Y
1238.	1908 <i>Dryandra fraseri</i>			
1239.	6966 <i>Duboisia hopwoodii</i> (Pituri)			
1240.	31334 <i>Duperreya sericea</i>			
1241.	33597 <i>Dysphania melanocarpa</i> forma <i>melanocarpa</i> (Black Goosefoot)			
1242.	33480 <i>Dysphania pumilio</i> (Clammy Goosefoot)			
1243.	1066 <i>Ecdeiocolea monostachya</i>			
1244.	6681 <i>Echium plantagineum</i> (Paterson's Curse)	Y		
1245.	11485 <i>Ehrharta brevifolia</i> var. <i>cuspidata</i>	Y		
1246.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
1247.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
1248.	1644 <i>Elythranthera emarginata</i> (Pink Enamel Orchid)			
1249.	2510 <i>Enchylaena lanata</i>			
1250.	12064 <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> (Barrier Saltbush)			
1251.	29555 <i>Enekbatus bounites</i>		P2	Y
1252.	376 <i>Eragrostis curvula</i> (African Lovegrass)	Y		
1253.	378 <i>Eragrostis dielsii</i> (Mallee Lovegrass)			
1254.	393 <i>Eragrostis setifolia</i> (Neverfail Grass)			
1255.	5536 <i>Eremaea acutifolia</i> (Rusty Eremaea)		P2	
1256.	5537 <i>Eremaea beaufortiooides</i>			
1257.	5538 <i>Eremaea brevifolia</i>			
1258.	14102 <i>Eremaea ebracteata</i> var. <i>ebracteata</i>			
1259.	5541 <i>Eremaea pauciflora</i>			
1260.	7185 <i>Eremophila brevifolia</i> (Spotted Eremophila)		P2	
1261.	7189 <i>Eremophila clarkei</i> (Turpentine Bush)			
1262.	7200 <i>Eremophila drummondii</i>			
1263.	7215 <i>Eremophila glabra</i> (Tar Bush)			
1264.	17175 <i>Eremophila glabra</i> subsp. <i>albicans</i>			
1265.	14193 <i>Eremophila glabra</i> subsp. <i>carcosa</i>			
1266.	14191 <i>Eremophila glabra</i> subsp. <i>tomentosa</i>			
1267.	7230 <i>Eremophila latrobei</i> (Warty Fuchsia Bush)			
1268.	7273 <i>Eremophila strongylophylla</i>			
1269.	17162 <i>Eremophila subfloccosa</i> subsp. <i>lanata</i>			
1270.	408 <i>Eriachne flaccida</i> (Claypan Grass)			
1271.	413 <i>Eriachne mucronata</i> (Mountain Wanderrie Grass)			
1272.	415 <i>Eriachne ovata</i>			
1273.	1646 <i>Eriochilus dilatatus</i> (White Bunny Orchid)			
1274.	30432 <i>Eriochilus dilatatus</i> subsp. <i>brevifolius</i>			
1275.	15410 <i>Eriochilus dilatatus</i> subsp. <i>dilatatus</i>			
1276.	15413 <i>Eriochilus dilatatus</i> subsp. <i>undulatus</i>			
1277.	4331 <i>Erodium aureum</i>	Y		
1278.	4335 <i>Erodium cygnorum</i> (Blue Heronsbill)			
1279.	4336 <i>Erodium moschatum</i> (Musky Crowfoot)	Y		
1280.	3013 <i>Eruca sativa</i> (Purplevein Rocket)	Y		
1281.	14376 <i>Erymophyllum ramosum</i> subsp. <i>involucratum</i>			
1282.	12740 <i>Erymophyllum tenellum</i>			
1283.	26823 <i>Erythroclonium sonderi</i>			
1284.	12896 <i>Eucalyptus arachnaea</i> (Black-stemmed Mallee)			
1285.	12895 <i>Eucalyptus arachnaea</i> subsp. <i>arachnaea</i>			
1286.	9141 <i>Eucalyptus baudiniana</i>			
1287.	13039 <i>Eucalyptus blaxellii</i>		P4	
1288.	-4900 <i>Eucalyptus blaxellii</i> / <i>loxophleba</i>			Y
1289.	-3984 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i>			Y
1290.	-7085 <i>Eucalyptus blaxellii</i> x <i>loxophleba</i> subsp. <i>supralaevis</i>			Y
1291.	35345 <i>Eucalyptus camaldulensis</i> subsp. <i>obtusa</i> (Blunt-budded River Red Gum)			
1292.	15441 <i>Eucalyptus camaldulensis</i> var. <i>obtusa</i> (Blunt-budded River Red Gum)			
1293.	13510 <i>Eucalyptus cuprea</i> (Mallee Box)		T	
1294.	15494 <i>Eucalyptus diminuta</i>			
1295.	15804 <i>Eucalyptus dolichocera</i>			
1296.	13550 <i>Eucalyptus ebbanoensis</i> subsp. <i>photina</i>		P4	
1297.	5640 <i>Eucalyptus eudesmioides</i> (Malalie)			
1298.	5648 <i>Eucalyptus flocktoniae</i> (Merri)			
1299.	5673 <i>Eucalyptus horistes</i>			
1300.	5681 <i>Eucalyptus jucunda</i> (Yuna Mallee)			
1301.	11295 <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> (York Gum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1302.	13038 <i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i>			
1303.	5722 <i>Eucalyptus obtusiflora</i> (Dongara Mallee)			
1304.	5725 <i>Eucalyptus oldfieldii</i> (Oldfield's Mallee)			
1305.	5730 <i>Eucalyptus oraria</i> (Ooragmandee)			
1306.	5756 <i>Eucalyptus pyriformis</i> (Pear-fruited Mallee)			
1307.	5761 <i>Eucalyptus rigidula</i> (Stiff-leaved Mallee)			
1308.	5763 <i>Eucalyptus rudis</i> (Flooded Gum)			
1309.	12883 <i>Eucalyptus subangusta</i> subsp. <i>subangusta</i>			
1310.	5793 <i>Eucalyptus transcontinentalis</i> (Redwood)			
1311.	11011 <i>Eulalia aurea</i>			
1312.	4617 <i>Euphorbia australis</i> (Namana)			
1313.	4620 <i>Euphorbia boophthona</i> (Gascoyne Spurge)			
1314.	4626 <i>Euphorbia drummondii</i> (Caustic Weed)			
1315.	17896 <i>Euphorbia drummondii</i> subsp. <i>drummondii</i>			
1316.	20014 <i>Euphorbia hyssopifolia</i>	Y		
1317.	4638 <i>Euphorbia peplus</i> (Petty Spurge)	Y		
1318.	4644 <i>Euphorbia sharkoensis</i>			
1319.	12097 <i>Euphorbia tannensis</i> subsp. <i>eremophila</i> (Desert Spurge)			
1320.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
1321.	-4286 <i>Euptilota</i> sp.			
1322.	10765 <i>Exocarpos sparteus</i> (Broom Ballart)			
1323.	1515 <i>Ferraria crispa</i> (Black Flag)	Y		
1324.	430 <i>Festuca arundinacea</i> (Tall Fescue)	Y		
1325.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
1326.	18392 <i>Freesia alba</i> x <i>leichtlinii</i>	Y		
1327.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
1328.	904 <i>Gahnia drummondii</i>			
1329.	906 <i>Gahnia lanigera</i> (Little Sedge)			
1330.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
1331.	7323 <i>Galium murale</i> (Small Goosegrass)	Y		
1332.	3907 <i>Gastrolobium laytonii</i> (Breelya)			
1333.	20482 <i>Gastrolobium nervosum</i>			
1334.	3912 <i>Gastrolobium oxylobioides</i> (Champion Bay Poison)			
1335.	3915 <i>Gastrolobium plicatum</i>			
1336.	3917 <i>Gastrolobium propinquum</i> (Hutt River Poison)		P3	
1337.	3924 <i>Gastrolobium spinosum</i> (Prickly Poison)			
1338.	19189 <i>Gastrolobium triangulare</i>			Y
1339.	16311 <i>Gazania linearis</i>	Y		
1340.	38241 <i>Geleznovia</i> sp. <i>Binnu</i> (K.A. Shepherd & J. Wege KS 1301)			
1341.	38242 <i>Geleznovia</i> sp. <i>Marchagee</i> (A. Crawford ADC 1353)			
1342.	4483 <i>Geleznovia verrucosa</i>			
1343.	12780 <i>Gilberta tenuifolia</i>			
1344.	33620 <i>Glischrocaryon angustifolium</i>			
1345.	6143 <i>Glischrocaryon aureum</i> (Common Popflower)			
1346.	7060 <i>Glossostigma diandrum</i>			
1347.	3938 <i>Glycine canescens</i> (Silky Glycine)			
1348.	8002 <i>Gnephosis tenuissima</i>			
1349.	19215 <i>Gompholobium glutinosum</i>			
1350.	10777 <i>Gompholobium gompholobioides</i>			
1351.	3951 <i>Gompholobium marginatum</i>			
1352.	19295 <i>Gompholobium pungens</i>			
1353.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
1354.	2677 <i>Gomphrena celosioides</i> (Gomphrena Weed)	Y		
1355.	11801 <i>Gonocarpus confertifolius</i> var. <i>helmsii</i>			
1356.	6159 <i>Gonocarpus nodulosus</i>			
1357.	6160 <i>Gonocarpus paniculatus</i>			
1358.	7495 <i>Goodenia berardiana</i>			
1359.	29362 <i>Goodenia coerulea</i>			
1360.	17806 <i>Goodenia drummondii</i> subsp. <i>drummondii</i>			
1361.	7513 <i>Goodenia hassallii</i>			
1362.	12551 <i>Goodenia micrantha</i>			
1363.	7527 <i>Goodenia mimuloides</i>			
1364.	7535 <i>Goodenia pinnatifida</i> (Cutleaf Goodenia)			
1365.	1951 <i>Grevillea amplexans</i>			
1366.	19357 <i>Grevillea amplexans</i> subsp. <i>amplexans</i>			
1367.	1956 <i>Grevillea argyrophylla</i> (Silvery-leaved Grevillea)			
1368.	15763 <i>Grevillea biformis</i> subsp. <i>biformis</i>			
1369.	1965 <i>Grevillea biternata</i>			
1370.	1968 <i>Grevillea bracteosa</i> (Bracted Grevillea)			
1371.	33579 <i>Grevillea bracteosa</i> subsp. <i>howatharra</i>		T	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1372.	1973 <i>Grevillea candelabroides</i>			
1373.	18116 <i>Grevillea commutata</i> subsp. <i>commutata</i>			
1374.	18130 <i>Grevillea commutata</i> subsp. <i>pinnatisecta</i>			
1375.	13453 <i>Grevillea didymobotrya</i> subsp. <i>didymobotrya</i>			
1376.	13454 <i>Grevillea didymobotrya</i> subsp. <i>involuta</i>			
1377.	1989 <i>Grevillea dielsiana</i> (<i>Diels Grevillea</i>)			
1378.	1999 <i>Grevillea erinacea</i>		P3	
1379.	2001 <i>Grevillea eriostachya</i> (<i>Flame Grevillea</i>)			
1380.	15816 <i>Grevillea filifolia</i>		P1	Y
1381.	15817 <i>Grevillea hirtella</i>		P3	
1382.	2022 <i>Grevillea integrifolia</i> (<i>Entire-leaved Grevillea</i>)			
1383.	2023 <i>Grevillea intricata</i>			
1384.	2032 <i>Grevillea leucopteris</i> (<i>White Plume Grevillea</i>)			
1385.	13416 <i>Grevillea petrophiloides</i> subsp. <i>petrophiloides</i>			
1386.	2063 <i>Grevillea phanerophlebia</i> (<i>Prominent Vein Grevillea</i>)		T	
1387.	8638 <i>Grevillea pinaster</i>			
1388.	15839 <i>Grevillea preissii</i> subsp. <i>preissii</i>			
1389.	-3994 <i>Grevillea</i> sp.			
1390.	2113 <i>Grevillea triloba</i>		P3	
1391.	17416 <i>Guichenotia angustifolia</i>			
1392.	5011 <i>Guichenotia ledifolia</i>			
1393.	5012 <i>Guichenotia macrantha</i> (<i>Large-flowered Guichenotia</i>)			
1394.	5013 <i>Guichenotia micrantha</i> (<i>Small Flowered Guichenotia</i>)			
1395.	-11458 <i>Guichenotia</i> sp.			
1396.	2807 <i>Gunnopsia quadrifida</i> (<i>Sturts Pigface</i>)			
1397.	2783 <i>Gyrostemon racemiger</i>			
1398.	2784 <i>Gyrostemon ramulosus</i> (<i>Corkybark</i>)			
1399.	2788 <i>Gyrostemon subnudus</i>			
1400.	1465 <i>Haemodorum discolor</i>			
1401.	1468 <i>Haemodorum laxum</i>			
1402.	1470 <i>Haemodorum paniculatum</i> (<i>Mardja</i>)			
1403.	1472 <i>Haemodorum simplex</i>			
1404.	1473 <i>Haemodorum simulans</i>			
1405.	-4252 <i>Haemodorum</i> sp.			
1406.	1474 <i>Haemodorum sparsiflorum</i>			
1407.	2131 <i>Hakea auriculata</i>			
1408.	2135 <i>Hakea bucculenta</i> (<i>Red Pokers</i>)			
1409.	2140 <i>Hakea circumalata</i>			
1410.	2146 <i>Hakea costata</i> (<i>Ribbed Hakea</i>)			
1411.	11924 <i>Hakea cygna</i> subsp. <i>cygna</i> (<i>Swan Fruit Hakea</i>)			
1412.	16908 <i>Hakea eneabba</i>			
1413.	2166 <i>Hakea incrassata</i> (<i>Marble Hakea</i>)			
1414.	2175 <i>Hakea lissocarpha</i> (<i>Honey Bush</i>)			
1415.	2190 <i>Hakea oldfieldii</i>		P3	
1416.	16901 <i>Hakea orthorrhyncha</i> var. <i>filiformis</i>			
1417.	2195 <i>Hakea platysperma</i> (<i>Cricket Ball Hakea</i>)			
1418.	2196 <i>Hakea preissii</i> (<i>Needle Tree</i>)			
1419.	2197 <i>Hakea prostrata</i> (<i>Harsh Hakea</i>)			
1420.	12233 <i>Hakea psilorrhyncha</i>			
1421.	2198 <i>Hakea pycnoneura</i>			
1422.	17557 <i>Hakea recurva</i> subsp. <i>recurva</i>			
1423.	2206 <i>Hakea stenocarpa</i> (<i>Narrow-fruited Hakea</i>)			
1424.	2214 <i>Hakea trifurcata</i> (<i>Two-leaf Hakea</i>)			
1425.	17485 <i>Halgania anagalloides</i>			
1426.	6685 <i>Halgania argyrophylla</i>			
1427.	10904 <i>Halgania bebrana</i>			
1428.	30294 <i>Halgania gustafsenii</i> var. <i>Mid West</i> (<i>G. Perry 370</i>)			
1429.	6696 <i>Halgania sericiflora</i>			
1430.	29716 <i>Halgania</i> sp. <i>Wongan Hills</i> (<i>K.F. Kenneally 2393</i>)			
1431.	13141 <i>Haliptilon roseum</i>			
1432.	-6317 <i>Halophila</i> sp.			
1433.	6180 <i>Haloragis trigonocarpa</i>			
1434.	17781 <i>Hannafordia quadrivalvis</i> subsp. <i>quadrivalvis</i>			
1435.	28253 <i>Hedynois rhagadioloides</i> subsp. <i>cretica</i>	Y		
1436.	8008 <i>Helianthus annuus</i> (<i>Sunflower</i>)	Y		
1437.	29594 <i>Helichrysum luteoalbum</i> (<i>Jersey Cudweed</i>)			
1438.	8027 <i>Helichrysum macranthum</i>			
1439.	17299 <i>Heliotropium ammophilum</i>			
1440.	6707 <i>Heliotropium curassavicum</i> (<i>Smooth Heliotrope</i>)			
1441.	26912 <i>Helminthocladia australis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1442.	11451 <i>Hemarthria uncinata</i> var. <i>uncinata</i>			
1443.	6840 <i>Hemiandra rubriflora</i>			
1444.	6849 <i>Hemigenia diplanthera</i>			
1445.	6869 <i>Hemigenia saligna</i>		P3	
1446.	26915 <i>Hennedya crispa</i>			
1447.	26925 <i>Heterocladia caudata</i>			
1448.	26927 <i>Heterodoxia denticulata</i>			
1449.	5108 <i>Hibbertia acerosa</i> (Needle Leaved Guinea Flower)			
1450.	5112 <i>Hibbertia aurea</i>			
1451.	5115 <i>Hibbertia conspicua</i> (Leafless Hibbertia)			
1452.	5116 <i>Hibbertia crassifolia</i>			
1453.	5120 <i>Hibbertia desmophylla</i>			
1454.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
1455.	5148 <i>Hibbertia mylnei</i>			
1456.	5158 <i>Hibbertia potentilliflora</i>			
1457.	5166 <i>Hibbertia rupicola</i>			
1458.	-10292 <i>Hibbertia</i> sp.			
1459.	5171 <i>Hibbertia spicata</i>			
1460.	11481 <i>Hibbertia spicata</i> subsp. <i>spicata</i>			
1461.	5177 <i>Hibbertia verrucosa</i>			
1462.	4927 <i>Hibiscus drummondii</i> (Drummond's Hibiscus)			
1463.	9085 <i>Hibiscus huegelii</i> (Lilac Hibiscus)			Y
1464.	-7172 <i>Hibiscus</i> sp.			
1465.	5807 <i>Homalocalyx chapmanii</i>		P2	
1466.	5812 <i>Homalocalyx inerrabundus</i>		P2	
1467.	8476 <i>Hordeum hystrix</i> (Mediterranean Region Barley Grass)	Y		
1468.	449 <i>Hordeum leporinum</i> (Barley Grass)	Y		
1469.	450 <i>Hordeum marinum</i>	Y		
1470.	3968 <i>Hovea trisperma</i> (Common Hovea)			
1471.	12741 <i>Hyalosperma cotula</i>			
1472.	12742 <i>Hyalosperma demissum</i>			
1473.	-12666 <i>Hyalosperma glutinosa</i> subsp. <i>glutinosa</i>			
1474.	12743 <i>Hyalosperma glutinosum</i>			
1475.	15447 <i>Hyalosperma glutinosum</i> subsp. <i>glutinosum</i>			
1476.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
1477.	5221 <i>Hybanthus floribundus</i>			
1478.	12007 <i>Hybanthus floribundus</i> subsp. <i>floribundus</i>			
1479.	6223 <i>Hydrocotyle alata</i>			
1480.	6226 <i>Hydrocotyle callicarpa</i> (Small Pennywort)			
1481.	11546 <i>Hydrocotyle pilifera</i> var. <i>glabrata</i>			
1482.	452 <i>Hyparrhenia hirta</i> (Tambookie Grass)	Y		
1483.	5180 <i>Hypericum gramineum</i> (Small St John's Wort)			
1484.	5181 <i>Hypericum japonicum</i> (Matted St John's Wort)			
1485.	26973 <i>Hypnea valentiae</i>			
1486.	5817 <i>Hypocalymma angustifolium</i> (White Myrtle)			
1487.	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
1488.	1070 <i>Hypolaena exsulca</i>			
1489.	11699 <i>Hypoxis glabella</i> var. <i>glabella</i>			
1490.	11604 <i>Hypoxis glabella</i> var. <i>leptantha</i>			
1491.	1503 <i>Hypoxis occidentalis</i>			
1492.	11736 <i>Hypoxis occidentalis</i> var. <i>occidentalis</i>			
1493.	14884 <i>Indigofera occidentalis</i>			
1494.	6620 <i>Ipomoea cairica</i> (Coast Morning Glory)	Y		
1495.	6622 <i>Ipomoea carnea</i>	Y		
1496.	6630 <i>Ipomoea indica</i> (Morning Glory)	Y		
1497.	8087 <i>Isoetopsis graminifolia</i> (Cushion Grass)			
1498.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
1499.	911 <i>Isolepis congrua</i>			
1500.	912 <i>Isolepis cyperoides</i>			
1501.	917 <i>Isolepis marginata</i> (Coarse Club-rush)	Y		
1502.	923 <i>Isolepis setiformis</i>			
1503.	2227 <i>Isopogon divergens</i> (Spreading Coneflower)			
1504.	2229 <i>Isopogon dubius</i> (Pincushion Coneflower)			
1505.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
1506.	3992 <i>Isotropis cuneifolia</i> (Granny Bonnets)			
1507.	19700 <i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			
1508.	-7160 <i>Isotropis</i> sp.			
1509.	3998 <i>Jacksonia angulata</i>			
1510.	14780 <i>Jacksonia arenicola</i>			
1511.	14783 <i>Jacksonia calcicola</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1512.	4006 <i>Jacksonia cupulifera</i>			
1513.	4010 <i>Jacksonia floribunda</i> (Holly Pea)			
1514.	4015 <i>Jacksonia hakeoides</i>			
1515.	14778 <i>Jacksonia nutans</i>			
1516.	14785 <i>Jacksonia rigida</i>			
1517.	-6184 <i>Jacksonia</i> sp.			
1518.	4029 <i>Jacksonia sternbergiana</i> (Stinkwood)			
1519.	-5319 <i>Jania</i> sp.			
1520.	6500 <i>Jasminum calcareum</i> (Poison Creeper)			
1521.	20454 <i>Juncus acutus</i> subsp. <i>acutus</i>	Y		
1522.	1178 <i>Juncus bufonius</i> (Toad Rush)	Y		
1523.	1180 <i>Juncus capitatus</i> (Capitate Rush)	Y		
1524.	11922 <i>Juncus kraussii</i> subsp. <i>australiensis</i>			
1525.	1194 <i>Juncus radula</i>			
1526.	4043 <i>Kennedia prorepens</i>			
1527.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
1528.	5022 <i>Keraudrenia hermanniifolia</i>			
1529.	12008 <i>Kickxia elatine</i> subsp. <i>crinita</i>	Y		
1530.	26994 <i>Kuetzingia angusta</i>			
1531.	26995 <i>Kuetzingia canaliculata</i>			
1532.	3667 <i>Labichea lanceolata</i> (Tall Labichea)			
1533.	11289 <i>Labichea lanceolata</i> subsp. <i>lanceolata</i>			
1534.	11545 <i>Labichea teretifolia</i> subsp. <i>grandistipulata</i>			
1535.	4046 <i>Lablab purpureus</i> (Lablab Bean)	Y		
1536.	20019 <i>Lachnagrostis filiformis</i>			
1537.	6780 <i>Lachnostachys eriobotrya</i> (Lambswool)			
1538.	6781 <i>Lachnostachys ferruginea</i> (Rusty Lambstail)			
1539.	-11593 <i>Lachnostachys</i> sp.			
1540.	17209 <i>Lachnostachys verbascifolia</i> var. <i>verbascifolia</i>			
1541.	18585 <i>Lagenophora huegelii</i>			
1542.	468 <i>Lamarckia aurea</i> (Goldentop)	Y		
1543.	6733 <i>Lantana camara</i> (Common Lantana)	Y		
1544.	-12044 <i>Lantana</i> sp.			Y
1545.	9099 <i>Lasiopetalum angustifolium</i> (Narrow Leaved Lasiopetalum)			
1546.	27001 <i>Laurencia filiformis</i>			
1547.	27002 <i>Laurencia forsteri</i>			
1548.	27005 <i>Laurencia majuscula</i>			
1549.	13284 <i>Lawrencella rosea</i>			
1550.	4959 <i>Lawrencia squamata</i>			
1551.	1305 <i>Laxmannia omnifertilis</i>			
1552.	11679 <i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i>			
1553.	11732 <i>Laxmannia sessiliflora</i> subsp. <i>sessiliflora</i>			
1554.	-10586 <i>Laxmannia</i> sp.			
1555.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
1556.	7580 <i>Lechenaultia linarioides</i> (Yellow Leschenaultia)			
1557.	19727 <i>Leiocarpa semicalva</i> subsp. <i>semicalva</i>			
1558.	27011 <i>Lenormandia latifolia</i>			
1559.	27013 <i>Lenormandia spectabilis</i>			
1560.	3018 <i>Lepidium africanum</i> (Rubble Peppergrass)	Y		
1561.	3030 <i>Lepidium lyratogynum</i>			
1562.	1073 <i>Lepidobolus chaetocephalus</i> (Bristle-headed Chaff Rush)			
1563.	1075 <i>Lepidobolus preissianus</i>			
1564.	18074 <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
1565.	-3273 <i>Lepidosperma</i> aff. <i>squamatum</i> (GJK & NG 5462)			
1566.	-3376 <i>Lepidosperma</i> aff. <i>tenuis</i>			
1567.	928 <i>Lepidosperma brunonianum</i>			
1568.	930 <i>Lepidosperma costale</i>			
1569.	936 <i>Lepidosperma leptostachyum</i>			
1570.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
1571.	944 <i>Lepidosperma scabrum</i>			
1572.	-10997 <i>Lepidosperma</i> sp.			
1573.	-3301 <i>Lepidosperma</i> sp. (NG 3944)			Y
1574.	-10998 <i>Lepidosperma</i> sp. <i>K</i>			
1575.	29147 <i>Lepidosperma</i> sp. <i>Moresby Range</i> (R.J. Cranfield 2751)		P1	Y
1576.	29145 <i>Lepidosperma</i> sp. <i>Zuytdorp</i> (G.J. Keighery & N. Gibson 1710)			
1577.	945 <i>Lepidosperma squamatum</i>			
1578.	947 <i>Lepidosperma tenuis</i>			
1579.	1653 <i>Leporella fimbriata</i> (Hare Orchid)			
1580.	19124 <i>Leptochloa fusca</i> subsp. <i>fusca</i>			
1581.	2350 <i>Leptomeria pauciflora</i> (Sparse-flowered Currant Bush)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1582.	15428 <i>Leptosema aphyllum</i>			
1583.	5853 <i>Leptospermum oligandrum</i>			
1584.	6354 <i>Leucopogon allittii</i>			
1585.	31794 <i>Leucopogon borealis</i>		P2	Y
1586.	6412 <i>Leucopogon marginatus</i>		T	
1587.	14832 <i>Leucopogon oblongus</i>			Y
1588.	6437 <i>Leucopogon psammophilus</i>		P1	
1589.	-7718 <i>Leucopogon</i> sp.			
1590.	20365 <i>Leucopogon</i> sp. Howatharra (D. & N. McFarland 1046)		P2	Y
1591.	31754 <i>Leucopogon</i> sp. Kojarena (J. Brooker 232)		P1	Y
1592.	20364 <i>Leucopogon</i> sp. Mid West (J.S. Beard 7388)			
1593.	20360 <i>Leucopogon</i> sp. Moresby Range (S. Patrick 2614)		P3	
1594.	-3306 <i>Leucopogon</i> sp. Morseby Range (GJK & NG 6526)			Y
1595.	37042 <i>Leucopogon</i> sp. Nabawa (M. Hislop 2765)			Y
1596.	34157 <i>Leucopogon</i> sp. Northern ciliate (R. Davis 3393)			
1597.	27018 <i>Leveillea jungermannioides</i>			
1598.	7670 <i>Levenhookia dubia</i> (Hairy Stylewort)			
1599.	7671 <i>Levenhookia leptantha</i> (Trumpet Stylewort)			
1600.	7676 <i>Levenhookia pusilla</i> (Midget Stylewort)			
1601.	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
1602.	6489 <i>Limonium sinuatum</i> (Perennial Sea Lavender)	Y		
1603.	7075 <i>Linaria maroccana</i>	Y		
1604.	4362 <i>Linum marginale</i> (Wild Flax)			
1605.	7400 <i>Lobelia alata</i> (Angled Lobelia)			
1606.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
1607.	7402 <i>Lobelia gibbosa</i> (Tall Lobelia)			
1608.	7407 <i>Lobelia rhytidospema</i> (Wrinkled-seeded Lobelia)			
1609.	16798 <i>Logania litoralis</i>			
1610.	6512 <i>Logania spermacocea</i>			
1611.	6515 <i>Logania vaginalis</i> (White Spray)			
1612.	10957 <i>Lolium perenne</i> x <i>rigidum</i>	Y		
1613.	478 <i>Lolium rigidum</i> (Wimmera Ryegrass)	Y		
1614.	11384 <i>Lolium temulentum</i> forma <i>temulentum</i>	Y		
1615.	1226 <i>Lomandra effusa</i> (Scented Matrush)			
1616.	1231 <i>Lomandra maritima</i>			
1617.	14542 <i>Lomandra micrantha</i> subsp. <i>micrantha</i>			
1618.	1234 <i>Lomandra nigricans</i>			
1619.	4060 <i>Lotus australis</i> (Austral Trefoil)			
1620.	4066 <i>Lupinus cosentinii</i>	Y		
1621.	6968 <i>Lycium ferocissimum</i> (African Boxthorn)	Y		
1622.	18049 <i>Lyginia imberbis</i>			
1623.	2396 <i>Lysiana casuarinae</i>			
1624.	36375 <i>Lysimachia arvensis</i> (Pimpernel)	Y		
1625.	34736 <i>Lysinema pentapetalum</i>			
1626.	5281 <i>Lythrum hyssopifolia</i> (Lesser Loosestrife)	Y		
1627.	2839 <i>Macarthuria australis</i>			
1628.	4070 <i>Macroptilium atropurpureum</i> (Purple Bean)	Y		
1629.	2539 <i>Maireana convexa</i> (Mulga Bluebush)			
1630.	2556 <i>Maireana planifolia</i> (Low Bluebush)			
1631.	-12679 <i>Maireana</i> sp.			
1632.	5861 <i>Malleostemon hursthousei</i>			
1633.	5864 <i>Malleostemon peltiger</i>			
1634.	14469 <i>Malleostemon</i> sp. Moonyoonooka (R.J. Cranfield 2947)		P2	Y
1635.	4961 <i>Malva parviflora</i> (Marshmallow)	Y		
1636.	19421 <i>Marianthus bicolor</i> (Painted Marianthus)			
1637.	17632 <i>Marianthus ringens</i>			
1638.	76 <i>Marsilea hirsuta</i> (Nardoo)			
1639.	-13015 <i>Marsilea</i> sp.			
1640.	11275 <i>Medicago laciniata</i> var. <i>laciniata</i>	Y		
1641.	4077 <i>Medicago minima</i> (Small Burr Medic)	Y		
1642.	4079 <i>Medicago polymorpha</i> (Burr Medic)	Y		
1643.	15064 <i>Melaleuca acuminata</i> subsp. <i>websteri</i>			
1644.	37580 <i>Melaleuca acutifolia</i>			
1645.	5876 <i>Melaleuca aspalathoides</i>			
1646.	19384 <i>Melaleuca bisulcata</i>			
1647.	19048 <i>Melaleuca campanae</i>			
1648.	5887 <i>Melaleuca cardiophylla</i> (Tangling Melaleuca)			
1649.	5893 <i>Melaleuca concreta</i>			
1650.	16088 <i>Melaleuca coroncarpa</i>			
1651.	5904 <i>Melaleuca depressa</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1652.	15602 <i>Melaleuca fulgens</i> subsp. <i>steadmanii</i>			
1653.	18129 <i>Melaleuca hollidayi</i>			
1654.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
1655.	19451 <i>Melaleuca huttensis</i>		P1	
1656.	5922 <i>Melaleuca lanceolata</i> (Rottnest Teatree)			
1657.	5930 <i>Melaleuca leiopyxis</i>			
1658.	18112 <i>Melaleuca leuropoma</i>			
1659.	18435 <i>Melaleuca longistaminea</i>			
1660.	5936 <i>Melaleuca megacephala</i>			
1661.	5958 <i>Melaleuca radula</i> (Graceful Honeymyrtle)			
1662.	5959 <i>Melaleuca rhapsiophylla</i> (Swamp Paperbark)			
1663.	-3184 <i>Melaleuca</i> sp.			
1664.	37660 <i>Melaleuca spectabilis</i>			Y
1665.	19449 <i>Melaleuca stereophloia</i>			
1666.	18598 <i>Melaleuca systema</i>			
1667.	5983 <i>Melaleuca trichophylla</i>			
1668.	-3611 <i>Melaleuca uncinata</i> group			
1669.	-9503 <i>Melaleuca urceolaris</i> x <i>zonalis</i>			
1670.	5987 <i>Melaleuca viminea</i> (Mohan)			
1671.	13280 <i>Melaleuca viminea</i> subsp. <i>viminea</i>			
1672.	4085 <i>Melilotus indicus</i>	Y		
1673.	14985 <i>Melinis repens</i>	Y		
1674.	6884 <i>Mentha spicata</i> (Spearmint)	Y		
1675.	2813 <i>Mesembryanthemum crystallinum</i> (Iceplant)	Y		
1676.	954 <i>Mesomelaena preissii</i>			
1677.	955 <i>Mesomelaena pseudostygia</i>			
1678.	27070 <i>Metamastophora flabellata</i>			
1679.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
1680.	37680 <i>Micromyrtus collina</i>		P1	
1681.	19855 <i>Micromyrtus rubricalyx</i>		P2	Y
1682.	8814 <i>Microtis brownii</i>			
1683.	17423 <i>Microtis graniticola</i>			
1684.	10954 <i>Microtis media</i> (Tall Mignonette Orchid)			
1685.	15419 <i>Microtis media</i> subsp. <i>media</i>			
1686.	-3881 <i>Microtis</i> sp.			
1687.	8105 <i>Millotia myosotidifolia</i>			
1688.	8107 <i>Minuria cunninghamii</i> (Bush Minuria)			
1689.	4089 <i>Mirbelia depressa</i>			
1690.	4091 <i>Mirbelia floribunda</i> (Purple Mirbelia)			
1691.	4097 <i>Mirbelia ramulosa</i>			
1692.	4100 <i>Mirbelia spinosa</i>			
1693.	4104 <i>Mirbelia trichocalyx</i>			
1694.	7085 <i>Misopates orontium</i> (Lesser Snapdragon)	Y		
1695.	33136 <i>Molineriella minuta</i> (Small Hairgrass)	Y		
1696.	29418 <i>Monoculus monstrosus</i>	Y		
1697.	7410 <i>Monopsis debilis</i>	Y		
1698.	37440 <i>Monopsis debilis</i> var. <i>depressa</i>	Y		
1699.	19584 <i>Monotaxis bracteata</i>			
1700.	4663 <i>Monotaxis lurida</i>			Y
1701.	19177 <i>Moraea setifolia</i>	Y		
1702.	2412 <i>Muehlenbeckia adpressa</i> (Climbing Lignum)			
1703.	7289 <i>Myoporum caprarioides</i> (Slender Myoporum)			
1704.	7291 <i>Myoporum insulare</i> (Blueberry Tree)			
1705.	17158 <i>Myoporum montanum</i> (Native Myrtle)			
1706.	10978 <i>Nemcia pauciflora</i>			
1707.	6243 <i>Neosciadium glochidiatum</i>			
1708.	492 <i>Neurachne alopecuroidea</i> (Foftail Mulga Grass)			
1709.	27100 <i>Neurymenia fraxinifolia</i>			
1710.	6974 <i>Nicotiana glauca</i> (Tree Tobacco)	Y		
1711.	11327 <i>Nicotiana occidentalis</i> subsp. <i>hesperis</i>			
1712.	11331 <i>Nicotiana occidentalis</i> subsp. <i>obliqua</i>			
1713.	6978 <i>Nicotiana rotundifolia</i> (Round-leaved Tobacco)			
1714.	4366 <i>Nitraria billardierei</i> (Nitre Bush)			
1715.	27103 <i>Nizymenia conferta</i>			
1716.	1381 <i>Nothoscordum gracile</i>	Y		
1717.	2401 <i>Nuytsia floribunda</i> (Christmas Tree)			
1718.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
1719.	15449 <i>Olearia dampieri</i> subsp. <i>dampieri</i>			
1720.	15450 <i>Olearia dampieri</i> subsp. <i>eremicola</i>			
1721.	8136 <i>Olearia homolepis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1722.	19801 <i>Oligochaetochilus sanguineus</i>			
1723.	19804 <i>Oligochaetochilus vittatus</i>			
1724.	-11061 <i>Opercularia</i> sp.			
1725.	18256 <i>Opercularia spermacocea</i>			
1726.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
1727.	-9864 <i>Opuntia</i> sp.			
1728.	7122 <i>Orobancha minor</i> (Lesser Broomrape)	Y		
1729.	11749 <i>Orthrosanthus laxus</i> var. <i>laxus</i> (Morning Iris)			
1730.	27107 <i>Osmundaria prolifera</i>			
1731.	4355 <i>Oxalis perennans</i>			
1732.	4356 <i>Oxalis pes-caprae</i> (Soursob)	Y		
1733.	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
1734.	36259 <i>Palisada cruciata</i>			
1735.	503 <i>Panicum decompositum</i> (Native Millet)			
1736.	516 <i>Parapholis incurva</i> (Coast Bargrass)	Y		
1737.	17114 <i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>			
1738.	7089 <i>Parentucellia latifolia</i> (Common Bartsia)	Y		
1739.	7090 <i>Parentucellia viscosa</i> (Sticky Bartsia)	Y		
1740.	12670 <i>Parietaria cardiostegia</i>			
1741.	1762 <i>Parietaria debilis</i> (Pellitory)			
1742.	10975 <i>Paspalidium basicladum</i>			
1743.	-12177 <i>Paspalidium</i> sp.			
1744.	-1528 <i>Paspalidium</i> sp. <i>indet</i>			
1745.	528 <i>Paspalum distichum</i> (Water Couch)	Y		
1746.	533 <i>Paspalum vaginatum</i> (Salt Water Couch)	Y		
1747.	1550 <i>Patersonia occidentalis</i> (Purple Flag)			
1748.	30476 <i>Patersonia occidentalis</i> var. <i>latifolia</i>			
1749.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
1750.	537 <i>Pennisetum glaucum</i> (Pearl Millet)	Y		
1751.	541 <i>Pennisetum setaceum</i> (Fountain Grass)	Y		
1752.	542 <i>Pennisetum villosum</i> (Feathertop)	Y		
1753.	7593 <i>Pentaptilon careyi</i>			
1754.	543 <i>Pentaschistis airoides</i> (False Hairgrass)	Y		
1755.	24022 <i>Pentaschistis airoides</i> subsp. <i>airoides</i>	Y		
1756.	11052 <i>Persicaria prostrata</i>			
1757.	2255 <i>Persoonia angustiflora</i>			
1758.	15629 <i>Persoonia hexagona</i>			
1759.	15632 <i>Persoonia stricta</i>			
1760.	2286 <i>Petrophile brevifolia</i>			
1761.	2290 <i>Petrophile conifera</i>			
1762.	2301 <i>Petrophile macrostachya</i>			
1763.	2303 <i>Petrophile megalostegia</i>			
1764.	29192 <i>Petrophile pilostyla</i> subsp. <i>pilostyla</i>			
1765.	10784 <i>Petrophile scabriuscula</i>			
1766.	19825 <i>Petrorhagia dubia</i>	Y		
1767.	27134 <i>Phacelocarpus peperocarpos</i>			
1768.	-12141 <i>Phaeoceros laevis</i>			
1769.	551 <i>Phalaris minor</i> (Lesser Canary Grass)	Y		
1770.	20460 <i>Pheladenia deformis</i>			
1771.	18505 <i>Philothea wonganensis</i>		T	
1772.	1173 <i>Philydrella pygmaea</i> (Butterfly Flowers)			
1773.	14306 <i>Philydrella pygmaea</i> subsp. <i>pygmaea</i>			
1774.	16825 <i>Phyllangium divergens</i>			
1775.	-3338 <i>Phyllangium paradoxum</i> complex.			
1776.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
1777.	4681 <i>Phyllanthus maitlandianus</i>			
1778.	4685 <i>Phyllanthus scaber</i>			
1779.	6009 <i>Pileanthus filifolius</i> (Summer Coppercups)			
1780.	20219 <i>Pileanthus peduncularis</i> subsp. <i>peduncularis</i>			
1781.	20220 <i>Pileanthus rubronitidus</i>			
1782.	18250 <i>Pileanthus vernicosus</i>			
1783.	5231 <i>Pimelea angustifolia</i> (Narrow-leaved Pimelea)			
1784.	5232 <i>Pimelea argentea</i> (Silvery Leaved Pimelea)			
1785.	5244 <i>Pimelea floribunda</i>			
1786.	5246 <i>Pimelea gilgiana</i>			
1787.	11402 <i>Pimelea imbricata</i> var. <i>piliger</i>			
1788.	11185 <i>Pimelea microcephala</i> subsp. <i>microcephala</i>			
1789.	19744 <i>Pittosporum angustifolium</i>			
1790.	19745 <i>Pittosporum ligustrifolium</i>			
1791.	3173 <i>Pittosporum phylliraeoides</i> (Weeping Pittosporum)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1792.	6798 <i>Pityrodia atriplicina</i>			
1793.	6811 <i>Pityrodia hemigenioides</i>			
1794.	6814 <i>Pityrodia loxocarpa</i>			
1795.	6816 <i>Pityrodia oldfieldii</i> (Oldfields Foxglove)			
1796.	6824 <i>Pityrodia verbascina</i> (Golden Bush)			
1797.	11785 <i>Plantago coronopus</i> subsp. <i>commutata</i>	Y		
1798.	7299 <i>Plantago debilis</i>			
1799.	6247 <i>Platysace cirrosa</i> (Karna)			
1800.	6255 <i>Platysace juncea</i>			
1801.	14996 <i>Platysace</i> sp. <i>Eneabba</i> (R. Hnatiuk 770001)			
1802.	27156 <i>Plocamium mertensii</i>			
1803.	571 <i>Poa annua</i> (Winter Grass)	Y		
1804.	577 <i>Poa poliformis</i> (Coastal Poa)			
1805.	8172 <i>Podolepis canescens</i>			
1806.	8173 <i>Podolepis capillaris</i> (Wiry Podolepis)			
1807.	8177 <i>Podolepis lessonii</i>			
1808.	8182 <i>Podotheca angustifolia</i> (Sticky Longheads)			
1809.	8184 <i>Podotheca gnaphalioides</i> (Golden Long-heads)			
1810.	8188 <i>Pogonolepis stricta</i>			
1811.	29919 <i>Polianthion wichurae</i>			
1812.	2905 <i>Polycarpon tetraphyllum</i> (Fourleaf Allseed)	Y		
1813.	2419 <i>Polygonum aviculare</i> (Wireweed)	Y		
1814.	582 <i>Polypogon monspeliensis</i> (Annual Beardgrass)	Y		
1815.	27173 <i>Polysiphonia decipiens</i>			
1816.	4688 <i>Poranthera drummondii</i>			
1817.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
1818.	2884 <i>Portulaca oleracea</i> (Purslane)	Y		
1819.	111 <i>Potamogeton ochreateus</i> (Blunt Pondweed)			
1820.	1669 <i>Prasophyllum cyphochilum</i> (Pouched Leek Orchid)			
1821.	1671 <i>Prasophyllum elatum</i> (Tall Leek Orchid)			
1822.	1672 <i>Prasophyllum fimbria</i> (Fringed Leek Orchid)			
1823.	1674 <i>Prasophyllum giganteum</i> (Bronze Leek Orchid)			
1824.	16688 <i>Prasophyllum gracile</i>			
1825.	-1736 <i>Prasophyllum macrostachyum</i> var. <i>ringens</i>			
1826.	1682 <i>Prasophyllum sargentii</i>			
1827.	3620 <i>Prosopis pallida</i> (Algaroba)	Y		
1828.	6919 <i>Prostanthera magnifica</i> (Magnificent Prostanthera)			
1829.	8189 <i>Pseudognaphalium luteoalbum</i> (Jersey Cudweed)	Y		
1830.	57 <i>Pteridium esculentum</i> (Bracken)			
1831.	13255 <i>Pterochaeta paniculata</i>			
1832.	1690 <i>Pterostylis nana</i> (Snail Orchid)			
1833.	1693 <i>Pterostylis recurva</i> (Jug Orchid)			
1834.	12217 <i>Pterostylis sanguinea</i>			
1835.	18657 <i>Pterostylis</i> sp. <i>inland</i> (A.C. Beauglehole 11880)			
1836.	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
1837.	2710 <i>Ptilotus chortophytum</i>			
1838.	2716 <i>Ptilotus declinatus</i> (Curved Mulla Mulla)			
1839.	2717 <i>Ptilotus divaricatus</i> (Climbing Mulla Mulla)			
1840.	11251 <i>Ptilotus divaricatus</i> var. <i>divaricatus</i>			
1841.	2718 <i>Ptilotus drummondii</i> (Narrowleaf Mulla Mulla)			
1842.	11260 <i>Ptilotus drummondii</i> var. <i>drummondii</i> (Pussytail)			
1843.	11797 <i>Ptilotus drummondii</i> var. <i>minor</i>			
1844.	2719 <i>Ptilotus eriochichus</i>			
1845.	11225 <i>Ptilotus exaltatus</i> var. <i>exaltatus</i> (Tall Mulla Mulla)			
1846.	11577 <i>Ptilotus gaudichaudii</i> var. <i>gaudichaudii</i>			
1847.	12001 <i>Ptilotus gaudichaudii</i> var. <i>parviflorus</i>			
1848.	11311 <i>Ptilotus grandiflorus</i> var. <i>grandiflorus</i>			
1849.	11775 <i>Ptilotus humilis</i> subsp. <i>humilis</i>			
1850.	17962 <i>Ptilotus humilis</i> subsp. <i>parviflorus</i>			
1851.	2742 <i>Ptilotus manglesii</i> (Pom Poms)			
1852.	2747 <i>Ptilotus obovatus</i> (Cotton Bush)			
1853.	2751 <i>Ptilotus polystachyus</i> (Prince of Wales Feather)			
1854.	17657 <i>Ptilotus polystachyus</i> var. <i>polystachyus</i> (Prince of Wales Feather)			
1855.	28340 <i>Ptilotus</i> sp. <i>Northampton</i> (R. Davis 10952)			
1856.	11364 <i>Ptilotus stirlingii</i> var. <i>stirlingii</i>			
1857.	2766 <i>Ptilotus villosiflorus</i>			
1858.	16367 <i>Pyrorchis nigricans</i> (Red beaks)			
1859.	8195 <i>Quinetia urvillei</i>			
1860.	4964 <i>Radyera farragei</i> (Knobby Hibiscus)			
1861.	3061 <i>Raphanus raphanistrum</i> (Wild Radish)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1862.	8197 <i>Reichardia tingitana</i> (False Sowthistle)	Y		
1863.	3083 <i>Reseda alba</i> (White Mingonette)	Y		
1864.	3085 <i>Reseda luteola</i> (Wild Mingonette)	Y		
1865.	19183 <i>Retama raetam</i>	Y		
1866.	11930 <i>Rhagodia baccata</i> subsp. <i>dioica</i> (Sea Berry Saltbush)			
1867.	2583 <i>Rhagodia latifolia</i>			
1868.	11316 <i>Rhagodia latifolia</i> subsp. <i>recta</i>			
1869.	2584 <i>Rhagodia preissii</i>			
1870.	11240 <i>Rhagodia preissii</i> subsp. <i>obovata</i>			
1871.	11254 <i>Rhagodia preissii</i> subsp. <i>preissii</i>			
1872.	-7999 <i>Rhagodia</i> sp.			
1873.	13308 <i>Rhodanthe charsleyae</i>			
1874.	13241 <i>Rhodanthe chlorocephala</i> subsp. <i>rosea</i>			
1875.	13242 <i>Rhodanthe chlorocephala</i> subsp. <i>splendida</i>			
1876.	13300 <i>Rhodanthe citrina</i>			
1877.	15035 <i>Rhodanthe corymbosa</i>			
1878.	13294 <i>Rhodanthe laevis</i>			
1879.	13234 <i>Rhodanthe manglesii</i>			
1880.	13249 <i>Rhodanthe oppositifolia</i> subsp. <i>oppositifolia</i>			
1881.	13296 <i>Rhodanthe polycephala</i>			
1882.	13251 <i>Rhodanthe propinqua</i>			
1883.	13309 <i>Rhodanthe spicata</i>			
1884.	13254 <i>Rhodanthe stricta</i>			
1885.	27224 <i>Rhodymenia sonderi</i>			
1886.	4699 <i>Ricinocarpos psilocladus</i>			
1887.	19942 <i>Ricinocarpos undulatus</i>			
1888.	4705 <i>Ricinus communis</i> (Castor Oil Plant)	Y		
1889.	1556 <i>Romulea rosea</i> (Guildford Grass)	Y		
1890.	3066 <i>Rorippa nasturtium-aquaticum</i> (Watercress)	Y		
1891.	10970 <i>Rostraria cristata</i>	Y		
1892.	11151 <i>Rostraria pumila</i>	Y		
1893.	20419 <i>Rulingia borealis</i>			
1894.	5059 <i>Rulingia densiflora</i>			
1895.	2433 <i>Rumex crispus</i> (Curled Dock)	Y		
1896.	2438 <i>Rumex obtusifolius</i> (Broadleaf Dock)	Y		Y
1897.	-13100 <i>Ruppia</i> sp.			
1898.	30434 <i>Salsola australis</i>			
1899.	18599 <i>Salsola tragus</i>			
1900.	6929 <i>Salvia verbenaca</i> (Wild Sage)	Y		
1901.	79 <i>Salvinia molesta</i> (Salvinia)	Y		
1902.	6484 <i>Samolus repens</i> (Creeping Brookweed)			
1903.	14108 <i>Samolus repens</i> var. <i>floribundus</i>			
1904.	14107 <i>Samolus repens</i> var. <i>paucifolius</i>			
1905.	2356 <i>Santalum acuminatum</i> (Quandong)			
1906.	2359 <i>Santalum spicatum</i> (Sandalwood)			
1907.	2593 <i>Sarcocornia quinqueflora</i> (Beaded Samphire)			
1908.	27230 <i>Sarconema filiforme</i>			
1909.	7595 <i>Scaevola anchusifolia</i>			
1910.	7603 <i>Scaevola canescens</i> (Grey Scaevola)			
1911.	7606 <i>Scaevola crassifolia</i> (Thick-leaved Fan-flower)			
1912.	13068 <i>Scaevola globosa</i>		P3	
1913.	7614 <i>Scaevola globulifera</i>			
1914.	7618 <i>Scaevola humifusa</i> (Procumbent Scaevola)			
1915.	7619 <i>Scaevola lanceolata</i>			
1916.	7627 <i>Scaevola oldfieldii</i>		P3	
1917.	7634 <i>Scaevola phlebopetala</i> (Velvet Fanflower)			
1918.	7637 <i>Scaevola porocarya</i> (Striate-fruit Scaevola)			
1919.	7643 <i>Scaevola sericophylla</i>			
1920.	-8719 <i>Scaevola</i> sp.			
1921.	7644 <i>Scaevola spinescens</i> (Currant Bush)			
1922.	13152 <i>Scaevola thesioides</i> subsp. <i>thesioides</i>			
1923.	7648 <i>Scaevola tomentosa</i> (Raggedleaf Fanflower)			
1924.	12588 <i>Scaevola virgata</i>			
1925.	11027 <i>Schinus terebinthifolius</i>	Y		
1926.	8200 <i>Schoenia cassiniana</i> (Schoenia)			
1927.	13356 <i>Schoenia filifolia</i> subsp. <i>subulifolia</i>		T	
1928.	972 <i>Schoenus armeria</i>			
1929.	17571 <i>Schoenus badius</i>		P2	
1930.	982 <i>Schoenus clandestinus</i>			
1931.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrusher)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1932.	17606	<i>Schoenus griffinianus</i>		P3	
1933.	994	<i>Schoenus humilis</i>			
1934.	1002	<i>Schoenus nanus</i> (Tiny Bog Rush)			
1935.	1006	<i>Schoenus odontocarpus</i>			
1936.	1009	<i>Schoenus pleiostemoneus</i>			
1937.	1013	<i>Schoenus sculptus</i> (Gimlet Bog-rush)			
1938.	-8000	<i>Schoenus</i> sp.			
1939.	16254	<i>Schoenus</i> sp. G Broad Sheath (K.L. Wilson 2633)			
1940.	1026	<i>Schoenus unispiculatus</i>			
1941.	17409	<i>Schoenus varicellae</i>			
1942.	6030	<i>Scholtzia ciliata</i>			
1943.	6034	<i>Scholtzia laxiflora</i>			
1944.	6035	<i>Scholtzia leptantha</i>			
1945.	6036	<i>Scholtzia oligandra</i> (Pink Scholtzia)			
1946.	6037	<i>Scholtzia parviflora</i>			
1947.	-10542	<i>Scholtzia</i> sp.			
1948.	20092	<i>Scholtzia</i> sp. Burma Road (A.C. Burns 138)			
1949.	14655	<i>Scholtzia</i> sp. Kojarena (A.M. Ashby 1904)		P1	Y
1950.	17398	<i>Scholtzia</i> sp. Northampton (A. Strid 20714)			
1951.	15427	<i>Scholtzia spatulata</i>			
1952.	6041	<i>Scholtzia umbellifera</i>			
1953.	27274	<i>Sebdenia flabellata</i>			
1954.	6	<i>Selaginella gracillima</i> (Tiny Clubmoss)			
1955.	8207	<i>Senecio glossanthus</i> (Slender Groundsel)			
1956.	15678	<i>Senecio hispidulus</i> var. <i>hispidulus</i>			
1957.	20663	<i>Senecio multicaulis</i> subsp. <i>multicaulis</i>			
1958.	20161	<i>Senecio pinnatifolius</i>			
1959.	25884	<i>Senecio pinnatifolius</i> var. <i>latilobus</i>			
1960.	12276	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			
1961.	12279	<i>Senna artemisioides</i> subsp. <i>helmsii</i>			
1962.	12282	<i>Senna artemisioides</i> subsp. <i>stricta</i>			Y
1963.	18444	<i>Senna charlesiana</i>			
1964.	12305	<i>Senna glutinosa</i> subsp. <i>chatelainiana</i>			
1965.	-9409	<i>Senna</i> sp.			
1966.	31575	<i>Serichonus gracilipes</i>		P3	
1967.	4970	<i>Sida calyxhymenia</i> (Tall Sida)			
1968.	19712	<i>Sida</i> sp. dark green fruits (S. van Leeuwen 2260)			
1969.	15972	<i>Silene gallica</i> var. <i>gallica</i>	Y		
1970.	8225	<i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
1971.	14583	<i>Siloxerus multiflorus</i>			
1972.	3068	<i>Sinapis arvensis</i> (Charlock)	Y		
1973.	6988	<i>Solanum americanum</i> (Glossy Nightshade)	Y		
1974.	7006	<i>Solanum ellipticum</i> (Potato Bush)			
1975.	7018	<i>Solanum lasiophyllum</i> (Flannel Bush)			
1976.	7020	<i>Solanum linnaeanum</i>	Y		
1977.	7022	<i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
1978.	7023	<i>Solanum nummularium</i> (Money-leaved Solanum)			
1979.	7025	<i>Solanum oldfieldii</i>			
1980.	11241	<i>Solanum orbiculatum</i> subsp. <i>orbiculatum</i> (Round-leaved Solanum)			
1981.	7037	<i>Solanum symonii</i>			
1982.	27281	<i>Solleria robusta</i>			
1983.	8231	<i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
1984.	617	<i>Sorghum halepense</i> (Johnson Grass)	Y		
1985.	-9207	<i>Sorghum</i> sp.			
1986.	35236	<i>Sorghum x drummondii</i> (Sudan Grass)	Y		
1987.	1312	<i>Sowerbaea laxiflora</i> (Purple Tassels)			
1988.	2912	<i>Spergula arvensis</i> (Corn Spurry)	Y		
1989.	2915	<i>Spergularia rubra</i> (Sand Spurry)	Y		
1990.	-11526	<i>Spergularia</i> sp.			
1991.	4203	<i>Sphaerolobium gracile</i>			
1992.	625	<i>Spinifex longifolius</i> (Beach Spinifex)			
1993.	635	<i>Sporobolus virginicus</i> (Marine Couch)			
1994.	4828	<i>Spyridium globulosum</i> (Basket Bush)			
1995.	4730	<i>Stackhousia dielsii</i> (Yellow Stackhousia)			
1996.	4733	<i>Stackhousia monogyna</i>			
1997.	7102	<i>Stemodia viscosa</i> (Pagurda)			
1998.	16190	<i>Stenanthemum complicatum</i>			
1999.	15065	<i>Stenanthemum notiale</i> subsp. <i>notiale</i>			
2000.	13476	<i>Stenanthemum pomaderroides</i>			
2001.	2316	<i>Stirlingia latifolia</i> (Blueboy)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2002.	27318	<i>Struvea plumosa</i>			
2003.	7679	<i>Stylidium adpressum</i> (Trigger-on-stilts)			
2004.	30278	<i>Stylidium androsaceum</i>			
2005.	7694	<i>Stylidium bulbiferum</i> (Circus Triggerplant)			
2006.	7698	<i>Stylidium caricifolium</i> (Milkmaids)			
2007.	7709	<i>Stylidium crossoccephalum</i> (Posy Triggerplant)			
2008.	7712	<i>Stylidium despectum</i> (Dwarf Triggerplant)			
2009.	7716	<i>Stylidium diuroides</i> (Donkey Triggerplant)			
2010.	12855	<i>Stylidium drummondianum</i>		P3	
2011.	7720	<i>Stylidium elongatum</i> (Tall Triggerplant)			
2012.	7721	<i>Stylidium emarginatum</i>			
2013.	17412	<i>Stylidium kalbarriense</i>			
2014.	7749	<i>Stylidium leptophyllum</i> (Needle-leaved Triggerplant)			
2015.	7759	<i>Stylidium macrocarpum</i> (Flagon Triggerplant)			
2016.	7773	<i>Stylidium petiolare</i> (Horn Triggerplant)			
2017.	25837	<i>Stylidium purpureum</i>			
2018.	7785	<i>Stylidium repens</i> (Matted Triggerplant)			
2019.	19247	<i>Stylidium septentrionale</i>			
2020.	17510	<i>Stylidium</i> sp. Kalbarri (A. Carr 145)			
2021.	17578	<i>Stylidium udusicola</i>			
2022.	3181	<i>Stylobasium australe</i>			
2023.	3182	<i>Stylobasium spathulatum</i> (Pebble Bush)			
2024.	1260	<i>Stypantra glauca</i> (Blind Grass)			
2025.	4220	<i>Swainsona canescens</i> (Grey Swainsona)			
2026.	19805	<i>Symphotrichum subulatum</i> (Bushy Starwort)	Y		
2027.	16861	<i>Synaphea recurva</i>			
2028.	-6840	<i>Synaphea</i> sp. ASG 34			
2029.	15533	<i>Synaphea spinulosa</i> subsp. <i>borealis</i>			Y
2030.	15532	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
2031.	20024	<i>Tagetes erecta</i>	Y		
2032.	15741	<i>Tamarix aphylla</i> (Athel Tree)	Y		
2033.	33319	<i>Tecticornia indica</i> subsp. <i>bidens</i>			
2034.	4256	<i>Templetonia retusa</i> (Cockies Tongues)			
2035.	2791	<i>Tersonia cyathiflora</i> (Button Creeper)			
2036.	2820	<i>Tetragonia decumbens</i> (Sea Spinach)	Y		
2037.	2823	<i>Tetragonia implexicoma</i> (Bower Spinach)			
2038.	1035	<i>Tetralia microcarpa</i>			
2039.	4528	<i>Tetralia confertifolia</i>			
2040.	-9994	<i>Thalassodendron</i> sp.			
2041.	1701	<i>Thelymitra antennifera</i> (Vanilla Orchid)			
2042.	-12431	<i>Thelymitra antennifera</i> x <i>macrophylla</i>			
2043.	10856	<i>Thelymitra benthamiana</i> (Cinnamon Sun Orchid)			
2044.	1707	<i>Thelymitra flexuosa</i> (Twisted Sun Orchid)			
2045.	20732	<i>Thelymitra petrophila</i>			
2046.	673	<i>Themeda triandra</i>			
2047.	10874	<i>Thinopyrum distichum</i>	Y		
2048.	5084	<i>Thomasia grandiflora</i> (Large Flowered Thomasia)			
2049.	2644	<i>Threlkeldia diffusa</i> (Coast Bonefruit)			
2050.	6051	<i>Thryptomene baeckeacea</i>			
2051.	6055	<i>Thryptomene denticulata</i>			
2052.	6057	<i>Thryptomene hyporhysis</i>			
2053.	6064	<i>Thryptomene racemulosa</i>			
2054.	-10092	<i>Thryptomene</i> sp.			
2055.	36097	<i>Thryptomene</i> sp. Greenough River (J. Docherty 169)			
2056.	19115	<i>Thryptomene</i> sp. Moresby Range (A.S. George 14873)		P3	Y
2057.	20366	<i>Thryptomene</i> sp. Red Bluff (A.G. Gunness 2358)			
2058.	17265	<i>Thryptomene</i> sp. Yuna Reserve (A.C. Burns 100)		P2	
2059.	6066	<i>Thryptomene stenophylla</i>		P2	
2060.	6067	<i>Thryptomene strongylophylla</i>			
2061.	1319	<i>Thysanotus arenarius</i>			
2062.	14387	<i>Thysanotus brittanii</i>			
2063.	1328	<i>Thysanotus dichotomus</i> (Branching Fringe Lily)			
2064.	1338	<i>Thysanotus manglesianus</i> (Fringed Lily)			
2065.	1343	<i>Thysanotus patersonii</i>			
2066.	1346	<i>Thysanotus pyramidalis</i>			
2067.	1348	<i>Thysanotus rectantherus</i>			
2068.	-9372	<i>Thysanotus</i> sp.			
2069.	1351	<i>Thysanotus sparteus</i>			
2070.	27335	<i>Tolypocladia calodictyon</i>			
2071.	27336	<i>Tolypocladia glomerulata</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2072.	1368 <i>Trachyandra divaricata</i>	Y		
2073.	19253 <i>Trachymene ceratocarpa</i>			
2074.	6268 <i>Trachymene cyanopetala</i>			
2075.	6279 <i>Trachymene ornata</i> (Spongefruit)			
2076.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
2077.	1485 <i>Tribonanthes violacea</i>			
2078.	-7030 <i>Tribulus</i> sp.			
2079.	6727 <i>Trichodesma zeylanicum</i> (Camel Bush)			
2080.	13559 <i>Trichodesma zeylanicum</i> var. <i>grandiflorum</i>			
2081.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
2082.	17542 <i>Trifolium arvense</i> var. <i>arvense</i>	Y		
2083.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
2084.	17763 <i>Trifolium campestre</i> var. <i>campestre</i> (Hop Clover)	Y		
2085.	4297 <i>Trifolium glomeratum</i> (Cluster Clover)	Y		
2086.	4298 <i>Trifolium hirtum</i> (Rose Clover)	Y		
2087.	4313 <i>Trifolium subterraneum</i> (Subterranean Clover)	Y		
2088.	142 <i>Triglochin calcitrapum</i>			
2089.	15821 <i>Triglochin huegelii</i>			
2090.	15820 <i>Triglochin linearis</i>			
2091.	147 <i>Triglochin mucronata</i>			
2092.	18587 <i>Triglochin nana</i>			
2093.	-8420 <i>Triglochin</i> sp.			
2094.	19175 <i>Triglochin</i> sp. <i>B Flora of Australia</i> (P.G. Wilson 4294)			
2095.	17885 <i>Triodia bromoides</i>		P4	
2096.	17882 <i>Triodia danthonioides</i>			
2097.	705 <i>Tripogon loliiformis</i> (Five Minute Grass)			
2098.	4737 <i>Tripterococcus brunonis</i> (Winged Stackhousia)			
2099.	708 <i>Triticum aestivum</i> (Wheat)	Y		
2100.	4360 <i>Tropaeolum majus</i> (Garden Nasturtium)	Y		
2101.	4840 <i>Trymalium daphnifolium</i>			
2102.	18326 <i>Urochloa panicoides</i>	Y		
2103.	9008 <i>Urodon dasyphyllus</i> (Mop Bushpea)			
2104.	8254 <i>Urospermum picroides</i> (False Hawkbit)	Y		
2105.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
2106.	38388 <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
2107.	1767 <i>Urtica urens</i> (Small Nettle)	Y		
2108.	7656 <i>Velleia cynopotamica</i>			
2109.	7664 <i>Velleia rosea</i> (Pink Velleia)			
2110.	8257 <i>Vellereophyton dealbatum</i> (White Cudweed)	Y		
2111.	15725 <i>Verbesina encelioides</i>	Y		
2112.	7666 <i>Verreauxia reinwardtii</i> (Common Verreauxia)			
2113.	12399 <i>Verticordia capillaris</i>		P4	
2114.	12401 <i>Verticordia centipeda</i>			
2115.	6073 <i>Verticordia chrysantha</i>			
2116.	12402 <i>Verticordia chrysanthella</i>			
2117.	14709 <i>Verticordia chrysostachys</i> var. <i>chrysostachys</i>			
2118.	12403 <i>Verticordia chrysostachys</i> var. <i>pallida</i>		P3	
2119.	-5117 <i>Verticordia chrysostachys</i> var. <i>pallida</i> x			Y
2120.	15432 <i>Verticordia densiflora</i> var. <i>densiflora</i>			
2121.	12413 <i>Verticordia densiflora</i> var. <i>roseostella</i>		P3	
2122.	12414 <i>Verticordia densiflora</i> var. <i>stelluligera</i>			
2123.	14712 <i>Verticordia dichroma</i> var. <i>dichroma</i>		P3	
2124.	6083 <i>Verticordia grandis</i> (Scarlet Featherflower)			
2125.	12430 <i>Verticordia huegelii</i> var. <i>stylosa</i>			
2126.	12437 <i>Verticordia laciniata</i>			
2127.	15622 <i>Verticordia lepidophylla</i> var. <i>lepidophylla</i>			
2128.	12443 <i>Verticordia monadelpha</i> var. <i>callitricha</i>			
2129.	15435 <i>Verticordia monadelpha</i> var. <i>monadelpha</i>			
2130.	12444 <i>Verticordia muelleriana</i> subsp. <i>minor</i>		P2	
2131.	10822 <i>Verticordia nobilis</i>			
2132.	6102 <i>Verticordia oculata</i>			
2133.	6106 <i>Verticordia penicillaris</i>		P4	
2134.	6107 <i>Verticordia pennigera</i>			
2135.	6109 <i>Verticordia picta</i> (Painted Featherflower)			
2136.	15615 <i>Verticordia spicata</i> subsp. <i>spicata</i>			
2137.	27360 <i>Vidalia spiralis</i>			
2138.	4325 <i>Viminaria juncea</i> (Swishbush)			
2139.	8262 <i>Vittadinia cervicularis</i>			
2140.	11387 <i>Vittadinia cervicularis</i> var. <i>cervicularis</i>			
2141.	11278 <i>Vittadinia cervicularis</i> var. <i>occidentalis</i>		P1	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2142.	8264 <i>Vittadinia dissecta</i>			
2143.	8266 <i>Vittadinia gracilis</i>			
2144.	-8692 <i>Vittadinia</i> sp.			
2145.	722 <i>Vulpia bromoides</i> (Squirrel Tail Fescue)	Y		
2146.	724 <i>Vulpia myuros</i> (Rat's Tail Fescue)	Y		
2147.	12052 <i>Vulpia myuros</i> forma megalura	Y		
2148.	33101 <i>Vulpia myuros</i> forma myuros	Y		
2149.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
2150.	7388 <i>Wahlenbergia multicaulis</i>			
2151.	7389 <i>Wahlenbergia preissii</i>			
2152.	7393 <i>Wahlenbergia tumidifruca</i>			
2153.	8275 <i>Waitzia acuminata</i> (Orange Immortelle)			
2154.	13331 <i>Waitzia acuminata</i> var. <i>acuminata</i>			
2155.	13330 <i>Waitzia acuminata</i> var. <i>albicans</i>			
2156.	13328 <i>Waitzia nitida</i>			
2157.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
2158.	32455 <i>Weissia controversa</i>			
2159.	6939 <i>Westringia dampieri</i>			
2160.	1391 <i>Wurmbea densiflora</i>			
2161.	1393 <i>Wurmbea dilatata</i>			
2162.	1394 <i>Wurmbea dioica</i> (Early Nancy)			
2163.	12072 <i>Wurmbea dioica</i> subsp. <i>alba</i>			
2164.	1398 <i>Wurmbea monantha</i>			
2165.	1401 <i>Wurmbea pygmaea</i>			
2166.	-9534 <i>Wurmbea</i> sp. <i>Nabawa</i> (T.D. Macfarlane et al. TDM 4408)			Y
2167.	1403 <i>Wurmbea tenella</i> (Eight Nancy)			
2168.	1404 <i>Wurmbea tubulosa</i> (Long-flowered Nancy)		T	
2169.	1252 <i>Xanthorrhoea drummondii</i>			
2170.	1256 <i>Xanthorrhoea preissii</i> (Grass tree)			
2171.	19938 <i>Xerochrysum bracteatum</i>			
2172.	7113 <i>Zaluzianskya divaricata</i> (Spreading Night Phlox)	Y		
2173.	4385 <i>Zygophyllum apiculatum</i> (Gallweed)			
2174.	4390 <i>Zygophyllum fruticosum</i> (Shrubby Twinleaf)			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX D - EPBC Act Protected Matters Search Results



EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 06/05/11 17:02:48



[Summary](#)

[Details](#)

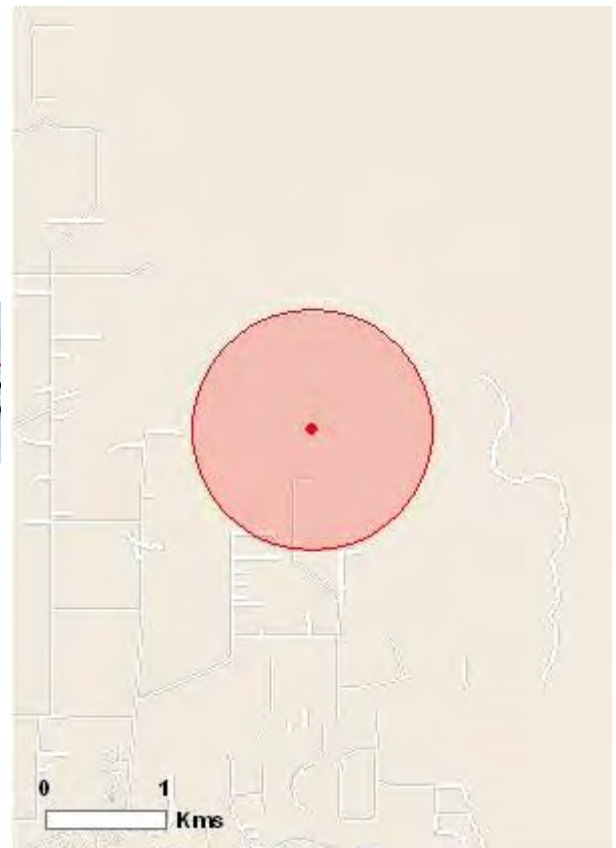
[Matters of NES](#)

[Other matters protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia (Geoscience
Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	3
Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	7
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

BIRDS

[Calyptorhynchus latirostris](#)

Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
---	------------	--

PLANTS

[Drummondita ericoides](#)

Morseby Range Drummondita [9193]	Endangered	Species or species habitat likely to occur within area
-------------------------------------	------------	--

[Eucalyptus cuprea](#)

Mallee Box [56773]	Endangered	Species or species habitat likely to occur within area
--------------------	------------	--

Migratory Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

Migratory Marine Birds

[Apus pacificus](#)

Fork-tailed Swift [678]		Species or species habitat may occur within area
-------------------------	--	--

[Ardea alba](#)

Great Egret, White Egret [59541]		Species or species habitat may occur within area
-------------------------------------	--	--

[Ardea ibis](#)

Cattle Egret [59542]		Species or species habitat may occur within area
----------------------	--	--

Migratory Terrestrial Species

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
-------------------------------	--	--

[Merops ornatus](#)

Rainbow Bee-eater [670]		Species or species habitat may occur within area
-------------------------	--	--

Migratory Wetlands Species

[Ardea alba](#)

Great Egret, White Egret
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species

[\[Resource Information \]](#)

Name

Status

Type of Presence

Birds

[Apus pacificus](#)

Fork-tailed Swift [678]

Species or species habitat may occur within area

[Ardea alba](#)

Great Egret, White Egret
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]

Species or species habitat likely to occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

Extra Information

Invasive Species

[\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name

Status

Type of Presence

Mammals

[Capra hircus](#)

Goat [2]

Species or species habitat likely to occur within area

[Felis catus](#)

Cat, House Cat, Domestic Cat
[19]

Species or species habitat likely to occur within area

[Oryctolagus cuniculus](#)

Rabbit, European Rabbit [128]

Species or species habitat likely to occur within area

[Vulpes vulpes](#)

Red Fox, Fox [18]

Species or species habitat likely to occur within area

Plants

[Cenchrus ciliaris](#)

Buffel-grass, Black Buffel-grass
[20213]

Species or species habitat may occur within area

[Lantana camara](#)

Lantana, Common Lantana,
Kamara Lantana, Large-leaf
Lantana, Pink Flowered
Lantana, Red Flowered Lantana,

Species or species habitat may occur within area

Red-Flowered Sage, White Sage, Wild Sage [10892]

[Lycium ferocissimum](#)

African Boxthorn, Boxthorn [19235]

Species or species habitat may occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.68636 114.6643

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

[Accessibility](#) | [Disclaimer](#) | [Privacy](#) | [© Commonwealth of Australia](#) | [Help](#)

Last updated: Thursday, 16-Sep-2010 09:13:25 EST

[Department of Sustainability, Environment, Water, Population and Communities](#)

GPO Box 787

Canberra ACT 2601 Australia

+61 2 6274 1111 [ABN](#)

| [Australian Government](#) |

APPENDIX E - DIA Registered Sites Search Results



Search Criteria

0 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6823202	270696
6826048	272100

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

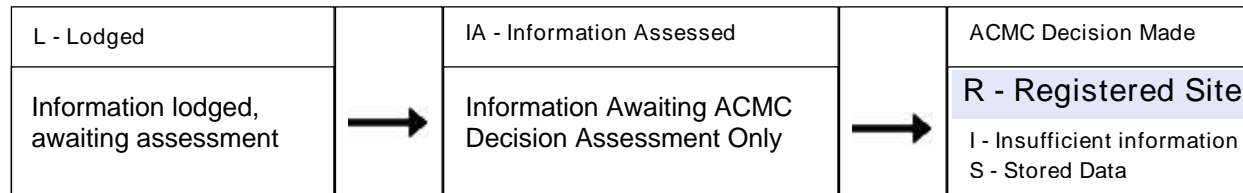
Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register of Aboriginal Sites established and maintained under the Aboriginal Heritage Act 1972 (AHA).

Legend

Restriction	Access	Coordinate Accuracy
N No restriction	C Closed	Accuracy is shown as a code in brackets following the site coordinates.
M Male access only	O Open	[Reliable] The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
F Female access	V Vulnerable	[Unreliable] The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status



*Explanation of Assessment

Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not the final assessment.

Final assessment and decisions will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

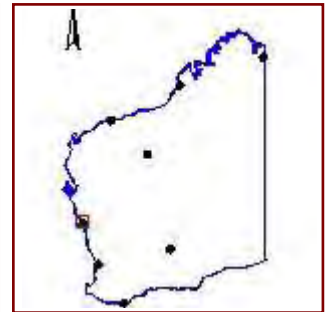
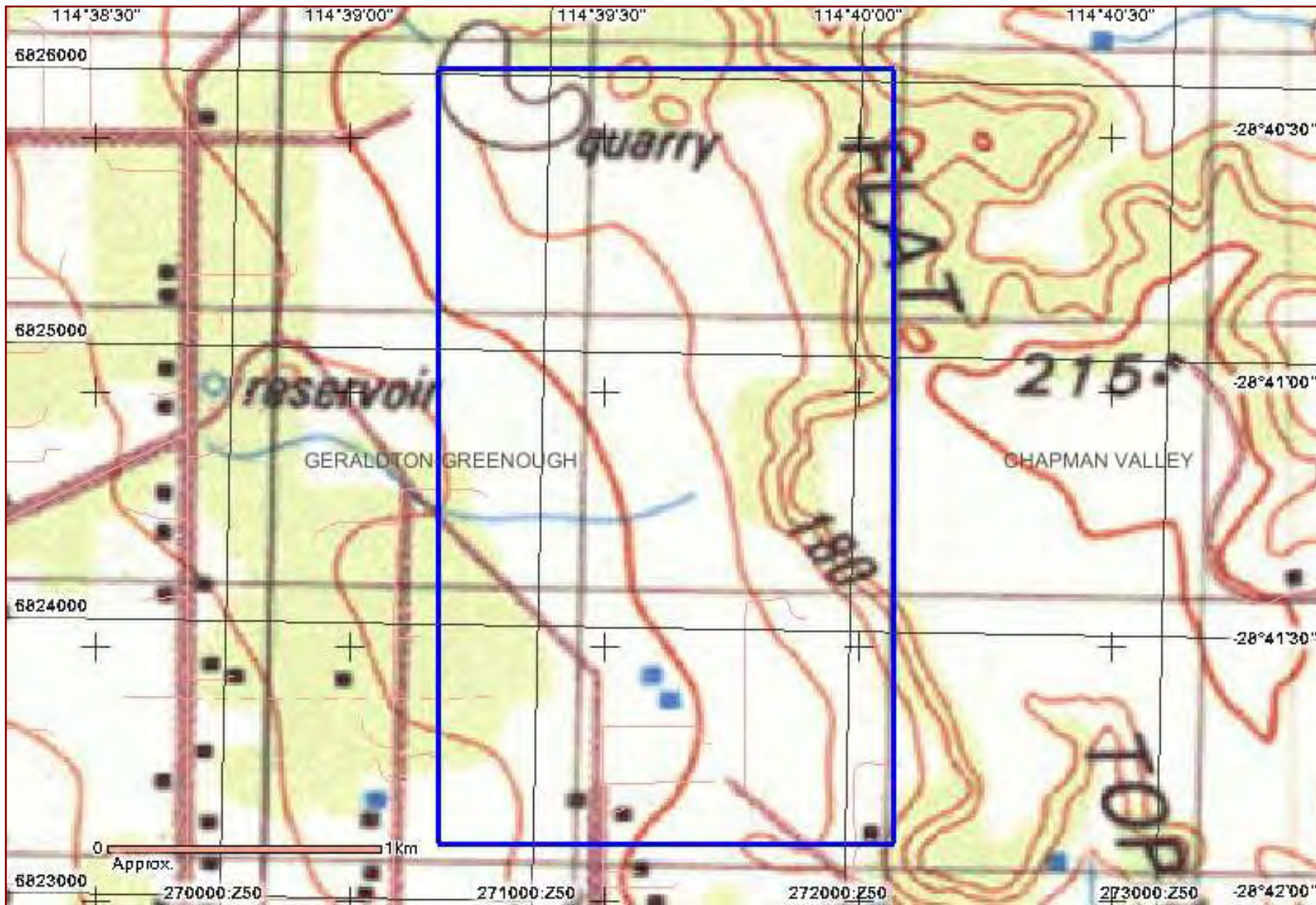
Sites Shown on Maps

Site boundaries may not appear on maps at low zoom levels







List of Registered Aboriginal Sites with Map

No results



Legend

Selected Heritage Sites

-  Registered Sites
-  Town
-  Map Area
-  Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

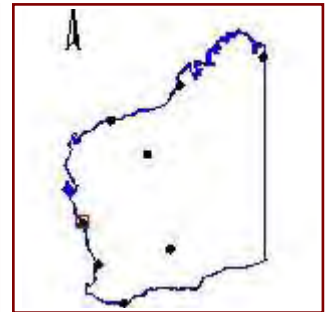
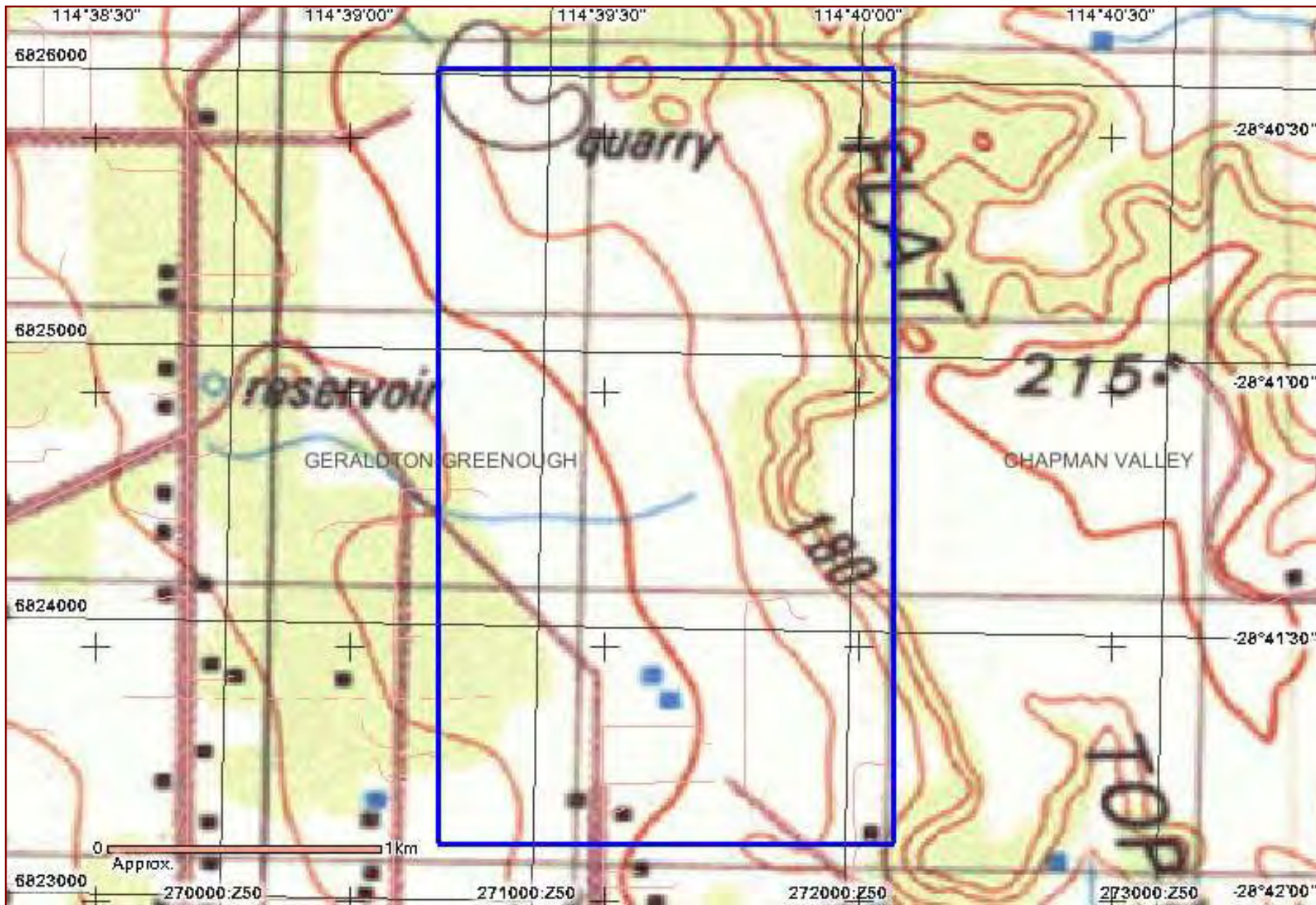
Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



List of Other Heritage Places with Map

No results



Legend

- Selected Heritage Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

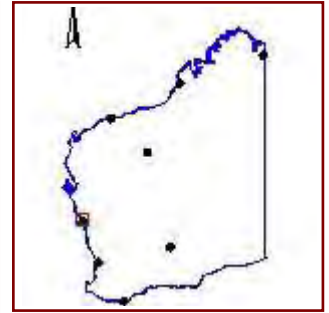
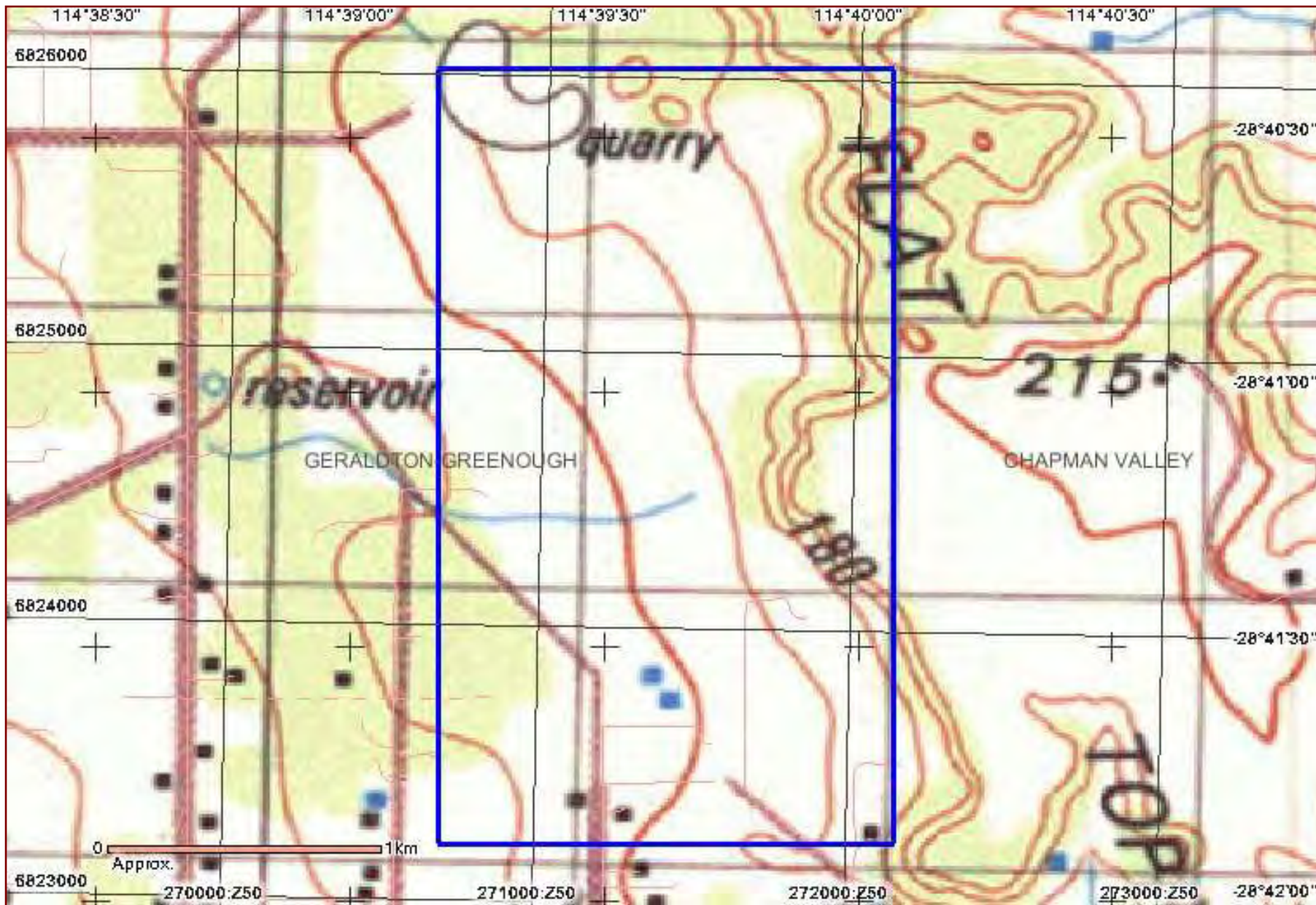
Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>



Map Showing Registered Aboriginal Sites and Other Heritage Places



Legend

- Selected Heritage Sites
- Registered Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Copyright for base map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Cadastre, Local Government Authority, Native Title boundary data copyright © Western Australian Land Information Authority trading as Landgate (2011).

Geothermal Application, Geothermal Title, Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (DMP) (2011.5).

For further important information on using this information please see the Department of Indigenous Affairs' Terms of Use statement at <http://www.dia.wa.gov.au/Terms-Of-Use/>

APPENDIX F - UXO Search Results and FESA Confirmation

IN REPLY, PLEASE QUOTE
605-05-01

GHD
76 Forrest Street
GERALDTON WA 6530

FESA Unexploded Ordnance Services
Telephone: (08) 9331 7218
Facsimile: (08) 9331 5928
E-mail: aarnold@fesa.wa.gov.au
ABN: 39 563 851 304

Attention: Ms C Miller

Dear Cathee

UNEXPLODED ORDNANCE RECONNAISSANCE OF LOTS 80 & 81 HACKETTS ROAD, WAGGRAKINE - GERALDTON

Further to the Unexploded Ordnance field reconnaissance carried out by FESA UXO Services on the 14th September 2006, on Lots 80 & 81 Hackett's Road, Geraldton.

As witnessed, a limited field investigation with the support of an electro magnetic Metal detector was carried out by myself over several areas of interest within the area of Lots 80 & 81 Hackett's Road. Those sites that I chose for the limited investigations I considered to be the most likely affected areas if the Department of Defence had in fact, fired explosive munitions onto the property during training exercises in WW11. The sites consisted of elevated features that would have represented good targets for artillery or infantry training exercises, however, after conducting the limited investigative searching, no such evidence (fragmentation from exploded munitions, actual artillery projectiles, mortars or other produce) was located to support this theory. Whilst several items of small arms munitions (a spent 410 shot gun cartridge, .22 calibre cartridge case and a .303 calibre projectile) were found, these were not of military origins, but from normal farm culling/shooting activities. Whilst .303 calibre projectiles would normally be associated with infantry training from the WW11 period, many ex service Lee Enfield .303 Rifles and ammunition stocks were released by the Commonwealth and widely used by farmers and other individuals in the post WW11 period, prior to more stringent licensing and gun controls introduced in the 60s and 70s. Had a quantity of these projectiles been found during the limited search, it would be reasonable to assume that infantry units may have conducted small arms training in the area. This may still be the case however, but as this type of munition is not considered UXO (ball ammunition in small arms manufacture does not contain explosives) no further searching will be required.

After careful consideration, I have now come to the conclusion that this particular region of the Red Peak Artillery Range as identified in the WA UXO Register of former Department of Defence Training Areas – WW11 (Site C-303, N126) poses a minimal risk as far as UXO Contamination is concerned. In this regard, no further searching for UXO is recommended prior to the development of this site. It would appear that the training activities as mentioned in the war Diaries from which the details of the Red Peak area were first identified, are that the risk areas lie more to the east of Lots 80 & 81, in the area stretching between Mount Fairfax, Red Peak and Wokatherra/Yetna on the eastern side of the Moresby Flat Topped Range.

Please be advised that this Office will make recommendations to the Department of Planning and Infrastructure (Geraldton Office) to apply a "UXO Advice Note" only to any referral received for the proposed development of Lots 80 & 81 Hackett's Road, Waggrakine, advising that the risk of UXO contamination is considered to be absolute minimal and that no further searching for UXO is necessary, nor required prior to the proposed development of the site. This "Advice note" will then be reflected in the WAPC Reference: Approval Subject to Conditions, and will be worded similar to the following:

The Fire and Emergency Services Authority of Western Australia (FESA) advises that historical research has revealed that during the past 100 years, former elements of the Australian Defence Forces may have conducted training and/or operational activities within or close to the area of the proposed subdivision. It is possible that as a result of these activities, the subject area may contain unexploded ordnance (UXO). Whilst it is considered that the possible risk from UXO on the land subject to this approval is minimal, an absolute guarantee that the area is free from UXO cannot be given. Should, during subdivisional works, or at any other time, a form or suspected form of UXO be located, FESA has advised that the following process should be initiated:

- 1. Do not disturb the site of the known or suspected UXO;*
- 2. Without disturbing the immediate vicinity, clearly mark the site of the UXO;*
- 3. Notify FESA of the circumstances/situation as quickly as possible; and*
- 4. Maintain a presence near the site until advised to the contrary by a member of FESA, the Western Australian Police Service or Defence Forces.*

Further advice on this issue may be obtained by contacting the Unexploded Ordnance Unit, Fire and Emergency Services Authority of Western Australia

Having said that and despite the sample searching conducted, no absolute guarantee can be given by this Office that Lots 80 & 81 are in fact, completely free of UXO. In the unlikely event that you and your Company locate a UXO or suspect UXO during your research site investigations, please follow the above process and let me know ASAP.

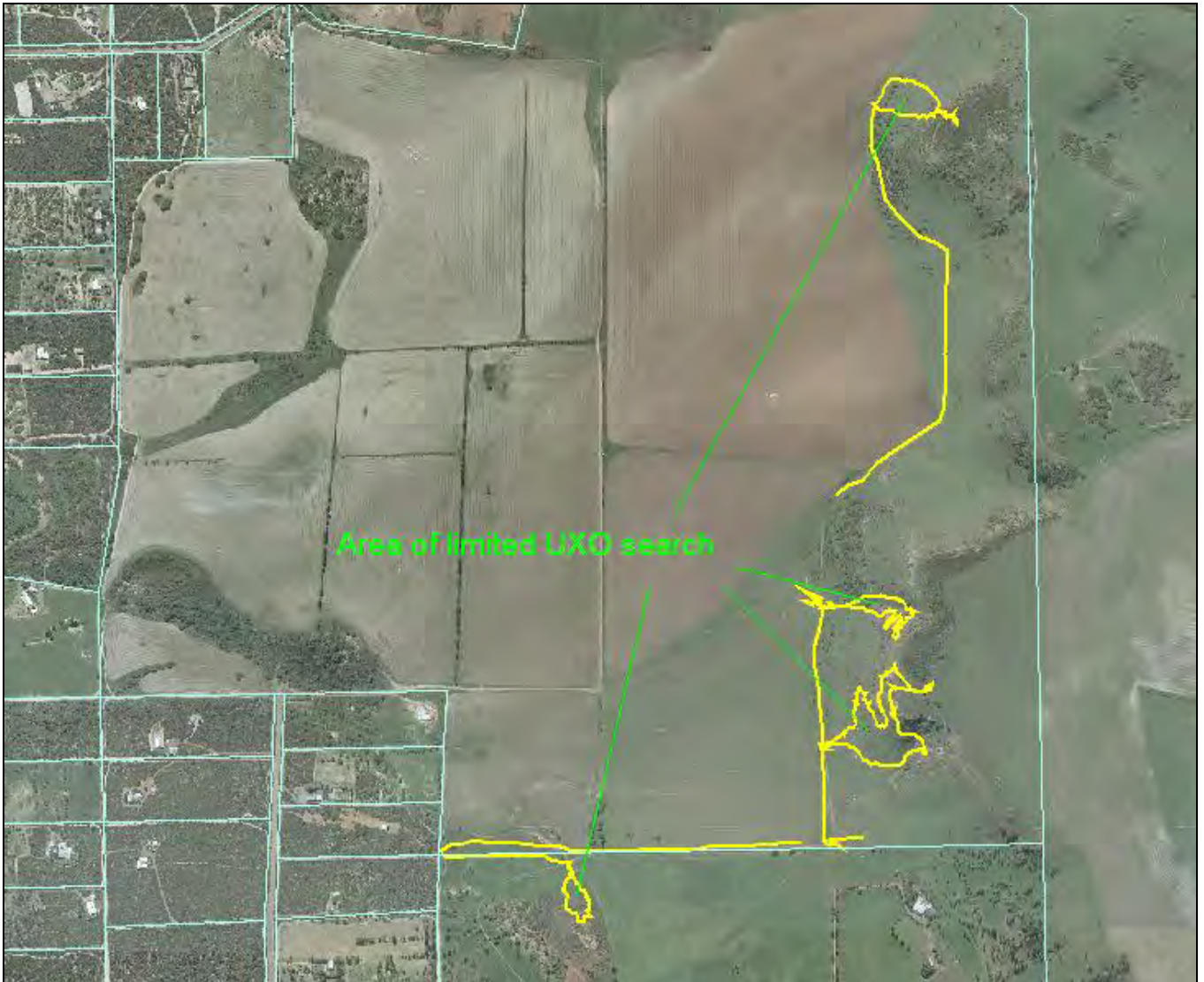
I have included a map on the following page showing the GPS track of most of the vehicle path, and the four search areas investigated for your records.

Again, I thank you for your company whilst on site and look forward to working with you again in the future as I am sure that the occasion will arise where GHD will be involved with other developments within potential UXO sites.

Yours sincerely

Andrew Arnold
FESA UXO LIAISON OFFICER
19 September 2006

**UXO Reconnaissance including limited detector search of several elevated areas
Lots 80 & 81 Hackett's Road, Waggrakine - Geraldton
Conducted by FESA UXO Services on the 14th September 2006**



Items of interest found



View looking south west over Lots 80-81 from top of ridge

Andrew Arnold
FESA UXO Liaison Officer

APPENDIX G - Draft Structure Plan Provisions

Appendix F – Proposed Local Structure Plan Provisions

1 – Public Open Space Management Plan

1-1 The preparation of a Public Open Space (POS) Management Plan is required for the areas reserved for Public Open Space across the proposed development area, including the areas of existing vegetation retained in POS and the section of the Moresby Ranges outside the development area, within Lots 80 and 81 Hackett Road, Waggrakine. Implementation of the Plan shall be required as a condition of subdivision in the event that a subdivision application for urban development of Lots 80 and 81 Hackett Road, Waggrakine is approved by the Western Australian Planning Commission.

1-2: The POS Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission on advice of the City of Geraldton Greenough, the Environmental Protection Authority, and the Department of Environment and Conservation.

1-3: The POS Management Plan shall address:

- (1) minimisation of clearing and vegetation disturbance during construction,
- (2) access control (during construction and post-construction),
- (3) revegetation species and establishment,
- (4) weed control,
- (5) dieback control and management,
- (6) stormwater management,
- (7) ongoing maintenance and management of the vegetated areas,
- (8) protection of wetlands,
- (9) fire management, and
- (10) interface management.



BLACKTOP CONSULTING ENGINEERS

ACN: 150 023 868 ABN: 84 683 812 614
PO Box 918 Geraldton WA 6531
PHONE : (08) 9921 1878
FAX: (08) 9964 54590

10 October 2012

Sutcliffe Road Joint Venture
PO Box 1917
Geraldton WA 6531

Att: Mr Kel Turner

Job No: 12BCE226
Your Job ref:

DRAFT FOR COMMENT



Dear Kel

Investigation : Proposed Subdivision Development Moresby Heights Waggrakine

Geotechnical Report

EXECUTIVE SUMMARY

Blacktop Consulting Engineers (BCE) have completed a geotechnical investigation at the proposed Moresby Heights subdivision development in Waggrakine.

The purpose of the investigation is to confirm the ground type is suitable for subdivision purposes.

The investigation findings suggest that the site essentially comprises of sand, clay and silt soils. The study has found that the colluvial materials rest on weathered bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. The depth of soils above rock across the site varies from 0.6m to 3m. Excavation was generally achieved with backhoe to 2m depth at most sites. Some pockets along the west side of the site comprise of deep layers of residual yellow sand.

Material characteristics of the site soils were found to be favourable for land development purposes.

BACKGROUND

On instruction from Sutcliffe Road Joint Venture, Blacktop Consulting Engineers (BCE) conducted a geotechnical investigation at the proposed Moresby Heights subdivision development in Waggrakine.

A structure plan showing the planned subdivision is provided in Figure 1 – Appendix A.

The field investigation programme and all related studies were planned and supervised by a Civil & Structural Engineer from BCE. Blacktop Materials Engineering completed the materials testing of samples taken during the investigation at their Geraldton laboratory.

Guags backhoe hire provided the machine and operator required to undertake test pit excavation.

The site investigation was completed during September 2012.

SCOPE OF INVESTIGATION

BCE's proposal for this study was described in our letter dated 1 August 2012.

The scope of our work is to:

1. Provide some geological background on the site.
2. Provide the AS2870 site classification for the site for use in the design of buildings.
3. Provide recommendations to assist in constructing site earthworks such as a description of soil types, soil organic content, soil density, suitable compaction testing methods, suitable fill materials, earthworks compaction requirements.
4. A soil bearing capacity and settlement estimate will be provided for the site.
5. Suitable foundation and retaining wall options will be described.
6. Advice on completing earthworks including a procedure to complete earthworks, a description of the expected behaviour of the soils, site preparation, lift thickness, compaction requirements, acceptable compaction testing methods based on the soil types and compaction testing frequency will be provided.
7. Assess the composition, depth and extent of site material for use as structural fill purposes.
8. Stability criteria for open excavations will be provided.
9. Erosion and sediment control guidance.
10. Laboratory determined CBR pavement design parameters will be provided.
11. Recommend an appropriate earthquake site sub-soil class.
12. Recommend appropriate wind design criteria.
13. Complete an investigation to determine if acid sulphate soils exist at the site.
14. Recommendations for the construction of site drainage will be made.

INVESTIGATION LOCATIONS

The subdivision structure plan provided in Figure 2 Appendix A has been marked showing the 30 investigation locations.

The locations were selected to provide a representative description of the soils across the site.

The survey coordinates in datum GDA zone 50 for each investigation location are shown on the site plan. The survey coordinates are also provided on each test pit excavation log.

Photographs of the site are provided in Appendix B. As can be seen from the photographs site exists at the base of the Moresby Ranges and comprises of undulating land, most of which has formerly been cleared for agricultural purposes.

DESKTOP STUDY

Physiography of Geraldton Geological Sheet

Introduction

The area subject to investigation is contained in the Geraldton Geological sheet.

The Houtman Abrolhos Islands are also covered by the Geraldton sheet and were among the first features to be discovered and named on the Western Australian coast. First recorded sighting of the islands by ship was in 1619.

The main land around Geraldton was first explored in 1839 by George Grey, who reported favourably of its agricultural prospects. Geraldton was settled in 1951 and derived its name from the Geraldine lead mine located 120km to the north.

Pastoral blocks were first established inland from 1849 to 1862, and agricultural settlements were established on the Greenough Flats between 1853 and 1857. The Midland Railway, linking Perth to Geraldton, was completed in 1894.

The first town jetty was built in 1874, extending 244m north of Gregory St. In 1893 a new 290m jetty was built northwards from Durlacher St. Work on the present port began in 1924 and expansion continues to the present day with the recent land reclamation to construct No. 7 berth.

Climate

Geraldton has an Extra – dry Mediterranean climate and is characterised by mild, wet winters and hot, dry summers. Average rainfall is approximately 500mm with the lowest rainfall on the coast north of Geraldton and the highest on the hills around Chapman Valley.

Potential annual evaporation ranges between 1800mm and 2400mm.

Nearly all of the rain falls during the winter months. Maximum summer temperatures often exceed 40 degrees Celsius. The area is noted for its strong summer southerly winds.

Vegetation

Most of the area of the Geraldton sheet on the mainland is occupied by wheat and sheep farms. The natural vegetation has largely been removed from these properties, but in the drainage areas of the rivers the most abundant trees are Jam, York gum, Needle bush and She-oak. The sand plain flora is more extensively preserved. It consists largely of low Acacia scrub and Wattle with patches of Banksia and Christmas trees.

Geomorphology

The Geraldton sheet has been divided into five regolith-landform land systems plus a marine system.

Because the proposed subdivision study area is so large it encompasses areas of both the Moresby and Spearwood regolith-landform land systems.

The Moresby System is a plateau and side slopes composed of residual materials and colluvial deposits over weathered Jurassic rocks, with minor occurrences of Triassic and Proterozoic rocks.

The regolith materials of the Moresby System are derived from weathering and erosion of the underlying dominantly siliciclastic sedimentary rocks of the Jurassic Cattamarra Coal Measures river drainage system area.

Slopes comprise loose deposits of rock debris accumulated through the action of gravity range in thickness from 1m to more than 8m. These deposits comprise of rock debris, gravel, boulders and gravelly silty sand and rest on weathered bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone.

The Spearwood system is comprised of residual sand overlying calcarenite in a series of deflated dunes. The yellow sand is sourced for use in the building industry in some areas of the Spearwood system. The material is typically slightly silty medium sand composed of quartz. The calcarenite formed in the Pleistocene (which was about 2.5 million years ago). The limestone is composed of eolianite (which means sediments deposited by the wind). The sediments formed limestone by becoming compacted under pressure and expelling connate fluids, gradually becoming solid rock.

The findings of this study support the existence of colluvial deposits of sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. Some pockets along the west side of the site comprises of deep layers of residual yellow sand typical of the Spearwood system.

FIELD INVESTIGATION STUDIES

General

The field investigation programme included the following works:

- Initial site walkover and reconnaissance to establish opportunities for site access and establish the location of buried services.
- Complete test pit excavation logs for thirty test pits across the site which describe the soil types encountered and the presence of any unsuitable material at the site in accordance with AS1726-1993.
- Provide photographs of the site.
- Report the depth of the water table or rock if encountered.
- Take 25kg samples at selected geological layers encountered to allow Moisture Content (MC), Particle Size Distribution (PSD), Consistency Limits (PI), Soil Organic Content, Calcium Carbonate, Maximum Dry Density (MDD / OMC), and Californian Bearing Ratio (CBR) tests to be completed.
- Take samples from selected test pits at 0.25m depth increments for acid sulphate analysis.
- Backfill the test pits.

RESULTS OF INVESTIGATION

Soil Types

Test pit excavation at the site suggests that the site may be typified by either:

1. The site is typically comprised of deposits of quartz sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone.
2. Some areas on the west side of the site comprise of deep layers of residual yellow sand. The sand is typically silty medium sand composed of quartz. The material is generally not well compacted. Limestone was not encountered beneath the sand to the 3m depth of investigation.

Photographs of soil types exposed during test pit construction are provided in Appendix B.

Please find attached excavation logs completed for the constructed test pits in Appendix C, which describe the soil types encountered.

Shallow rock was encountered at test pits 7, 12, 16, 29 & 30.

A photograph of surface rock near test pit 16 is provided Figure 5 Appendix B.

Clay, clayey sand, gravel or rock was encountered at test pits 2,3,7,10 to 30.

Characteristics of the encountered soil materials are presented in summary form below.

Water Table

For this investigation, no specific data on the depth to the water table has been obtained for the area. The study has concentrated on soil properties. There was no evidence of the water table within the excavation depth of 3m of the soil surface.

Laboratory Materials Testing

The NATA endorsed test certificates for tests completed on samples are attached in Appendix D.

Results are summarised in the following section.

Unified Soil Classification Symbol (USC)

The Unified Soil Classification Symbol is calculated based upon results of particle size distribution and consistency limit testing.

The particle size distribution of a material is determined by screening a material over sieves and calculating the mass passing each. The effect of grading on density, internal friction (stability when wet) and permeability justifies its use as an indicator of likely performance.

Consistency limits are conceptual limits when it may be considered a material proceeds through a semi solid, plastic and liquid states as its moisture increases. These limits are determined using empirical procedures in the laboratory. The consistency limits are related to the type and amount of clay in a material. The objection to material with a high clay content is that clay increases in volume and decreases in strength with increase in moisture content. The volume change tends to destroy the mechanical interlock and reduce internal friction and stability and results in inferior performance.

The calculated Unified Soil Classification (USC) symbol for the site material is provided on the test certificates.

Results suggest that the USC symbol for the site materials are generally:

1. SC which is the classification symbol for a sand / clay mixture.
2. SM which is the classification symbol for a sand / silt mixture.

The site material is all very fine grained.

The samples were found to contain between 9% to 56% of material passing the 75micron sieve.

Silt and clay is defined as the sample fraction which passes the 75micron sieve.

As a guide, usually soils are preferred for foundation material which do not contain more than about 10% silt and clay. The objection to material with a high silt and clay content is that an excessive silt and clay fraction under soaked conditions reduces the soils bearing capacity.

The results of consistency limit testing generally suggested that most of the soils which contained clay had a moderate plasticity. It was typical of most sites that the clay fraction in the soil increased with depth.

Whilst the materials are suitable for construction purposes the reactive nature of the underlying soil types will need to be considered in the design of improvements to the site.

Soil Compaction Summary

To avoid the likelihood of settlement, it is required by the Building Code of Australia and Australian Design Standards that for domestic structures, soils shall be compacted to 95% Maximum Modified Dry Density (MMDD) in accordance with AS1289.

It is understood that soils at this level of compaction will resist further settlement, under residential construction loading, and hence provide a reliable and sound foundation.

In clean well graded sand soils it is generally accepted that the measurement of eight blows per 300mm depth of penetration using a 16 mm diameter 9.0 kg Perth Sand Penetrometer (PSP) in accordance with AS1289 6.3.3 is an acceptable indication that the sand exists at 95% modified maximum dry density.

For this reason, eight blows per 300mm depth of penetration using a PSP is the compaction requirement, which most local authorities stipulate a building pad shall achieve prior to building commencement.

AS 1289 6.3.3 provides the specific method for completing PSP tests.

AS1289 6.3.3 stipulates that the soil for PSP measurement shall be

1. Non cohesive.
2. Not contain particles greater than 2mm diameter.

Such material is classified as clean sand.

Blacktop suggest that a useful guide for identifying non cohesive material shall be the amount of silt and clay contained in the sample. Silt and clay is indicated by the fraction of sample passing the 75 micron sieve.

If the material exceeds 5% passing the 75micron sieve, then the material should be considered cohesive. It is not possible to guarantee that PSP compaction measurements completed in soils which exceed this silt content are accurate.

As can be seen from the Particle Size Distribution Test Certificates completed on the site soils, the silt and clay fraction far greater than the limits allowed by AS1289 6.3.3 for PSP measurement.

For this reason indicative measurement of the compaction of site soils was generally only undertaken at the areas found to comprise residual yellow sand during the site investigation.

Results at these locations indicate that the sands are generally very loose. Results of PSP testing are provided on the excavation logs.

Verification of soil compaction in the material types at the site is required be under taken by a NATA accredited agency using a nuclear densometer to Australian Standard 1289 5.8.1 "Soil compaction and density tests using nuclear density gauge".

Site Classification AS2879 – 2011

Calculation of estimation of characteristic surface movement derived using method prescribed in AS2870- from the soil sample test certificates suggest that the following surface movement may be predicted from soil shrinkage indices, based on soil reactivity with moisture.

The calculation of expected surface movement does not make any allowance for movements caused by soil densification settlement.

Calculations assume that the site is compacted to 95% modified maximum dry density in accordance with AS1289, and that the foundation soils are protected from excessive moisture ingress.

Calculations are based on the existing soil profile below the maximum depth of excavation for footing and slab. (This depth of this excavation is usually 370mm to the bottom of the footings).

Test Pit No.	Expected Surface Movement (mm) *	Site Classification in Accordance with AS2870 - 2011
1 – 30	From 0 to 22mm	M

* Estimation of the characteristic surface movement completed in accordance with AS2870 – 2011.

Table 1 : Estimation of Site Classification

As can be seen from the calculated surface movement the predicted shrinkage response of the clay contained in the soil to moisture change is significant in some areas across the site.

In accordance with classification method provided by determination of characteristic surface movement in AS2870 –2011, and based on the results of the soil samples, the site is classified as Class 'M'. This classification indicates a moderately reactive site. This classification is based on the most reactive area of the site. If the site was sub-classified many areas of the site would be classified as Class 'S'.

The calculated surface movement for each individual investigation site is provided in Table 1 Appendix E.

For reference:

1. AS 2870- stipulates that sites which experience between 0 – 20mm expected surface movement may be classified as Class "S". Essentially AS2870 – considers this to be a stable site.
2. AS 2870- stipulates that sites which experience between 20 – 40mm expected surface movement may be classified as Class "M". Essentially AS2870 – considers this to be a moderately reactive site.
3. AS 2870- stipulates that sites which experience between 40 – 60mm expected surface movement may be classified as Class "H1". Essentially AS2870 – considers this to be a highly reactive site.
4. AS 2870- stipulates that sites which experience between 60 – 75mm expected surface movement may be classified as Class "H2". Essentially AS2870 – considers this to be a highly reactive site.

The calculation of expected surface movement does not make any allowance for movements caused by soil densification settlement. Calculations assume that the foundation soils are protected from excessive moisture ingress.

Moisture Content

Results of field moisture content determined for 15 soil samples are presented in Appendix D. Results generally suggest that soil moisture contents are quite low in soils within 1m of the ground surface and that sandy soils tend to retain less moisture than materials containing clay.

Organic

When materials contain greater than 1% organic matter compaction can be very difficult to achieve. 1% of decomposed vegetation is a considerable quantity in soil and it can have a significant effect on the physical characteristics of the soil when it is mixed through the soil.

Organic matter which has entered the soil from stands of Wattle and Acacia species tends to suppress the ability of soils to take on moisture and hence can make the process of soil moisture conditioning and the achievement of 95% MMDD compaction very difficult.

BCE experience in the past suggests that if the material contains greater than 1% organic matter this could be grounds to replace the material or to entertain a compaction concession in the engineering specification.

10 field samples were tested to determine the organic content of the soil. Results indicate that the samples tested had an organic content of between 0.5% to 1.9%. Generally the near surface samples (within 0.5m of the surface) had an organic content equal to or less than 1% so organics are not expected to present a problem.

Calcium Carbonate

10 field samples were tested to determine the calcium carbonate content of the soil. All samples returned results of between 2.8% to 4.7% calcium carbonate content.

Maximum Dry Density / Optimum Moisture Content (t/m^3 / %)

The Maximum Modified Dry Density results are what might be expected for a silty sands and clayey sands.

The maximum dry density of the materials indicate that compaction of the materials is measurable with a nuclear densometer instrument.

Based on the results of the materials optimum moisture content, moisture quantities to be added to the soil to bring the soils to optimum can be calculated once the insitu moisture content of the soil is determined. For example if soil taken from Site 1 at 0.5m depth which was found to exist at 2.4% field moisture, is required to be conditioned to optimum, approximately 147 litres of water are required to be added per $1m^3$ of soil to condition the soil to optimum moisture content to assist in achieving compaction.

CBR value

The CBR is a strength test which describes the effort of a standard piston to penetrate a compacted confined soil specimen. The results are expressed as a ratio of the loads to cause the same penetration in a standard crushed rock material.

Where soils may be affected by moisture a soaked CBR test is completed. This test provides an indication of material strength when then the specimen is saturated. An Unsoaked CBR test indicates material strength at optimum moisture content, or an unsaturated state.

Samples were modelled at 95% maximum modified dry density and 100% optimum moisture content. This is in line with most land development guidelines. A 4.5kg surcharge was placed on the samples during modelling to replicate the basecourse layer.

As a reference, Main Roads Specification 501 "PAVEMENTS" stipulates that for **gravel basecourse**, suitable for all pavements except freeways and controlled access highways, the Soaked CBR (96%MDD & 100%OMC) shall be 80% minimum.

The City of Geraldton – Greenough land development guidelines stipulates that subgrade shall have a soaked CBR exceeding 7% and a PI less than 15.

4 samples taken from between the ground surface to 0.5m depth were tested to determine the soaked CBR value of the soil.

The results of the CBR testing indicate that the site material:

1. Exceeded the City of Geraldton – Greenough land development guidelines which requires subgrade to have a minimum soaked CBR of 7%.

CONCLUSIONS

Material characteristics of the site soils were found to be favourable for construction purposes. To ensure successful engineering design of site improvements BCE recommend that the following considerations be given to the site ground conditions during subdivision design and construction:

Site

The site includes both the Moresby and Spearwood regolith-landform land systems. The soils types which can be expected in these systems include colluvial deposits of sand, clay and silt of varying thickness overlying bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. Some pockets along the west side of the site comprise of deep layers of residual yellow sand typical of the Spearwood system.

The subsurface clays may generally be described as containing moderately reactive clay.

Shallow rock was encountered at some sites.

The water table was not encountered during the investigation.

Site Materials

Compaction of site materials will be most effectively achieved by conditioning the materials to optimum, (and curing if possible) before compacting. The mandatory use of pad foot rollers to achieve compaction should be considered on cohesive soils and flat drum rollers on the sandy soil types.

It is suggested from the outset of construction that trials are completed to determine the most effective way to achieve compaction in the various site soil types. BCE would be pleased to assist with these trials if requested.

Prior to the commencement of site compaction excavative efforts shall ensure all visible deleterious materials such as grass roots etc are removed from site.

AS2870 Site Classification

In accordance with AS 2870- 2011 the site is classified as Class "M". This classification indicates a moderately reactive site.

This classification is based on the most reactive areas of the site. If the site was sub-classified the majority of the site would be classified as Class 'S'.

The reactive areas of the site are expected to experience significant volumetric changes due to expansion and contraction caused by variations in ground soil moisture content. Specific structural detailing and drainage requirements will be required by AS2870 for this classification.

Site Compaction

It was not possible during the site investigation to confirm the compaction of the soils at the site at most areas. The silt and clay content of the site soil requires compaction of the site soils to be verified by a NATA accredited agency using a nuclear densometer to Australian Standard 1289 5.8.1 "Soil compaction and density tests using nuclear density gauge".

Compaction of areas of the site found to comprise of residual yellow sand indicate that the sands are generally very loose. Results of PSP testing undertaken is provided on the excavation logs.

Without compaction verification, constructed premises risk settlement damage caused by consolidation of loose soil layers, should they be inadequately compacted.

Calculations of the Lot site classification assumes that the site is compacted to 95% modified maximum dry density in accordance with AS1289 to a depth of 600mm below building foundations.

Bearing Capacity & Settlement Estimates

The study area lends itself to the use of lightly loaded shallow footings. Presumptive allowable bearing pressures of 150kPa may be considered at the site on dry soils where ground improvement has been completed within the zone of influence of footings to 95%MMDD a depth of 600mm below building footings and pavements. This should ensure that total and differential settlements will be less than 10mm.

If footings are founded directly on underlying rock layers the rock is expected provide allowable bearing pressures in excess of 400kPa. The rock layer should ensure that total and differential settlements will be negligible.

The design of site drainage to ensure that foundation soils are kept dry will be important to achieving the stipulated bearing pressures.

Suitable Foundation and Retaining Options

Earth retaining systems shall be designed in accordance with AS4678.

Any conventional form of retaining system designed in accordance with AS4678 will be suitable at the site and will perform well. BCE would be please to supply certified retaining options if requested.

The suggested design parameters for temporary and permanent retaining wall design for the site soils are:

Yellow Sand

- Friction angle 32 degrees.
- Density 1.87t/m³.

Clay

- Cu – Required to be determined by further testing.
- Density 1.98t/m³ to 2.18t/m³

Construction Materials

Laterite gravel was encountered at Test Pit 11 at 0.3m to 0.7m depth and Test Pit 2 at 0.3m to 0.8m depth. To investigate the possibility that the gravel may be useful for use as basecourse construction material BCE had the samples tested.

Test certificates 12BME9474 & 12BME9479 are provided in Appendix D which show the PSD and PI content of the gravel. Upper and lower grading curves provided by MRWA Pavement Specification 501 for basecourse have been provided on the certificates. MRWA specifies basecourse gravel shall have a Liquid Limit 25% maximum and a Linear Shrinkage 3% maximum.

As can be seen on the test certificates the sample from Test Pit 2 contains too much clay and both samples are too sandy to meet the MRWA basecourse specification.

The materials would make suitable sub base. BCE suggest that consideration be given to further searching for potential gravel deposits on the property. Blacktop have specialist people to assist with gravel searching if requested.

Pockets along the west side of the site which comprise of deep residual yellow sand will provide sand suitable for use as structural fill material. Material for use as structural fill shall be selected which is non-plastic and does not contain more than 10% passing the 75 micron sieve.

Due to the difficulty in achieving and maintaining the moisture content required to achieve compaction the site materials containing clay are not recommended to use for structural fill. This material will be suitable for fill which is not load bearing.

Cut and Fill Slope Stability Criteria

The angle of repose of the site materials is estimated to be approximately 30 degrees.

Excavations for foundations may be required using standard earthmoving equipment. Where shoring will not be provided to excavations it is suggested that excavation batters be sloped at an angle of 1V:3H in soils and 1V:1.5H in rock to prevent collapse of trench walls.

Fill slopes should not be steeper than 1V:3H.

Soil Susceptibility to Scouring

Given the site receives significant run off from the nearby ranges, and contains clayey soils with low permeability in some areas, design of the development should make provision for water runoff flow without causing damage.

The soils at the site will be susceptible to scouring from medium to high velocity overland water flow or strong winds.

The site surface materials are very fined grained and will be easily transported by water and wind movement.

To avoid scouring, embankments receiving flow from significant catchments, should be stone pitched or otherwise armoured.

Provision to stop airborne sand shall be taken during windy periods.

Subgrade CBR

CBR results indicate that the site surface materials at the four areas sampled exceed City of Geraldton – Greenough local authority requirements for subgrade.

CBR results indicate that provided the near surface site materials are suitably compacted they will make suitable subgrade.

Once the design of the development can be confirmed CBR's in road pavement areas should be confirmed. Generally the depth of sand between the basecourse layer and underlying clayey soils (obviously depending on final road design horizontal alignment) should be adequate to protect the pavement from reflective cracking of underlying soils, provided the formations are well drained.

Earthquake Site Factor

In accordance with AS1170.4 (Seismic design loads) the site is classified as Ce.

Wind Classification

In accordance with AS1170.2 the site is classified as Region B Terrain Category 2.

In accordance with AS4055 the site is classified as N3.

Acid Sulfate Soils

Testing for acid sulfate soils suggests that the levels of acid sulfate content in soils at the site are below threshold levels which the DoE require the development of an acid sulfate management plan.

Please refer to Appendix F for acid sulfate report.

AS2870 Drainage Design Recommendations

Given that this site has been found to comprise of underlying clay soils, the following specific detailing requirements will be required by AS2870 during, and following the construction of premises on the subdivision, by the Builder.

The design methods provided in AS2870 are based on the performance requirements that significant damage can be avoided provided that foundation site conditions are properly maintained.

All soils are affected by water. Silts are weakened by water. Sands can settle if heavily watered, and clays shrink and swell with variations in moisture content. Site works should be completed which ensure building foundations are protected from moisture ingress.

Floor Level

To avoid the possibility of flooding in poorly drained soils AS2870 recommends that the minimum height of the slab above finished ground level should be 150mm.

This requirement together with the Shires requirements for finished floor level should also be used to establish the building floor height during site earthworks.

Drainage shall be designed and constructed to avoid water ponding against or near the footing. The ground in the immediate vicinity of the perimeter footing shall be graded to fall 50 mm minimum away from the footing over a distance of 3m.

Any paving shall also be suitably sloped away from the building.

For M class sites it is recommended that a polyethylene membrane be laid at 5% fall away from the building approximately 200mm below the graded ground surface. It is recommended that this membrane extend 3m from the edge of the building.

Plumbing trenches shall be sloped away from the house and shall be backfilled with native Lot soil in the top 300mm within 1.5m of the house. The soil used for backfilling should be compacted. Where

pipes pass under the footing system, the trench shall be backfilled with native Lot fill to restrict the ingress of moisture beneath the footing system.

Subsurface drains shall be free draining and shall be able to be inspected and maintained. Subsurface drains shall be protected by filters and geotextiles.

NOTE: Wherever practicable, subsurface drains should be avoided near footings.

Construction

Following construction of the sand pad it may be required to excavate and backfill trenches for plumbing and other services. The site classification provided in this report relies upon all trench backfill being compacted to 95% MMDD. If the builder has any doubts as to whether the reinstatement of trenches by service providers meets this compaction requirement then the builder shall engage Blacktop to verify the compaction of backfill prior to pouring the footings or slab.

Plumbing Requirements

The building shall be provided with an adequate system of plumbing detailed in accordance with the following:

- a) Septic tanks and associated soakage areas shall be located a minimum distance of 5m from the building, where possible, to minimise soil moisture increase within the foundation.
- b) Plumbing and drainage under a slab shall be avoided where practicable

NOTE: Methods used should comply with local plumbing and drainage regulations.

Additional Requirements

The following requirements apply to the building services and footing system in addition to the above:

- a) Water run-off shall be collected and channelled away from the building during construction.
- b) Excavations near the edge of the footing system shall be backfilled in such a way as to prevent access of water to the foundation. For example, excavations should be backfilled above or adjacent to the footing with material similar to native material compacted by hand-rodging or tamping. Porous material such as sand, gravel or building rubble should not be used.
- a) Water shall not be allowed to pond in trenches for a long period.

Foundation Maintenance

Garden beds adjacent to the building should be avoided. Care should be taken to avoid over watering of gardens close to the building footings.

Planting of trees should be avoided near the foundation of a building or neighbouring building. To reduce, but not eliminate, the possibility of damage, tree planting should be restricted to a distance from the building of the mature height of the plant.

Where rows or groups of trees are involved, the distance from the building should be increased.

Leaks in plumbing, including stormwater and sewerage drainage, should be repaired promptly.

Site drainage recommendations should be maintained for the economic life of the building.

SCOPE & LIMITS OF GEOTECHNICAL INVESTIGATION

This report presents the results of a geotechnical investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project and structures described herein.

The advice tendered in this report is based on information obtained from the investigation locations tests points and sample points and is not warranted in respect to the conditions that may be encountered across the site at other than these locations. It is emphasised that the actual characteristics of the subsurface materials may vary significantly between adjacent test points and sample intervals and at allocations other than where observations, explorations and investigations have been made. Subsurface conditions, including groundwater levels and contaminant concentrations can change in a limited time. This should be borne in mind when assessing the data.

It should be noted that because of the inherent uncertainties in subsurface evaluations, changed or unanticipated subsurface conditions may occur that could affect total project cost and/or execution. BCE does not accept responsibility for the consequences of significant variances in the conditions and the requirements for execution of the work.

Should you have any queries please do not hesitate to contact Mr Lester Smith of this office on 99211878.

Yours faithfully


Lester Smith
Engineering Manager

Attachment: Appendix A-F

REFERENCES

Geological Survey of Western Australia. GERALDTON. Bureau of Mineral Resources, Geology and Geophysics 1982.

Langford, R.L.,2000. Regolith-Landform Resources of the Geraldton 1:50 000 Sheet.

AS2870-2011 Residential slabs and footings – Construction. Standards Australia.

Varnes, D.J., 1978. Slope Movement Types and Processes. National Academy of Sciences.

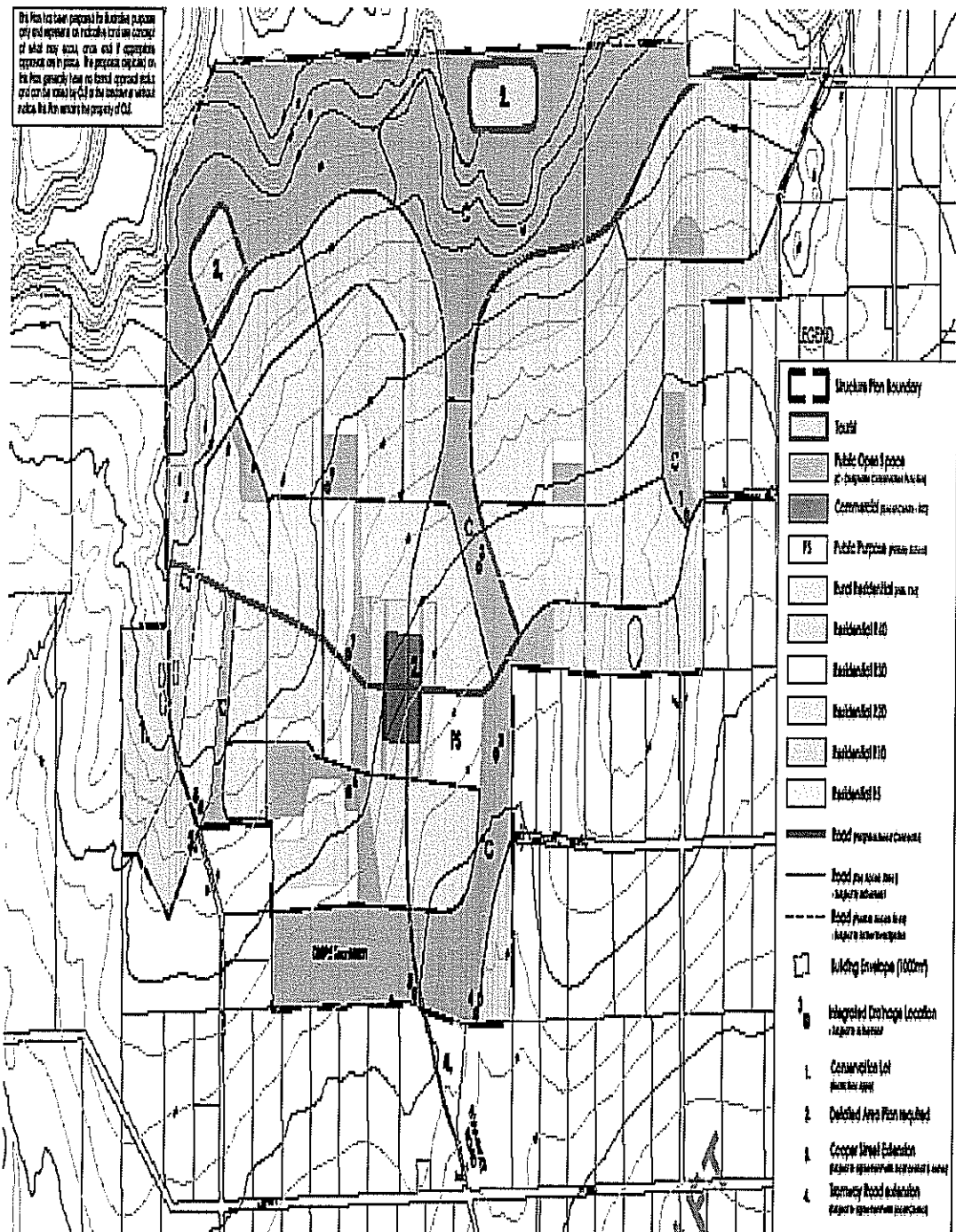
Scott, C. R., 1980. Soil Mechanics and Foundations. Applied Science Publishers Ltd.

Appendix A : Figure 1 : Subdivision structure plan.

www.cleplan.com.au



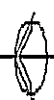
This Plan has been prepared for illustrative purposes only and represents a conceptual framework of what may occur, over and above the proposed approach only in principle. The proposed approach on this Plan generally has no formal approval and can only be used by CLE or the Council or without notice the Plan remains the property of CLE.



LEGEND

	Structure Plan Boundary
	Local
	Public Open Space or Community Amenity Area
	Commercial (medium density)
	Public Purpose (medium density)
	Residential (medium density)
	Residential L20
	Residential L30
	Residential L50
	Residential L70
	Residential L90
	Flood propagation channel
	Flood (see local map) (major flood channel)
	Flood (see local map) (major flood channel)
	Flood (see local map) (minor flood channel)
	Building Envelope (100m)
	Integrated Drainage Location (Major or Minor)
	1. Commercial Lot (medium density)
	2. Deleted Area (Plan required)
	3. Cooper Street Extension (subject to agreement with adjacent landowner)
	4. Temporary Road (subject to agreement with adjacent landowner)

2118-PS-01 (16.08.2012).rd



DRAFT

DRAFT LOCAL STRUCTURE PLAN

Moreley Heights, Geraldton

Appendix B : Photographs



Figure 1 : Photograph of site looking north from site 10.



Figure 2 : Photograph of site looking east to the Moresby ranges.



Figure 3 : Photograph of site looking east to Moresby ranges.



Figure 4 : Photograph of site looking west from site 21.



Figure 5 : Photograph of rocks on surface near site 16.

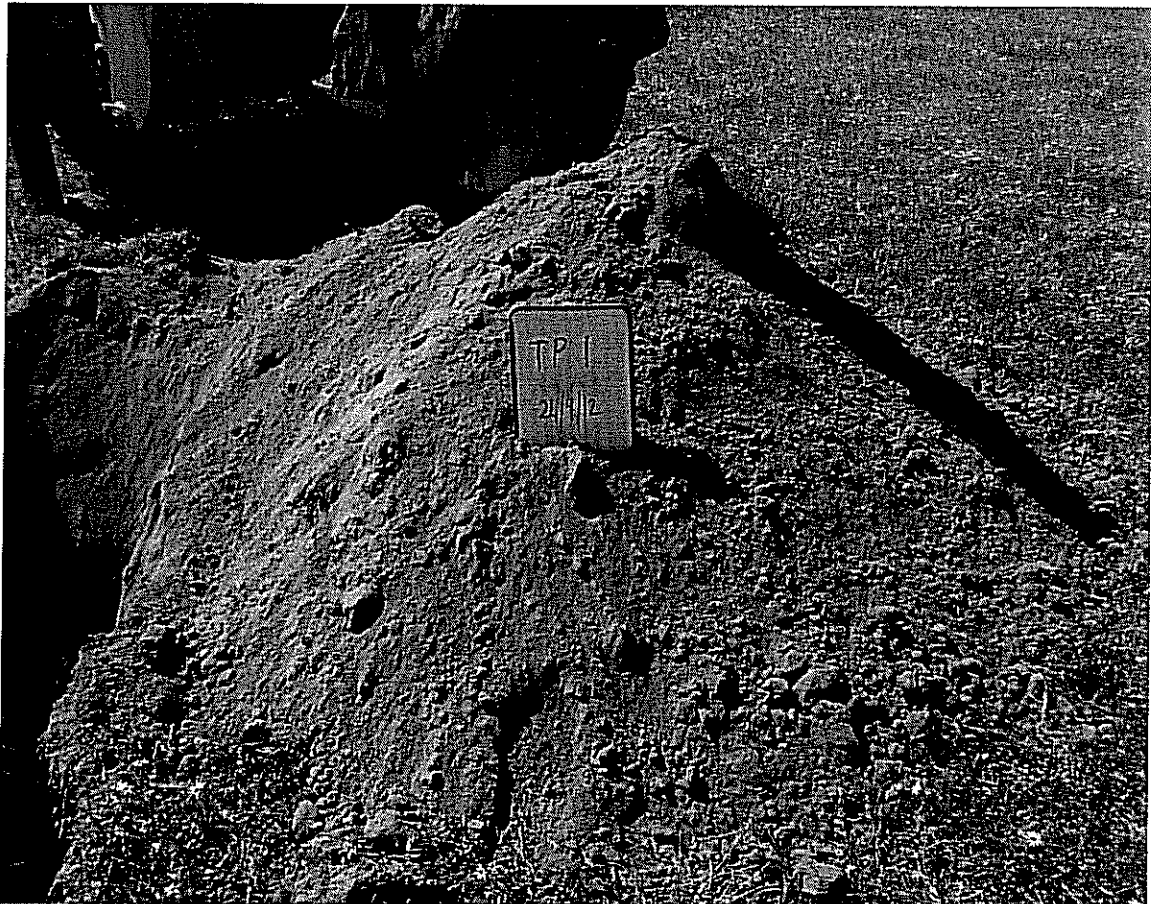


Figure 6 : Photograph of test site 1 excavation.



Figure 7 : Photograph of material excavated from test site 1.



Figure 8 : Photograph of test site 10 excavation.



Figure 9 : Photograph of material excavated from test site 10.



Figure 10 : Photograph of test site 20 excavation.



Figure 11 : Photograph of material excavated from test site 20.

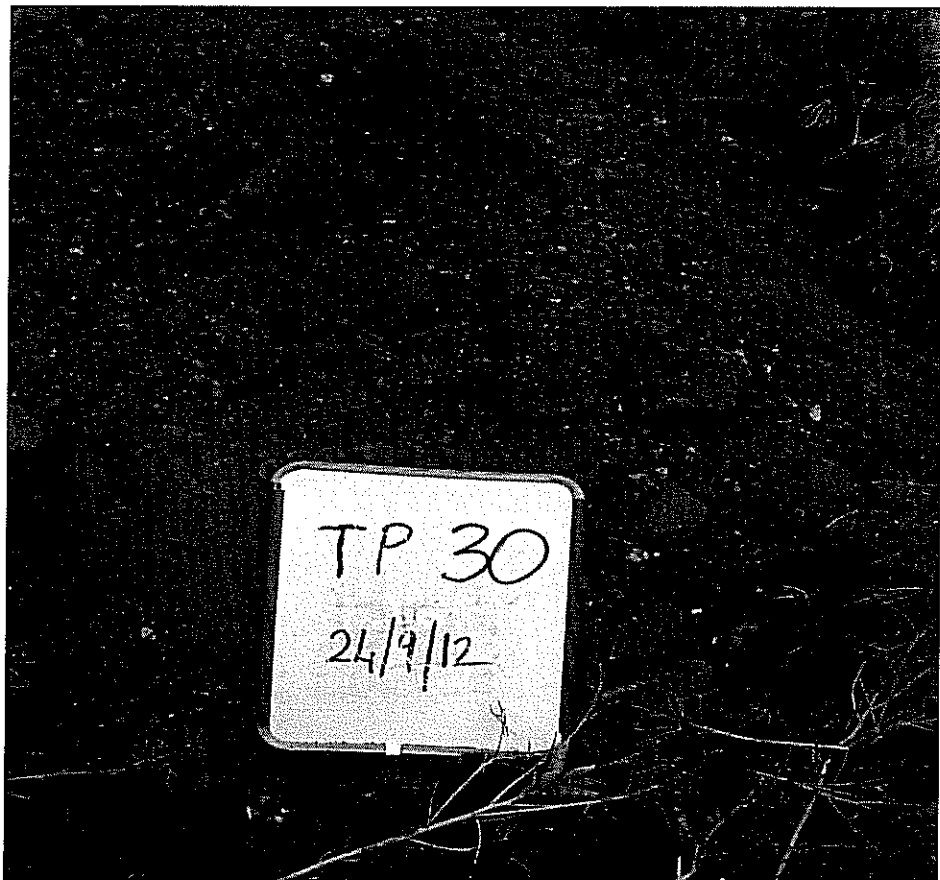


Figure 12 : Photograph of test site 30 excavation.



Figure 13 : Photograph of material excavated from test site 30.

Appendix C : Excavation Logs

BCE

TEST PIT LOG

TP 01

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 1
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 270500E / 6825500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Moist	SP-SM	B	Top 200mm of soil contains rootlets. Sample taken at 0.5m depth. Sample No. 12BME9473. Tests for PSD, PI, MMDD, MC & CBR completed. Penetrometer testing from ground level indicates sand is very loose GL(4,4,4). Material lightly cemented when excavated.
	0.5						
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 02

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 2	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 270248E / 6824925N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.3m: Clayey Gravelly SAND: Brown, laterite gravel and sand. Slightly plastic.	Dry	SC	B	Too gravelly for penetrometer testing. Sample taken at 0.8m depth. Sample No. 12BME9474. Tests for PSD, PI & MC completed.
	1.0	L	0.8m: Silty Clayey SAND: Brown, orange , red Slightly plastic.	Dry	SC	NS	Dry and cemented when excavated but material crumbles under finger pressure. Material looks like laterite particles but very soft. Acid sulfate testing completed at this site.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 04

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
PROJECT: Moresby Heights Subdivision
SITE: Test Pit 4
LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
DATE COMMENCED: 24/09/2012
DATE COMPLETED: 24/09/2012
LOGGED BY: L Smith

Machine: Backhoe
Excavation Depth: 3m

RL: Natural Ground Surface
GDA Coordinate: 270791E / 682500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Moist	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from ground level indicates sand is reasonably compact GL(6,9,9).
	1.0						Material lightly cemented when excavated.
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 05

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 5	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 270641E / 6825225N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Moist	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from ground level indicates sand is very loose GL(4,5,5). Material lightly cemented when excavated.
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 06

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 6
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 270805E / 6825794N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0		0.0m: Silty SAND: Yellow, sand is medium, non-plastic.	Dry	SM	NS	Top 200mm of soil contains rootlets. Sample taken at 0.5m depth. Sample No. 12BME9477. Tests for PSD, PI, MC, Organic & CaCO3 completed. Penetrometer testing from 300mm below ground level indicates sand is reasonably compact GL(10,10,10). Material lightly cemented when excavated.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 07

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED: 24/09/2012	
SITE: Test Pit 7	DATE COMPLETED: 24/09/2012	
LOCATION: Refer to test pit locality plan	LOGGED BY: L Smith	

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 0.6m	GDA Coordinate: 271183E / 6825935N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Light brown, sand is medium, non- plastic. Contains sandstone and quartz cobble to 200mm dia.	Dry	SM	NS	Top 200mm of soil contains rootlets.
	0.6	VD	0.6m: Moderately weathered, dark red and brown siliciclastic sedimentary rock. Test Pit Terminated at 600mm depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 8

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 8	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271000E / 6825500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description	Moisture Condition	USC Symbol	Sample	Field Records/Comments
			type, colour, particle size, plasticity, minor components				In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Moist	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level indicates sand is quite loose GL(5,5,5).
	0.5						
	1.0						
	1.5						Material lightly cemented when excavated.
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 09

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 9	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271000E / 6825000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	B	Top 200mm of soil contains rootlets. Sample taken at 0.5m depth. Sample No. 12BME9478. Tests for PSD, PI, MC, Organic & CaCO3 completed. Penetrometer testing from ground level indicates sand is reasonably compact GL(13,13,13). Material lightly cemented when excavated.
	1.5			Moist			Material appears to have slightly higher moisture content from 1.5m depth.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 10	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271077E / 6824654N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, sand is medium, non- plastic.	Dry	SM	NS	Top 200mm of soil contains rootlets.
	1.5	L	1.5m: Silty Clayey SAND: Red / brown, sand is medium, slightly plastic.	Moist	SC	NS	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth.
	3.0		Test Pit Terminated at 3000mm depth.				

BCE

TEST PIT LOG

TP 11

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 11
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271000E / 682400N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand ls medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.3m: Gravelly Silty SAND: Brown, orange, Non -plastic. Contains considerable laterite gravel fraction.	Dry	SP-SM	B	Sample taken at 0.5m depth. Sample No. 12BME9479. Tests for PSD & PI completed. Too rocky for Penetrometer testing.
	1.0	L	0.7m: Silty Clayey SAND: Brown, orange , red Plastic. Contains slight gravel fraction.	Moist	SC	NS	Cemented and difficult to excavate. Material cemented when excavated.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 12

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 12
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271182E / 6823723N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.4m: Silty SAND: Light grey, lightly cemented like a weathered sandstone but excavatable.	Dry	SM	NS	Too rocky for Penetrometer testing.
	1.0	L	0.7m: Silty Clayey SAND: Yellow, orange Moderately plastic. Contains slight gravel fraction.	Dry	SC	B	Cemented and difficult to excavate. Material cemented when excavated. Sample taken at 1.2m depth. Sample No. 12BME9480. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	2.0		Test Pit Terminated at 2000mm depth. Clay too hard.				
	2.5						
	3.0						

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 13

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 13	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271317E / 6824260N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Brown / orange, sand is medium, non- plastic.	Dry	SP-SM	B	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(14,14,14). Sample taken at 0.5m depth. Sample No. 12BME9481. Tests for MC, MMDD & CBR completed. Material lightly cemented when excavated.
	1.5	L	1.5m: Silty Clayey SAND: Brown / orange, sand is medium, slightly plastic.	Moist	SC	NS	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth. Material lightly cemented when excavated.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 14

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 14	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271320E / 6824746N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, sand is medium, non- plastic.	Dry	SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL (10,10,10). Material lightly cemented when excavated.
	1.5	L	1.5m: Silty Clayey SAND: Red / brown, sand is medium, slightly plastic.	Moist	SC	B	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth. Sample taken at 2.0m depth. Sample No. 12BME9482. Tests for PSD & PI completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 15

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 15	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271229E / 6825337N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / orange, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(9,12,12). Material lightly cemented when excavated.
	1.5	L	1.5m: Silty Clayey SAND:Red / Brown, sand is medium, slightly plastic.	Moist	SC	B	Material appears to have slightly higher moisture content from 1.5m depth. Material appears to get more clayey with depth. Material lightly cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9483. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 16

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 16
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 1.1m

RL: Natural Ground Surface
 GDA Coordinate: 271271E / 6825820N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty Gravelly SAND : Brown, sand is medium, non- plastic. Contains laterite and quartz gravel to 30mm dia.	Dry	SM	NS	Top 200mm of soil contains rootlets. Surface rock outcrops nearby.
	0.5	L	0.5m: Silty Clayey SAND: Red / grey / brown, sand is medium, medium plasticity.	Moist	SC	B	Cemented when excavated. Difficult to excavate. Sample taken at 0.5m depth. Sample No. 12BME9484. Tests for MMDD, MC & CBR completed.
	1.1	VD	1.1m: Moderately weathered, dark red and brown siliciclastic sedimentary rock. Test Pit Terminated at 1.1m depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 17

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 17	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6823700N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Orange / Brown, sand is medium, non- plastic.	Moist	SM	B	Top 200mm of soil contains rootlets. Penetrometer testing from 300mm below ground level -300mm(11,11,11). Sample taken at 0.5m depth. Sample No. 12BME9485. Tests for PSD & PI completed. Acid sulfate testing completed. Material lightly cemented when excavated. Material appears to have slightly higher moisture content from 1.5m depth.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 18

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 18	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6824000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Orange, quartz sand is medium, slightly plastic.	Dry	SC	B	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from 300mm below ground level -300mm (5,4,3) indicates sand is quite loose. Sample taken at 0.5m depth. Sample No. 12BME9486. Tests for PSD, PI, MC, Organic & CaCO3 completed. Material lightly cemented when excavated.
	1.0						Material appears to have slightly higher moisture content from 1.0m depth.
	1.5						
	2.0						
	2.5						
	3.0						

			Test Pit Terminated at 3000mm depth.				
--	--	--	--------------------------------------	--	--	--	--

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 19

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 19
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271500E / 6824500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.8	L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Moist	CL	B	Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9487. Tests for PSD & PI completed. Acid sulfate testing completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 20

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 20	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6825000N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red, brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	B	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(20,20, ref). Sample taken at 0.5m depth. Sample No. 12BME9488. Tests for MMDD, MC & CBR completed.
	1.0	L	1.0m: Silty Clayey SAND: Red, brown. Plastic. Contains slight gravel fraction.	Moist	SC	NS	Material lightly cemented when excavated. Material appears to get more clayey with depth.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 21

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 21	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6825500N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
									in situ testing, additional observations
Groundwater not encountered	Natural ground	0	L		0.0m: Silty SAND: Red, brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(8,7,7) indicates quite loose.
		1.0	L		1.0m: Silty Clayey SAND: Red, brown. Moderately plastic. Contains slight gravel fraction.	Moist	SC	B	Material lightly cemented when excavated. Material appears to get more clayey with depth. Sample taken at 2.0m depth. Sample No. 12BME9489. Tests for PSD, PI, MC, CaCO ₃ & Organic Content completed.
		3.0			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 22

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 22	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 682600N

	Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments in situ testing, additional observations
	Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red, sand is medium, non-plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
		0.5						
		1.0	L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Dry	SC	B	Material difficult to excavate. Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9490. Tests for PSD & PI completed. Acid sulfate testing completed.
		1.5						
		2.0						
		2.5						
		3.0						
				Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 23

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 23
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271801E / 6823730N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, quartz sand is medium, slightly plastic. Contains fine rounded quartz particles.	Dry	SM	NS	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from 300mm below ground level -300mm (6,5,5) indicates sand is quite loose.
	1.0						
	1.5						Material appears to have slightly higher moisture content from 1.0m depth.
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 24	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271727E / 6825298N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Red / brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Material lightly cemented when excavated.
	0.7	L	0.7m: Silty Clayey SAND: Red / brown. Moderately plastic. Contains slight gravel fraction.	Moist	SC	B	Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9491. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE**TEST PIT LOG****TP 25**

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture
 PROJECT: Moresby Heights Subdivision
 SITE: Test Pit 25
 LOCATION: Refer to test pit locality plan

JOB NUMBER: 12BCE 226
 DATE COMMENCED: 24/09/2012
 DATE COMPLETED: 24/09/2012
 LOGGED BY: L Smith

Machine: Backhoe
 Excavation Depth: 3m

RL: Natural Ground Surface
 GDA Coordinate: 271786E / 6825788N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty Clayey SAND: Red / brown, sand is medium, moderately plastic. Rounded quartz particles. Contains slight gravel fraction.	Dry	SC	B	Top 200mm of soil contains rootlets. Material cemented when excavated. Penetrometer testing from ground level (16,16,ref). Material difficult to excavate. Sample taken at 1.5m depth. Sample No. 12BME9492. Tests for PSD & PI completed.
	0.5						
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
 Checked By: R Fawcett

BCE

TEST PIT LOG

TP 26

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 26	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 272000E / 6823500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty Clayey SAND: Red / brown, sand is medium, moderately plastic. Rounded quartz particles. Contains slight gravel fraction.	Dry	SC	NS	Top 200mm of soil contains rootlets. Material cemented when excavated. Penetrometer testing from ground level GL(10,10,10). Material appears to have slightly higher moisture content from 1.0m depth.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 27

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 27	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271631E / 6824042N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							In situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Orange / brown, quartz sand is medium, non-plastic. Contains fine rounded quartz particles.	Dry	SM	B	Top 200mm of soil contains rootlets.
	0.5						Penetrometer testing from ground level GL(5,4,10) indicates sand is quite loose.
	1.0						Sample taken at 0.5m depth. Sample No. 12BME9493. Tests for PSD, PI, MC, Organic & CaCO3 completed.
	1.5						Material lightly cemented when excavated.
	2.0						Material appears to have slightly higher moisture content from 1.0m depth.
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 28

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE 226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED: 24/09/2012
SITE: Test Pit 28	DATE COMPLETED: 24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY: L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271229E / 6825337N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets. Penetrometer testing from ground level GL(12,10,10).
	0.5	L	0.4m: Silty Clayey SAND: Red / Brown, sand is medium, moderately plastic.	Moist	SC	B	Material lightly cemented when excavated. Material appears to get more clayey with depth. Sample taken at 2.0m depth. Sample No. 12BME9494. Tests for PSD & PI completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 29	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 1.5m	GDA Coordinate: 271821E / 6825004N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description	Moisture Condition	USC Symbol	Sample	Field Records/Comments
					type, colour, particle size, plasticity, minor components				In situ testing, additional observations
Groundwater not encountered	Natural ground	0	L		0.0m: Silty Gravelly SAND : Brown, sand is medium, non- plastic. Contains laterite and quartz gravel to 30mm dia.	Dry	SM	NS	Top 200mm of soil contains rootlets.
		0.5							
		1.0	L		0.9m: Silty Clayey SAND: Red / brown, sand is medium, medium plasticity.	Dry	SC	NS	Cemented when excavated. Difficult to excavate.
		1.5	VD		1.5m: Moderately weathered, dark red and blue siliciclastic sedimentary rock. Test Pit Terminated at 1.5m depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.
		2.0							
		2.5							
		3.0							

BCE

TEST PIT LOG

TP 30

Sheet 1 of 1

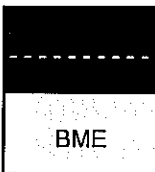
CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 30	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 0.9m	GDA Coordinate: 271765E / 6825527N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty Gravelly Clayey SAND : Brown, sand is medium, moderately plastic. Contains laterite and quartz gravel to 30mm dia.	Dry	SM	B	Top 200mm of soil contains rootlets. Sample taken at 0.8m depth. Sample No. 12BME9495. Tests for PSD, PI, MC & CaCO3 completed.
	0.5						
	1.0	VD	0.9m: Moderately weathered, dark red and brown siliciclastic sedimentary rock. Test Pit Terminated at 0.9m depth. (Machine Refusal - Ground too Hard)				Bucket teeth smoking at refusal.
	1.5						
	2.0						
	2.5						
	3.0						

Produced By: L Smith
Checked By: R Fawcett

Appendix D : Test Certificate Results
Moisture Content (MC), Particle Size
Distribution (PSD), Consistency Limits
(PI), Organic, Calcium Carbonate,
Maximum Dry Density (MDD / OMC), and
Soaked Californian Bearing Ratio (CBR).



BLACKTOP MATERIALS ENGINEERING

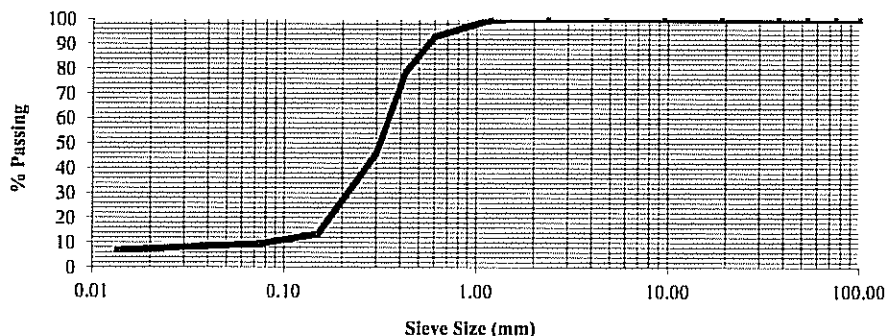
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 3

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 1
LOCATION: Depth: 0.5m
DESCRIPTION: Yellow Sand with Silt
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9473
SAMPLE No.: 12BME9473
DATE SAMPLED 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	100
0.600	93
0.425	79
0.300	46
0.150	13
0.075	9
0.0135	7

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	18.5	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SP-SM

Field Moisture Content

In accordance with WA 110.1
2.4%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
7 % retained on 0.600mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 3 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9473
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9473
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 1	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Yellow Sand with Silt	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method WA 141.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	2.7
Drop Height (mm):	300
No. of layers:	5
No. of blows / layer:	< 9
MOISTURE CONTENT : (%/OMC)	
At compaction:	10.2 / 99.0
After Penetration	
Top 30mm:	12.1 / 117.5
Entire Depth:	13.1 / 127.5
DRY DENSITY (t/m³/%MDD)	
At compaction:	1.78 / 95.5
After soaking:	1.78 / 95.5
SURCHARGE (kg):	4.5
CONDITION OF SPECIMEN:	Soaked 4 days
SWELL (%):	0.0
MDD DATA (WA133.1)	
MAXIMUM DRY DENSITY (t/m³):	1.869
OPTIMUM MOISTURE CONTENT (%):	10.3
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	20
At 5.0mm penetration:	

Note:

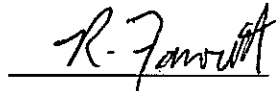
Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

0 % retained on 19.0mm sieve and excluded from test.

Non standard test. Less than 9 blows with the 2.7kg hammer. Tested at clients request.

Approved Signatory :



(R Fawcett)

Date :

3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

Form No. R-WA-06-03

BLACKTOP MATERIALS ENGINEERING

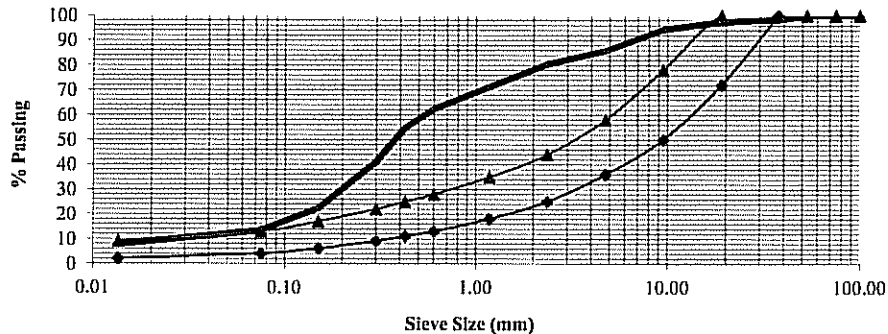
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9474
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9474
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 2	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.8m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Gravelly Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Material Suitability	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	98
19.0	97
9.5	94
4.75	86
2.36	80
1.18	71
0.600	62
0.425	55
0.300	41
0.150	22
0.075	13
0.0135	8

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit	29.8	%
(*120.2)		
Plastic Limit	19.4	%
(*121.1)		
Plasticity Index	10.4	%
(*122.1)		
Linear Shrinkage	4.4	%
(*123.1)		

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
 SC

Field Moisture Content

In accordance with WA 110.1
 8.6%

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 Upper and lower grading curve guides provided as per MRWA Pavement Specification 501 (Table 501.08) for basecourse.
 No cracking, crumbling or curling with shrinkage.
 2 % retained on 37.5mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

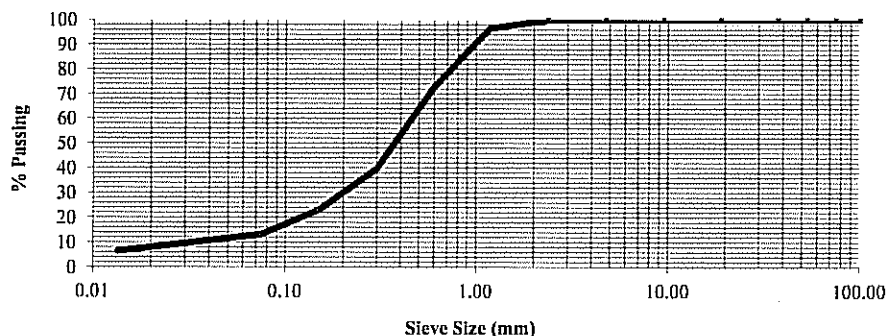
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9475
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9475
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 3	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.3m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	97
0.600	73
0.425	56
0.300	40
0.150	23
0.075	13
0.0135	6

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	18.2	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SM

Calcium Carbonate Content

In accordance with WA 915.1
4.7%

Field Moisture Content

In accordance with WA 110.1
2.4%

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 No cracking, crumbling or curling with shrinkage.
 3 % retained on 1.18mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

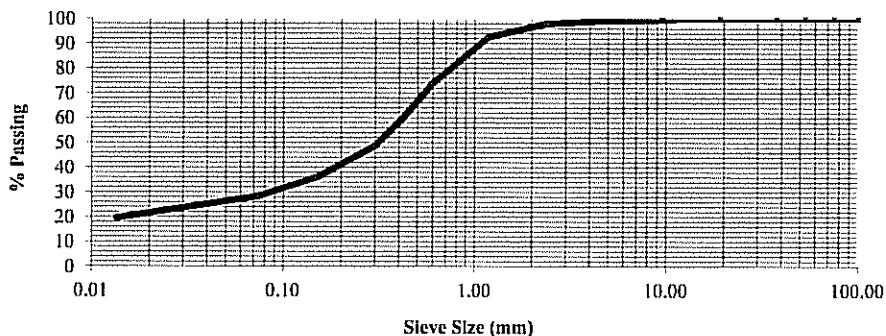
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9476
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9476
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 3	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 2.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	98
1.18	93
0.600	74
0.425	60
0.300	49
0.150	36
0.075	28
0.0135	20

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	23.9	%
Plastic Limit (*121.1)	11.7	%
Plasticity Index (*122.1)	12.2	%
Linear Shrinkage (*123.1)	6.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

Approved Signatory :

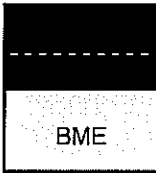
(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

WORLD RECOGNISED
ACCREDITATION



BLACKTOP MATERIALS ENGINEERING

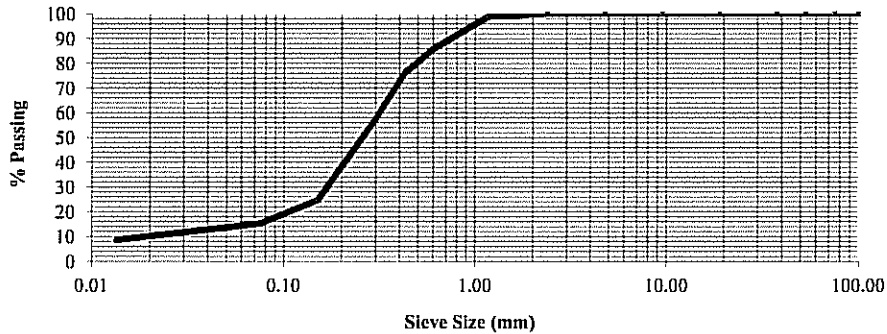
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 6
LOCATION: Depth: 0.5m
DESCRIPTION: Silty Yellow Sand
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9477
SAMPLE No.: 12BME9477
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	99
0.600	86
0.425	76
0.300	57
0.150	25
0.075	15
0.0135	9

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	18.6	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SM

Calcium Carbonate Content

In accordance with WA 915.1
3.6%

Field Moisture Content

In accordance with WA 110.1
3.2%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 1.18mm sieve.

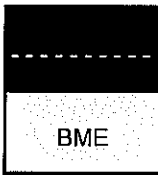
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

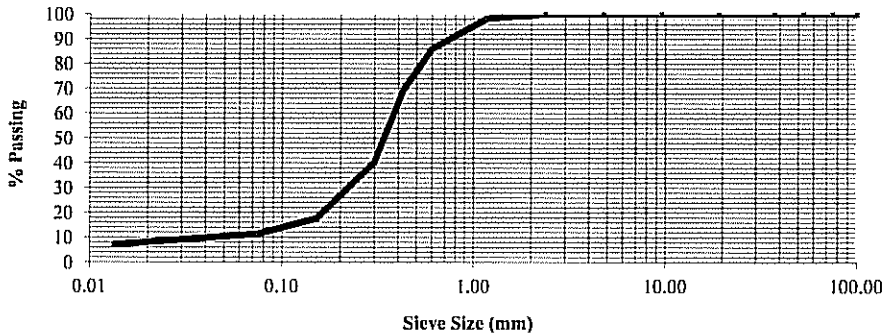
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 9
LOCATION: Depth: 0.5m
DESCRIPTION: Yellow Sand with Silt
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9478
SAMPLE No.: 12BME9478
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	98
0.600	86
0.425	69
0.300	40
0.150	17
0.075	11
0.0135	7

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	16.5	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SW-SM

Calcium Carbonate Content

In accordance with WA 915.1
2.8%

Field Moisture Content

In accordance with WA 110.1
2.2%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
2 % retained on 1.18mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

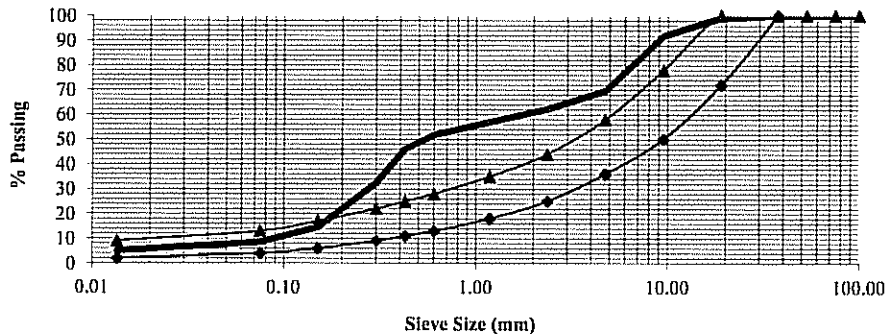
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au



TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9479
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9479
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED:	24/09/2012
LOCATION:	Test Pit 11	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Material Suitability	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	99
9.5	92
4.75	70
2.36	62
1.18	57
0.600	52
0.425	46
0.300	32
0.150	15
0.075	9
0.0135	5

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	20.8	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.8	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SP-SM

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 Upper and lower grading curve guides provided as per MRWA Pavement Specification 501 (Table 501.08) for basecourse.
 No cracking, crumbling or curling with shrinkage.
 1 % retained on 19.0mm sieve.

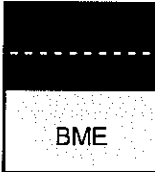
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

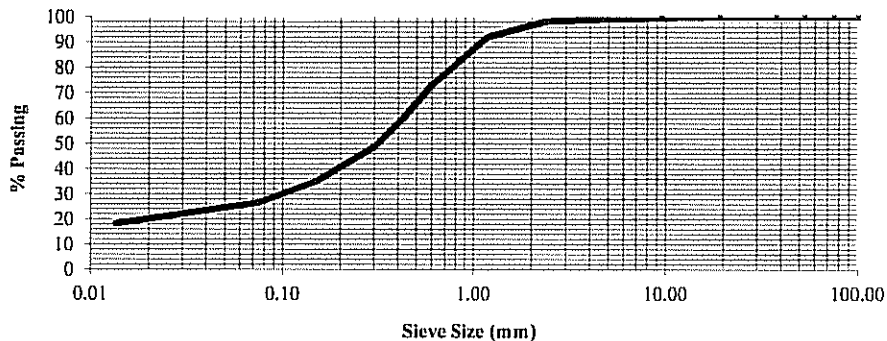


BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9480
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9480
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 12	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 1.2m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	98
1.18	92
0.600	73
0.425	60
0.300	49
0.150	35
0.075	27
0.0135	18

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	34.0	%
Plastic Limit (*121.1)	12.8	%
Plasticity Index (*122.1)	21.2	%
Linear Shrinkage (*123.1)	8.4	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

in accordance with WA 915.1
3.8%

Field Moisture Content

In accordance with WA 110.1
8.2%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9481
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9481
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 13	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

Field Moisture Content

in accordance with WA 110.1

2.9%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

Approved Signatory :



(R Fawcett)

Date : **3/10/2012**



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

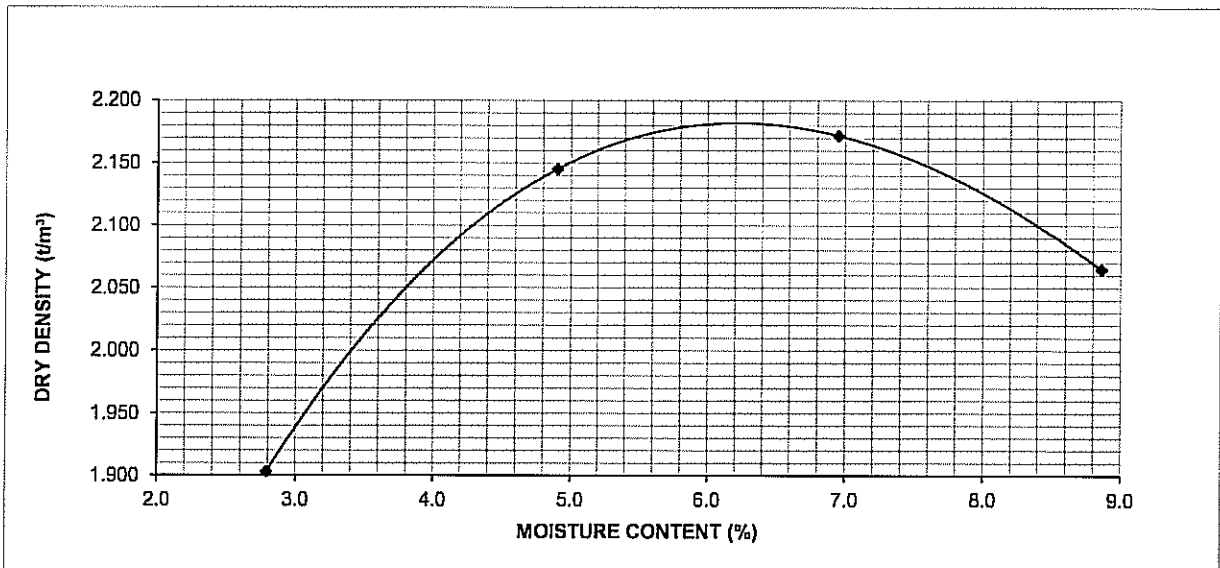
TEST CERTIFICATE

Page 2 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9481
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9481
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 13	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method WA 133.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 2.181

OPTIMUM MOISTURE CONTENT (%) = 6.3

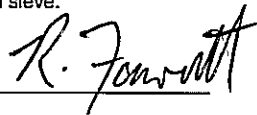
Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

0 % retained on 19.0mm sieve.

Approved Signatory :

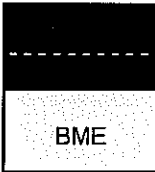


(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

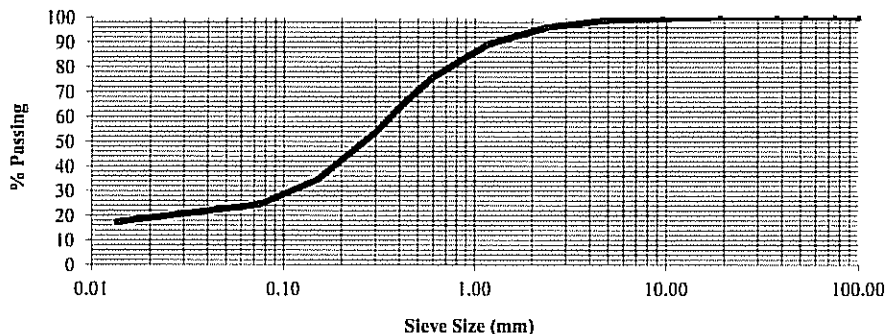
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 14
LOCATION: Depth: 2.0m
DESCRIPTION: Clayey Sand minor Gravel
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9482
SAMPLE No.: 12BME9482
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	96
1.18	89
0.600	76
0.425	66
0.300	54
0.150	35
0.075	25
0.0135	17

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	24.2	%
Plastic Limit (*121.1)	12.7	%
Plasticity Index (*122.1)	11.5	%
Linear Shrinkage (*123.1)	4.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

WORLD RECOGNISED
ACCREDITATION

BLACKTOP MATERIALS ENGINEERING

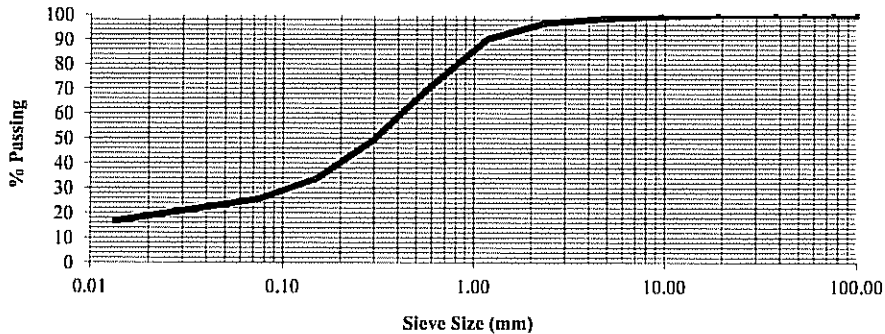
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9483
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9483
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 15	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 2.0m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	99
2.36	97
1.18	90
0.600	71
0.425	61
0.300	49
0.150	34
0.075	25
0.0135	17

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	27.7	%
Plastic Limit (*121.1)	10.9	%
Plasticity Index (*122.1)	16.8	%
Linear Shrinkage (*123.1)	6.8	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

In accordance with WA 915.1
3.8%

Field Moisture Content

In accordance with WA 110.1
6.3%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 4.75mm sieve.

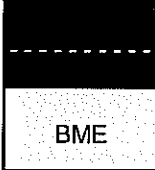
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9484
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9484
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 16	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

Field Moisture Content

in accordance with WA 110.1

7.2%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

Approved Signatory :

(R Fawcett)

Date : **3/10/2012**



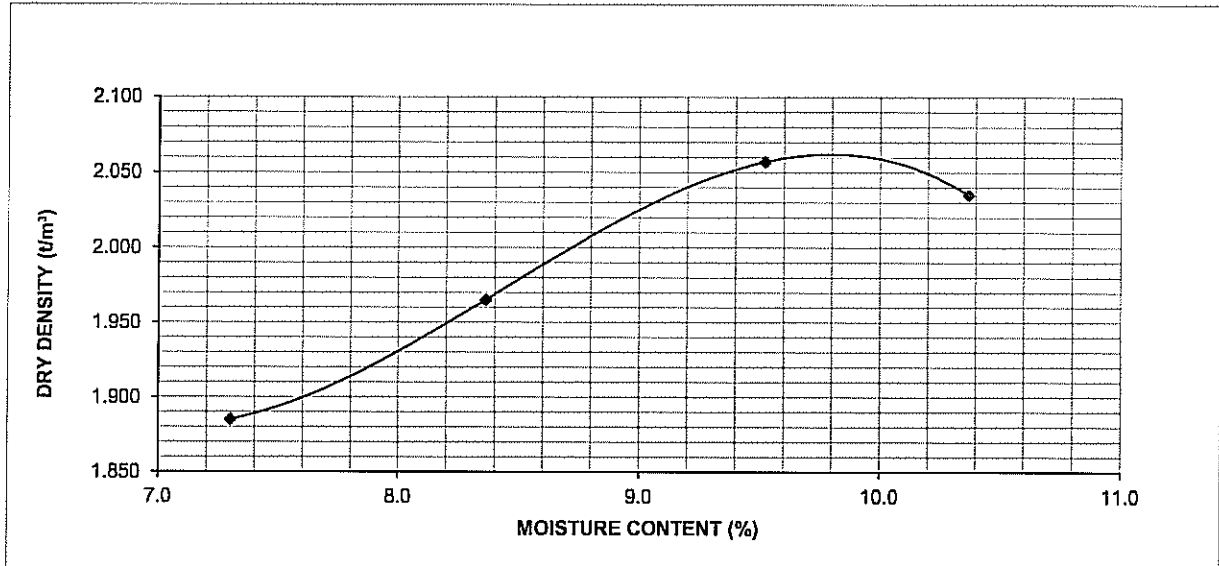
This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9484
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9484
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 16	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method WA 133.1 (Modified Compaction)

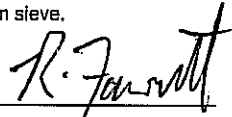


MAXIMUM DRY DENSITY (t/m³) = 2.062

OPTIMUM MOISTURE CONTENT (%) = 9.8

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 1 % retained on 19.0mm sieve.

Approved Signatory :  (R Fawcett) Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 3 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9484
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9484
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 16	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method WA 141.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	16
MOISTURE CONTENT : (%/OMC)	
At compaction:	10.1 / 103.5
After Penetration	
Top 30mm:	11.6 / 119.0
Entire Depth:	11.6 / 118.5
DRY DENSITY (t/m³/%MDD)	
At compaction:	1.95 / 94.5
After soaking:	1.95 / 94.5
SURCHARGE (kg):	4.5
CONDITION OF SPECIMEN:	Soaked 4 days
SWELL (%):	0.0
MDD DATA (WA133.1)	
MAXIMUM DRY DENSITY (t/m³):	2.062
OPTIMUM MOISTURE CONTENT (%):	9.8
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	25
At 5.0mm penetration:	

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

1 % retained on 19.0mm sieve and excluded from test.

Approved Signatory :



(R Fawcett)

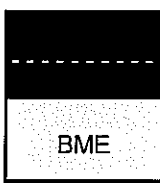
Date :

3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

Form No. R-WA-06-03



BLACKTOP MATERIALS ENGINEERING

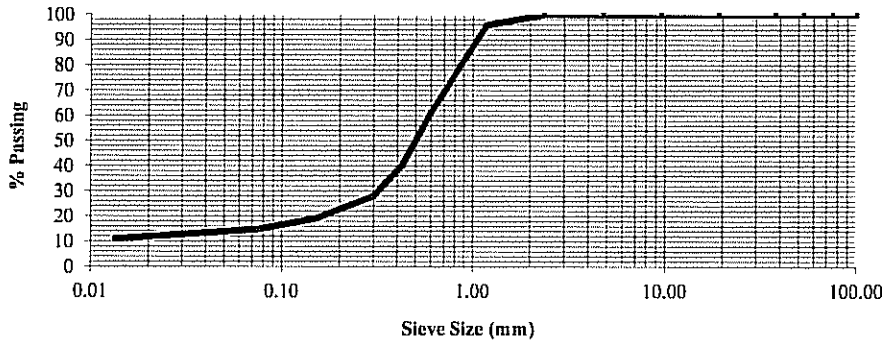
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 17
LOCATION: Depth: 0.5m
DESCRIPTION: Silty Sand
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9485
SAMPLE No.: 12BME9485
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	96
0.600	61
0.425	40
0.300	28
0.150	19
0.075	15
0.0135	11

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	17.0	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SM

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
4 % retained on 1.18mm sieve.

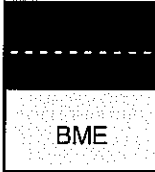
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

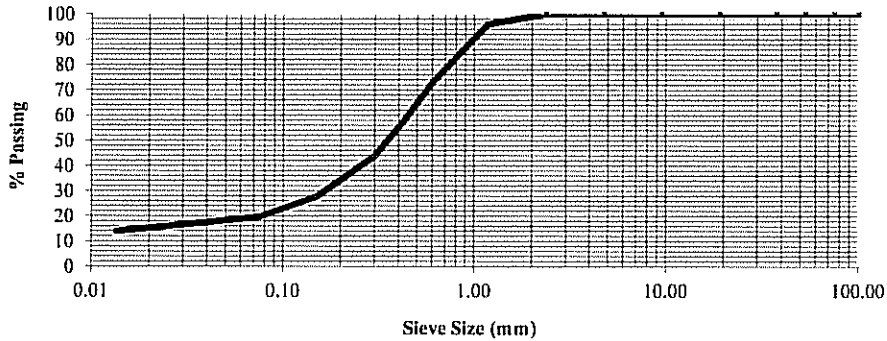


BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9486
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9486
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 18	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	96
0.600	73
0.425	58
0.300	44
0.150	28
0.075	20
0.0135	14

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	21.0	%
Plastic Limit (*121.1)	13.8	%
Plasticity Index (*122.1)	7.2	%
Linear Shrinkage (*123.1)	2.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

In accordance with WA 915.1
3.3%

Field Moisture Content

In accordance with WA 110.1
3.8%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
4 % retained on 1.18mm sieve.

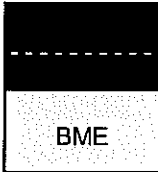
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

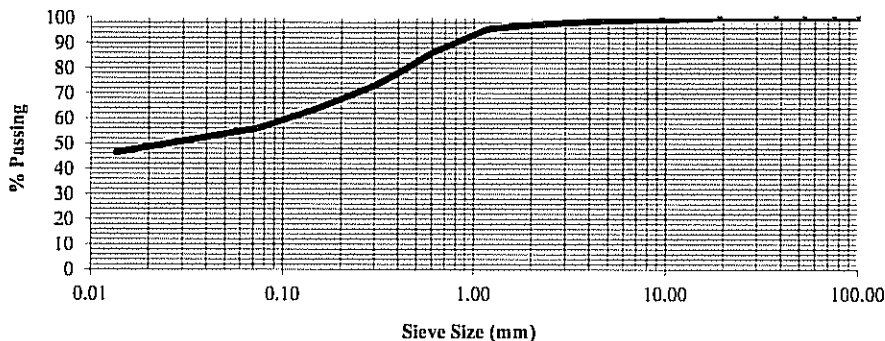


BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9487
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9487
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 19	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 2.0m	PROJECT No.:	Not Supplied
DESCRIPTION:	Sandy Clay minor Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	99
4.75	99
2.36	98
1.18	96
0.600	86
0.425	79
0.300	73
0.150	64
0.075	56
0.0135	46

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	41.8	%
Plastic Limit (*121.1)	19.7	%
Plasticity Index (*122.1)	22.1	%
Linear Shrinkage (*123.1)	8.4	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
CL

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 9.5mm sieve.

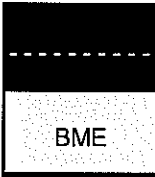
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9488
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9488
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 20	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

Field Moisture Content

in accordance with WA 110.1

2.3%

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

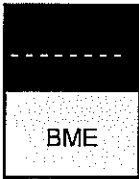
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531

ACN: 098 257 071 / ABN: 52 098 257 071

PHONE: (08) 9921 1878 / FAX: (08) 9965 5730

email: blacktop@westnet.com.au

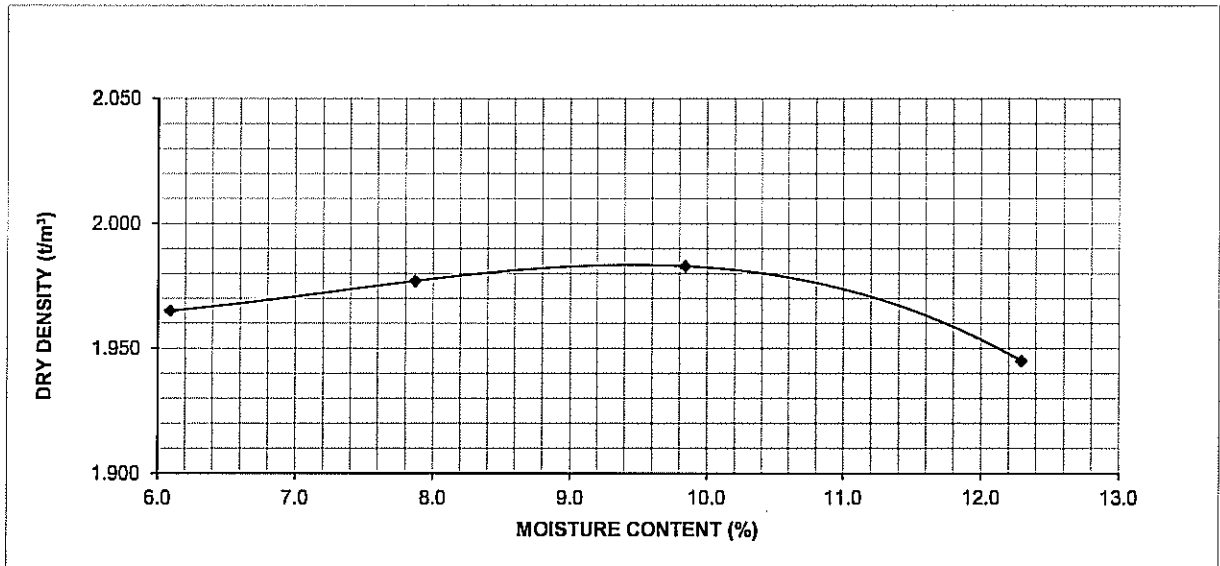
TEST CERTIFICATE

Page 2 of 3

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9488
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9488
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 20	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method WA 133.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.983

OPTIMUM MOISTURE CONTENT (%) = 9.4

Note:

Sampled by Blacktop Materials Engineering.

Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.

2 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date :

3/10/2012



This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

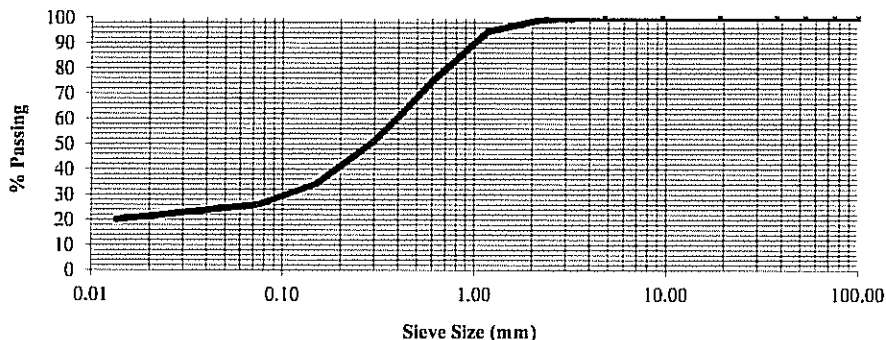
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture ADDRESS: PO Box 1917 Geraldton WA 6531 PROJECT/ROAD: Moresby Heights Subdivision LOCATION: Test Pit 21 LOCATION: Depth: 2.0m DESCRIPTION: Clayey Sand PROPOSED USE: Foundation	CERTIFICATE No.: 12BME9489 SAMPLE No.: 12BME9489 DATE SAMPLED: 24/09/2012 DATE TESTED: 25/09-3/10/2012 PROJECT No.: Not Supplied CLIENT LOT No.: Not Supplied CLIENT ORDER No.: Not Supplied TEST REQUEST No.: Not Supplied
--	--



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	95
0.600	75
0.425	63
0.300	51
0.150	34
0.075	26
0.0135	20

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	25.0	%
Plastic Limit (*121.1)	11.8	%
Plasticity Index (*122.1)	13.2	%
Linear Shrinkage (*123.1)	6.0	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2

SC

Calcium Carbonate Content

In accordance with WA 915.1
3.7%

Field Moisture Content

In accordance with WA 110.1
6.8%

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 No cracking, crumbling or curling with shrinkage.
 5 % retained on 1.18mm sieve.

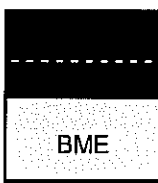
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

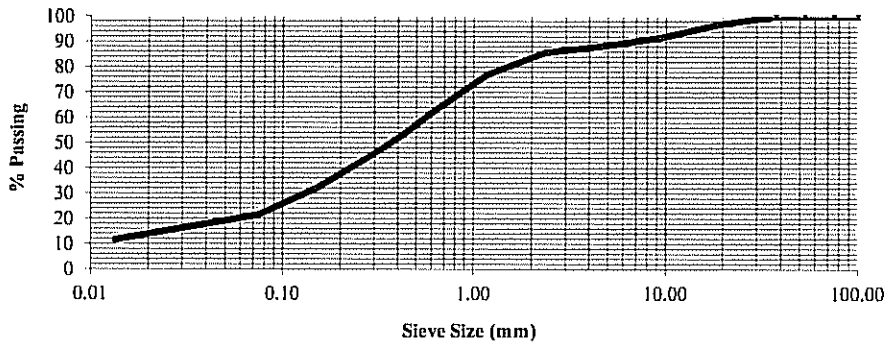
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 22
LOCATION: Depth: 2.0m
DESCRIPTION: Gravelly Clayey Sand
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9490
SAMPLE No.: 12BME9490
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	97
9.5	92
4.75	88
2.36	86
1.18	77
0.600	62
0.425	53
0.300	46
0.150	32
0.075	21
0.0135	12

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	39.1	%
Plastic Limit (*121.1)	21.5	%
Plasticity Index (*122.1)	17.6	%
Linear Shrinkage (*123.1)	7.2	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
3 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

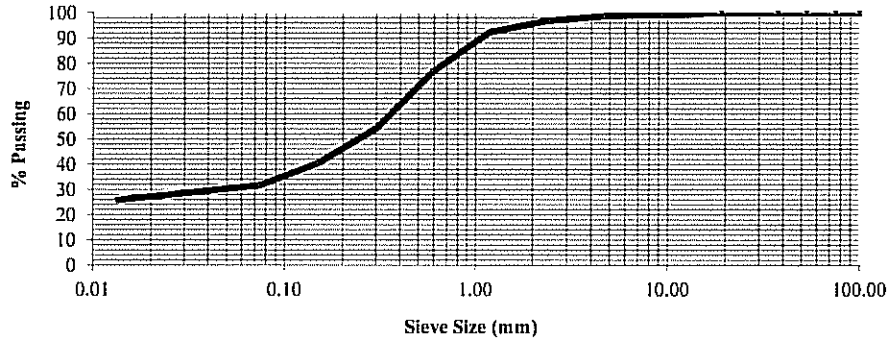
PO Box 1018 Geraldton WA 6531
 ACN: 098 257 071 / ABN: 52 098 257 071
 PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
 email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9491
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9491
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 24	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 2.0m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	99
4.75	99
2.36	97
1.18	92
0.600	77
0.425	66
0.300	54
0.150	41
0.075	32
0.0135	26

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	31.0	%
Plastic Limit (*121.1)	14.4	%
Plasticity Index (*122.1)	16.6	%
Linear Shrinkage (*123.1)	5.6	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

In accordance with WA 915.1
 4.4%

Field Moisture Content

In accordance with WA 110.1
 8.3%

Note:

Sampled by Blacktop Materials Engineering.
 Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
 No cracking, crumbling or curling with shrinkage.
 1 % retained on 9.5mm sieve.

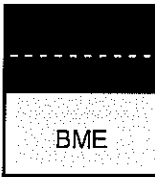
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
 Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

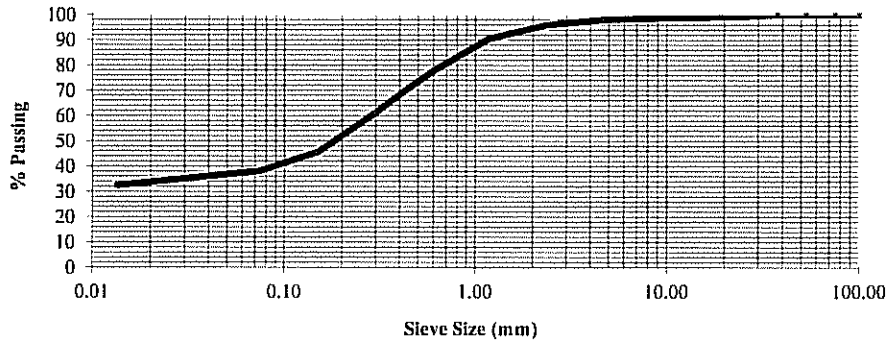


BLACKTOP MATERIALS ENGINEERING

PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9492
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9492
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 25	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 1.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Sand with Gravel	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	99
9.5	99
4.75	98
2.36	96
1.18	91
0.600	78
0.425	70
0.300	61
0.150	46
0.075	38
0.0135	32

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	30.0	%
Plastic Limit (*121.1)	13.2	%
Plasticity Index (*122.1)	16.8	%
Linear Shrinkage (*123.1)	7.2	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
1 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

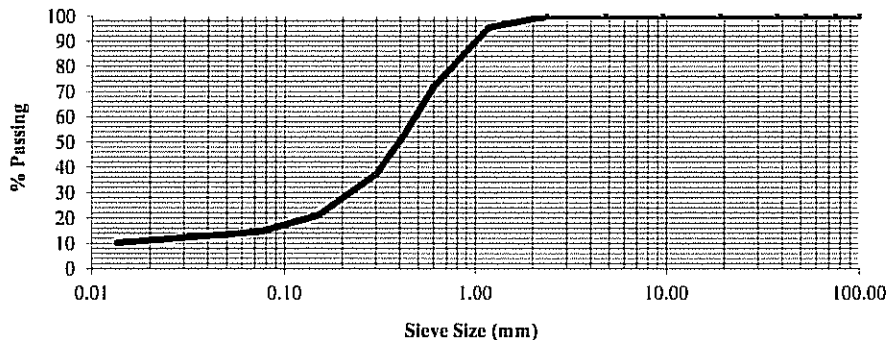
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9493
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9493
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED	24/09/2012
LOCATION:	Test Pit 27	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.5m	PROJECT No.:	Not Supplied
DESCRIPTION:	Silty Sand	CLIENT LOT No:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	95
0.600	72
0.425	53
0.300	37
0.150	21
0.075	15
0.0135	10

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	18.8	%
Plastic Limit (*121.1)	Non Plastic	%
Plasticity Index (*122.1)	Non Plastic	%
Linear Shrinkage (*123.1)	0.4	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2

SM

Calcium Carbonate Content

In accordance with WA 915.1

3.3%

Field Moisture Content

In accordance with WA 110.1

3.0%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
5 % retained on 1.18mm sieve.

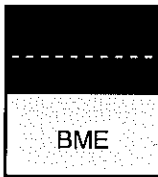
Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025, Accreditation No 14505



BLACKTOP MATERIALS ENGINEERING

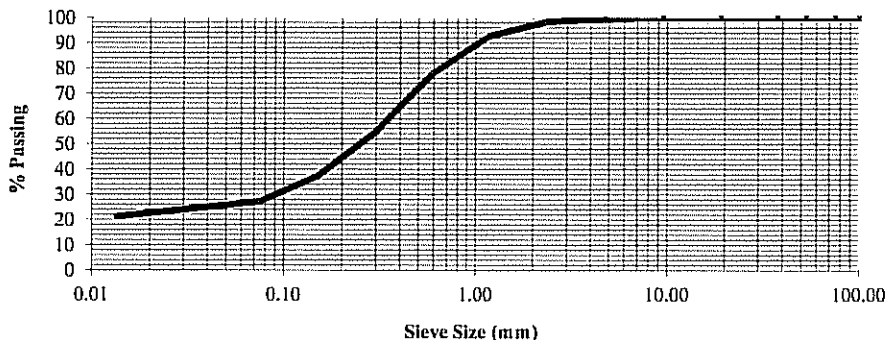
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

TEST CERTIFICATE

Page 1 of 1

CLIENT: Sutcliffe Road Joint Venture
ADDRESS: PO Box 1917 Geraldton WA 6531
PROJECT/ROAD: Moresby Heights Subdivision
LOCATION: Test Pit 28
LOCATION: Depth: 2.0m
DESCRIPTION: Clayey Sand minor Gravel
PROPOSED USE: Foundation

CERTIFICATE No.: 12BME9494
SAMPLE No.: 12BME9494
DATE SAMPLED: 24/09/2012
DATE TESTED: 25/09-3/10/2012
PROJECT No.: Not Supplied
CLIENT LOT No.: Not Supplied
CLIENT ORDER No.: Not Supplied
TEST REQUEST No.: Not Supplied



PARTICLE SIZE DISTRIBUTION

In accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	98
1.18	93
0.600	78
0.425	67
0.300	55
0.150	37
0.075	27
0.0135	21

CONSISTENCY LIMITS

In accordance with Test Method WA*

Liquid Limit (*120.2)	27.4	%
Plastic Limit (*121.1)	13.4	%
Plasticity Index (*122.1)	14.0	%
Linear Shrinkage (*123.1)	4.8	%

Unified Soil Classification

In accordance with AS1726 Appendix A, Section A2
SC

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
2 % retained on 2.36mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

BLACKTOP MATERIALS ENGINEERING

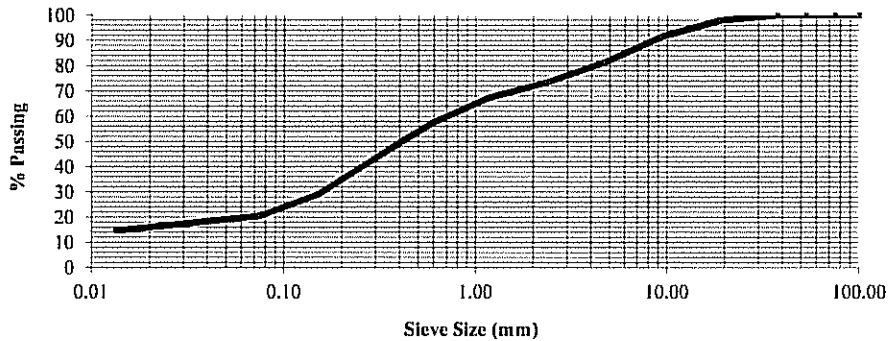
PO Box 1018 Geraldton WA 6531
ACN: 098 257 071 / ABN: 52 098 257 071
PHONE: (08) 9921 1878 / FAX: (08) 9965 5730
email: blacktop@westnet.com.au

BME

TEST CERTIFICATE

Page 1 of 1

CLIENT:	Sutcliffe Road Joint Venture	CERTIFICATE No.:	12BME9495
ADDRESS:	PO Box 1917 Geraldton WA 6531	SAMPLE No.:	12BME9495
PROJECT/ROAD:	Moresby Heights Subdivision	DATE SAMPLED:	24/09/2012
LOCATION:	Test Pit 30	DATE TESTED:	25/09-3/10/2012
LOCATION:	Depth: 0.8m	PROJECT No.:	Not Supplied
DESCRIPTION:	Clayey Gravelly Sand	CLIENT LOT No.:	Not Supplied
PROPOSED USE:	Foundation	CLIENT ORDER No.:	Not Supplied
		TEST REQUEST No.:	Not Supplied



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method WA 115.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	98
9.5	92
4.75	81
2.36	73
1.18	67
0.600	58
0.425	51
0.300	43
0.150	29
0.075	20
0.0135	15

CONSISTENCY LIMITS

in accordance with Test Method WA*

Liquid Limit (*120.2)	30.4	%
Plastic Limit (*121.1)	13.7	%
Plasticity Index (*122.1)	16.7	%
Linear Shrinkage (*123.1)	6.8	%

Unified Soil Classification

in accordance with AS1726 Appendix A, Section A2
SC

Calcium Carbonate Content

In accordance with WA 915.1
3.5%

Field Moisture Content

in accordance with WA 110.1
7.1%

Note:

Sampled by Blacktop Materials Engineering.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton.
No cracking, crumbling or curling with shrinkage.
2 % retained on 19.0mm sieve.

Approved Signatory :

(R Fawcett)

Date : 3/10/2012



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. Accreditation No 14505

**Mining &
Civil
Geotest Pty Ltd**

**Organic content of Soils
ASTM: D 2974-07a
Test Method C**

Ph (08) 9414 8022 Fax (08) 9414 8011

Email kevin@mcgeotest.com.au

Unit 1/1 Pusey Road, JANDAKOT WA 6164

Job No: 60023

Report No: 60023-P12/3364-3373

Date of issue: 28 September 2012

Client:	Blacktop Materials Engineering	Date tested:	27 September 2012
Project:	Routine Testing	Tested by:	M Carmichael
Location:	Moresby Height Subdivision	Checked:	M van Herk

Sample Number	Location	Ash content %	Organic content %
P12/3364	12BME9475 TP3 0.5 Moresby Height Subdivision	99.5	0.5
P12/3365	12BME9477 TP6 0.5 Moresby Height Subdivision	99.1	0.9
P12/3366	12BME9478 TP9 0.5 Moresby Height Subdivision	99.4	0.6
P12/3367	12BME9480 TP12 1.2 Moresby Height Subdivision	98.1	1.9
P12/3368	12BME9483 TP15 2.0 Moresby Height Subdivision	98.9	1.1
P12/3369	12BME9486 TP18 0.5 Moresby Height Subdivision	99.0	1.0
P12/3370	12BME9489 TP21 2.0 Moresby Height Subdivision	98.3	1.7
P12/3371	12BME9491 TP24 2.0 Moresby Height Subdivision	98.1	1.9
P12/3372	12BME9493 TP27 0.5 Moresby Height Subdivision	98.8	1.2
P12/3373	12BME9495 TP30 0.8 Moresby Height Subdivision	98.2	1.8
Tested as received	Samples oven dried prior to test Furnace temperature 440 ^o C		

Client address: 111 Anderson St, Geraldton

Organic content April 2009



Approved Signature Kevin M Jones

Appendix E : Calculation of expected surface movement for each investigation location

Investigation Location	Expected Surface Movement (mm) *
1	0
2	9
3	10
4	0
5	0
6	0
7	0
8	0
9	0
10	4
11	10
12	13
13	6
14	4
15	5
16	12
17	0
18	8
19	17
20	14
21	8
22	10
23	17
24	12
25	22

26	22
27	1
28	13
29	8
30	8

Table 1 : Estimation of the characteristic surface movement.

* Estimation of the characteristic surface movement completed in accordance with AS2870 – 2011.

Appendix F : Acid sulfate investigation report.

Appendix C

BME Infiltration Test Certificate



BLACKTOP MATERIALS ENGINEERING

ACN: 098 257 071 ABN: 52 098 257 071
PO BOX 1018 GERALDTON WA 6531
PHONE: (08) 9921 1878
FAX: (08) 99655730

TEST CERTIFICATE

Page 1 of 2

CLIENT:	AECOM, Unit 8, 273 Foreshore Drive, Geraldton, WA 6530	JOB NO.:	83
PROJECT:	Moreseby Heights	CLIENT ORDER NO.:	Not Supplied
LOCATION:	Various locations across subdivision - For test locations refer to attached plan.	DATE FIELD TESTED	28&29/11/11
		DATE LAB	30/11/11
		CALCULATED	
SAMPLE NO:	11BME8278	CERTIFICATE No.	11BME8278

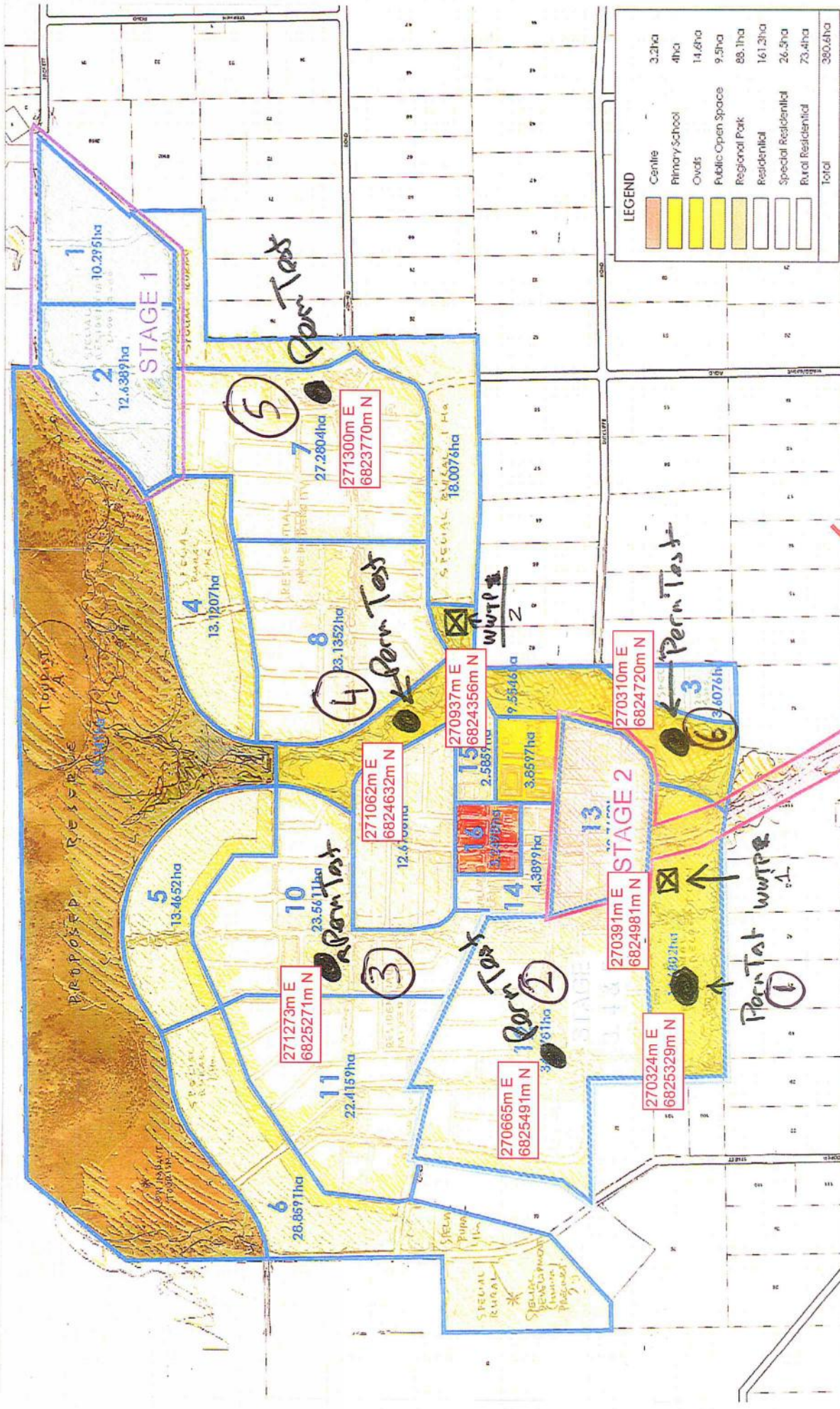
Method for determining the absorptive capacity of a soil in accordance with Schedule 8 – Health Regulations 1974

Test Site Location	Soil Description	Moisture condition of soil prior to soaking	Time taken for water level to fall 25mm after soaking	Calculated infiltration rate (m/s)
Test Site 1 @ 0.3m depth. 270324E 6825329N	Yellow Quartz Sand	Dry	1 Minute 20 Seconds	3.13×10^{-4} m/s
Test Site 2 @ 0.3m depth. 270665E 6825491N	Yellow Quartz Sand	Dry	1 Minute Nil Seconds	4.17×10^{-4} m/s
Test Site 3 @ 0.3m depth. 271273E 6825271N	Red Quartz Sand	Dry	2 Minutes 45 Seconds	1.52×10^{-4} m/s
Test Site 4 @ 0.3m depth. 271062E 6824632N	Red Quartz Sand	Dry	4 Minutes 45 Seconds	8.77×10^{-5} m/s
Test Site 5 @ 0.3m depth. 271300E 6823770N	Grey Silty Quartz Sand	Dry	7 Minutes 30 Seconds	5.56×10^{-5} m/s
Test Site 6 @ 0.3m depth. 270310E 6824720N	Pale Orange Quartz Sand	Dry	50 Seconds	5.00×10^{-4} m/s

Notes: Test sites soaked over 8 hrs to establish saturated flow conditions.

Authorised Signatory :  (L. Smith)

Date : 30/11/11

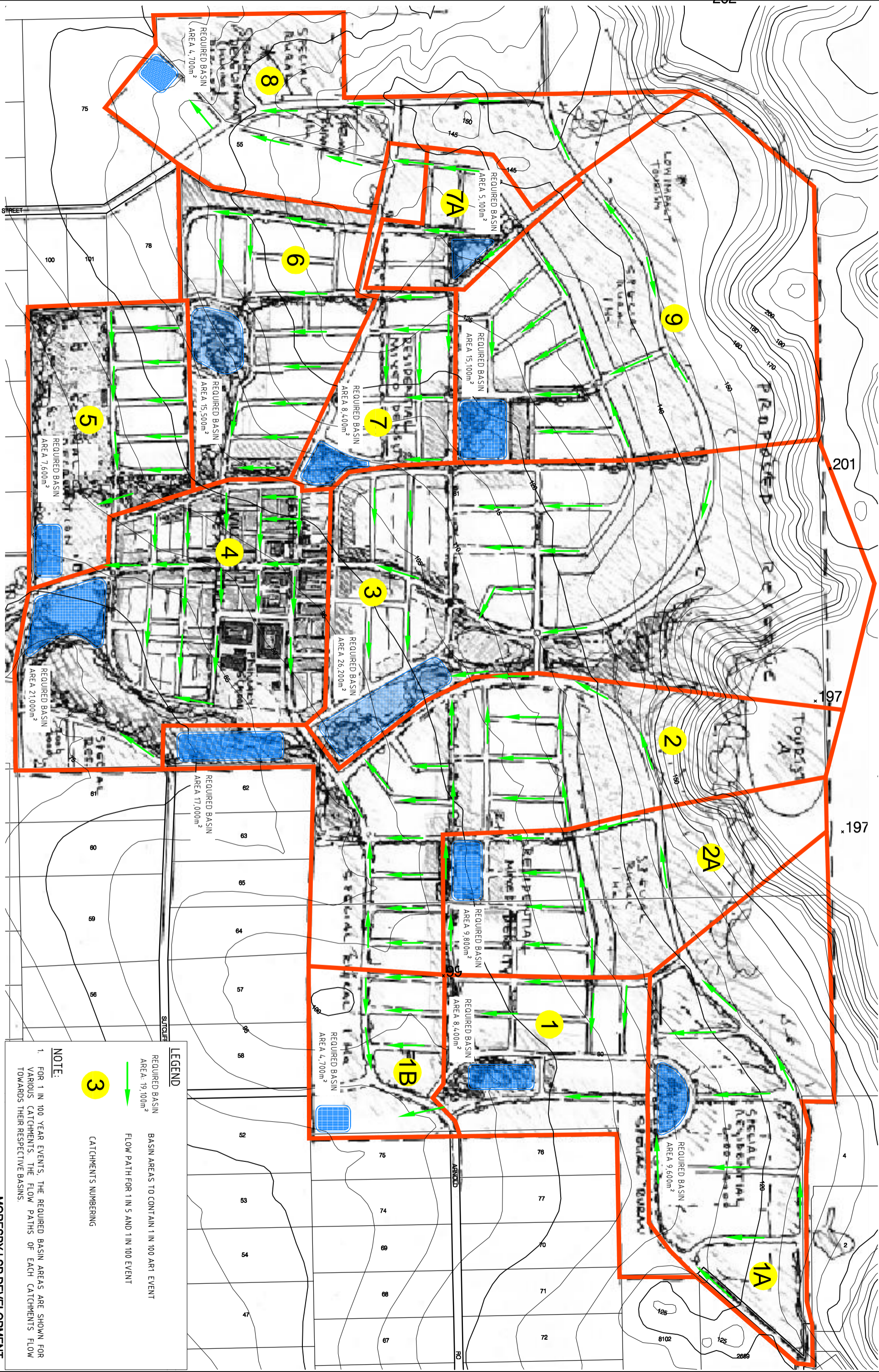


LOT 80 & 81 HACKETT ROAD
MORSEY HEIGHTS




CONCEPT STAGING PLAN

Appendix D

Stormwater Catchments and Event Plan



LEGEND

	REQUIRED BASIN AREA: 19,100m ²
	BASIN AREAS TO CONTAIN 1 IN 100 ARI EVENT FLOW PATH FOR 1 IN 5 AND 1 IN 100 EVENT
	CATCHMENTS NUMBERING

NOTE:
 1. FOR 1 IN 100 YEAR EVENTS, THE REQUIRED BASIN AREAS ARE SHOWN FOR VARIOUS CATCHMENTS. THE FLOW PATHS OF EACH CATCHMENTS FLOW TOWARDS THEIR RESPECTIVE BASINS.

Appendix E

PC Sump Results

--

Project Details	
Project	Moresby Heights LWMS - Catchment 1
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	47932	1	47932	
Lots	89018	0.5	44509	
Reserve	68600	0.1	6860	
TOTAL	205550		99301	

INPUT DATA	
Location	Geraldton
A _{Impervious}	9.9301 ha
GWL	0.000 m AHD
Depth to GWL from base	88.500 m
Max Allowable TWL	90.000 m AHD
Sump Base Level	88.500 m AHD
Sump Width at base	40 m
Sump Length at base	140 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	12202	3861.28	3861	8341	1.197	89.697	0.303	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 1A
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	86071	1	86071	
Lots	159847	0.1	15985	
Reserve	122000	0.1	12200	
TOTAL	367918		114256	

INPUT DATA	
Location	Geraldton
A _{impervious}	11.4256 ha
GWL	0.000 m AHD
Depth to GWL from base	113.500 m
Max Allowable TWL	115.000 m AHD
Sump Base Level	113.500 m AHD
Sump Width at base	55 m
Sump Length at base	125 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	14040	4510.07	4510	9530	1.162	114.662	0.338	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 1B
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	27811	1	27811	
Reserve	54249	0.1	5425	
Lots	37929	0.5	18965	
TOTAL	119989		52200	

INPUT DATA	
Location	Geraldton
A _{Impervious}	5.2200 ha
GWL	0.000 m AHD
Depth to GWL from base	83.500 m
Max Allowable TWL	85.000 m AHD
Sump Base Level	83.500 m AHD
Sump Width at base	45 m
Sump Length at base	65 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	6414	2021.55	2022	4393	1.167	84.667	0.333	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 2
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	104685	1	104685	
Lots	173633	0.5	86817	
Lots & Reserve	185739	0.1	18574	
TOTAL	464057		210075	

INPUT DATA	
Location	Geraldton
A _{Impervious}	21.0075 ha
GWL	0.000 m AHD
Depth to GWL from base	78.500 m
Max Allowable TWL	80.000 m AHD
Sump Base Level	78.500 m AHD
Sump Width at base	50 m
Sump Length at base	250 m
Side Slope	6.0 1 in --
Soil Permeability, K	2.5 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	25814	8284.69	8285	17529	1.191	79.691	0.309	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 2A
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	65089	1	65089	
Lots	80725	0.5	40363	
Lots & Reserve	134866	0.1	13487	
TOTAL	280680		118938	

INPUT DATA	
Location	Geraldton
A _{impervious}	11.8938 ha
GWL	0.000 m AHD
Depth to GWL from base	95.500 m
Max Allowable TWL	97.000 m AHD
Sump Base Level	95.500 m AHD
Sump Width at base	54 m
Sump Length at base	130 m
Side Slope	6.0 1 in --
Soil Permeability, K	2.5 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	14615	4676.24	4676	9939	1.183	96.683	0.317	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 3
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	177338	1	177338	
Lots	113859.5	1	113860	
Lots & Reserve	324450	0.1	32445	
TOTAL	615647.5		323643	

INPUT DATA	
Location	Geraldton
A _{Impervious}	32.3643 ha
GWL	0.000 m AHD
Depth to GWL from base	88.500 m
Max Allowable TWL	90.000 m AHD
Sump Base Level	88.500 m AHD
Sump Width at base	300 m
Sump Length at base	70 m
Side Slope	6.0 1 in --
Soil Permeability, K	2.5 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	39769	13019.59	13020	26750	1.134	89.634	0.366	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 4
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	182769	1	182769	
Lots	130483	0.5	65242	
Reserve	69938	0.1	6994	
TOTAL	383190		255004	

INPUT DATA	
Location	Geraldton
A _{Impervious}	25.5004 ha
GWL	0.000 m AHD
Depth to GWL from base	68.500 m
Max Allowable TWL	70.000 m AHD
Sump Base Level	68.500 m AHD
Sump Width at base	100 m
Sump Length at base	170 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	36	3.90	35803	8855.94	13284	22519	1.186	69.686	0.314	Shallow water table log model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 5
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	39060	1	39060	
Lots	44746	0.5	22373	
Reserve	108337	0.1	10834	
TOTAL	192143		72267	

INPUT DATA	
Location	Geraldton
A _{Impervious}	7.2267 ha
GWL	0.000 m AHD
Depth to GWL from base	98.800 m
Max Allowable TWL	100.000 m AHD
Sump Base Level	98.800 m AHD
Sump Width at base	50 m
Sump Length at base	115 m
Side Slope	6.0 1 in --
Soil Permeability, K	4.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	8880	3038.34	3038	5842	0.877	99.677	0.323	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 6
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	96580	1	96580	
Lots	111359	0.5	55680	
Reserve	33871	0.1	3387	
TOTAL	241810		155647	

INPUT DATA	
Location	Geraldton
A _{Impervious}	15.5647 ha
GWL	0.000 m AHD
Depth to GWL from base	101.300 m
Max Allowable TWL	102.500 m AHD
Sump Base Level	101.300 m AHD
Sump Width at base	100 m
Sump Length at base	130 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	19126	6620.60	6621	12505	0.877	102.177	0.323	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 7
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	59532	1	59532	
Lots	79818	0.5	39909	
Reserve	0	0.1	0	
TOTAL	139350		99441	

INPUT DATA	
Location	Geraldton
A _{Impervious}	9.9441 ha
GWL	0.000 m AHD
Depth to GWL from base	103.500 m
Max Allowable TWL	105.000 m AHD
Sump Base Level	103.500 m AHD
Sump Width at base	75 m
Sump Length at base	80 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	12219	3926.74	3927	8293	1.160	104.660	0.340	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 7A
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	33188	1	33188	
Lots	48712	0.5	24356	
Lots and Reserve	0	0.1	0	
TOTAL	81900		57544	

INPUT DATA	
Location	Geraldton
A _{Impervious}	5.7544 ha
GWL	0.000 m AHD
Depth to GWL from base	113.500 m
Max Allowable TWL	115.000 m AHD
Sump Base Level	113.500 m AHD
Sump Width at base	65 m
Sump Length at base	50 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	7071	2233.62	2234	4837	1.172	114.672	0.328	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 8
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	23203	1	23203	
Lots	0	0.5	0	
Lots and Reserve	290114	0.1	29011	
TOTAL	313317		52214	

INPUT DATA	
Location	Geraldton
A _{impermious}	5.2214 ha
GWL	0.000 m AHD
Depth to GWL from base	98.500 m
Max Allowable TWL	100.000 m AHD
Sump Base Level	98.500 m AHD
Sump Width at base	50 m
Sump Length at base	60 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	6416	2033.58	2034	4383	1.146	99.646	0.354	Clogged base model	

--

Project Details	
Project	Moresby Heights LWMS - Catchment 9
Job Number	6022587
Task	1.1
Designer	MB

Catchment Area Details				
Land Form	Area (m2)	Runoff Coeff	Aimp (m2)	Comments
Road Reserve & POS	89412	1	89412	
Lots	122432	0.5	61216	
Reserve	364447	0.1	36445	
TOTAL	576291		187073	

INPUT DATA	
Location	Geraldton
A _{Impervious}	18.7073 ha
GWL	0.000 m AHD
Depth to GWL from base	113.500 m
Max Allowable TWL	115.000 m AHD
Sump Base Level	113.500 m AHD
Sump Width at base	125 m
Sump Length at base	95 m
Side Slope	6.0 1 in --
Soil Permeability, K	1.8 m/d
Permeability Clogged Layer	0.15 m/d
Thickness of Clogged Layer	200 mm
Reduction Factor - Shallow	0.800
Reduction Factor - Deep	0.333
Reduction Factor - Clogged	1.000

SUMMARY OUTPUT

ARI (years)	Duration (hours)	Rainfall Intensity (mm/h)	Total Inflow (m3)	Infiltration q0 (m3/day)	Total Outflow (m3)	Storage Required (m3)	Water Depth, H (m)	TWL (m AHD)	Freeboard (m)	Critical Model	Comments
100	24	5.12	22987	7485.98	7486	15502	1.151	114.651	0.349	Clogged base model	

Appendix F

Acid Sulfate Investigation



BLACKTOP CONSULTING ENGINEERS

ACN: 150 023 868 ABN: 84 683 812 614
PO Box 918 Geraldton WA 6531
PHONE : (08) 9921 1878
FAX: (08) 9964 2869

15 October 2012

Sutcliffe Road Joint Venture
PO Box 1917
Geraldton WA 6531

Job No: 12BCE226
Your Job ref:

Att: Mr Kel Turner

Dear Kel

Investigation : Proposed Subdivision Development Moresby Heights Waggrakine

Acid Sulfate Study

Executive Summary

Blacktop Consulting Engineers (BCE) have completed an acid sulfate investigation at the proposed Moresby Heights subdivision development in Waggrakine.

The purpose of the investigation is to determine if the DEC will require an acid sulfate management plan to be submitted when the land is developed.

The study has found that the colluvial materials comprising of sand, clay and silt rest on weathered bedrock that ranges from a residual soil of mottled sand clay to highly weathered silty sandstone. The depth of soils above rock across the site varies from 0.6m to 3m. Some pockets along the west side of the site comprise of deep layers of residual yellow sand.

The DEC ASS Risk Mapping for ASS on the site suggests that the development area is classified as C3 which is extremely low probability / low confidence.

Samples from the site have reported results lower than the action criteria for acid sulfate soils, and which also suggest that there is an inherent neutralising capacity in the samples.

Actual or potential acid sulfate conditions were found to be below threshold levels which the DEC require the development of a acid sulfate management plan.

Scope of Work

On instruction from Sutcliffe Road Joint Venture, Blacktop Consulting Engineers (BCE) completed an acid sulfate investigation at the proposed Moresby Heights subdivision development in Waggrakine.

A structure plan showing the planned subdivision is provided in Figure 1 – Appendix A.

The purpose of the investigation is to determine if the DEC will require the development of a acid sulfate management plan when the land is subdivided.

The investigation has been completed in accordance with guidelines provided by IDENTIFICATION AND INVESTIGATION OF ACID SULFATE SOILS AND ACIDIC LANDSCAPES, May 2009, Department of Environment and Conservation (DEC).

Background

Acid sulfate soil (ASS) is the common name given to soils and sediments containing iron sulfides, the most common being pyrite.

Pyrite is formed when seawater or sulfate rich water mixes with land sediments containing iron oxides and organic matter in a water logged situation, in the absence of oxygen.

For pyrite to form, it requires:

- A supply of sulfur (usually from seawater).
- Anaerobic (oxygen free) conditions.
- A supply of energy for bacteria (usually rotting organic matter eg mangrove leaves).
- A system to remove reaction products (ie tidal flushing of the system).
- A source of iron (most often from terrestrial sediments).
- Temperatures greater than 10 degrees celsius.

When ASS are exposed to air the iron sulfides in the soil react with oxygen and water to produce sulphuric acid and iron compounds.

Soils containing acid sulfate are most commonly found in low-lying land bordering the coast or estuarine and saline wetlands, and freshwater groundwater dependent wetlands throughout the state. As defined by the DEC the term 'acid sulfate soils' or 'ASS' includes both potential acid sulfate soils and actual acid sulfate soils.

- Potential acid sulfate soils (PASS) are soils or sediments which contain iron sulfides and/or other sulfidic minerals that have **not** been oxidised by exposure to air. The field pH of these soils in their undisturbed state is more than pH 4 and is commonly neutral to alkaline (pH 6.5 to pH 7.5). These soils or sediments are invariably saturated with water in their natural state. The waterlogged layer may be peat, clay, loam, silt or sand and is usually dark grey and soft but may also be dark brown, or medium to pale grey to white.
- Actual acid sulfate soils (AASS) are soils or sediments which contain iron sulfides and/or other sulfidic minerals that have previously undergone some oxidation to produce sulfuric acid. This results in existing acidity (pH <4) and often a yellow and/or red mottling (jarosite/iron oxide) in the soil profile. AASS commonly also contain residual un-oxidised iron sulfides, or potential acidity, as well as existing acidity.

Activities that have the potential to disturb ASS, either directly, or by affecting the elevation of the water table, need to be managed appropriately to avoid environmental harm.

Successful management requires that an acid sulfate soil management plan should be prepared and implemented. Management measures should be governed by the guiding principle of avoidance of disturbance over any other measure.

Assessment Criteria

The assessment criteria adopted for this study of ASS are the *Texture-based ASS Action Criteria* as developed by QASSIT and outlined in the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland 1998*.

Desktop Study

BCE have consulted the DEC ASS Risk Maps for Geraldton to determine the potential for acid sulphates at the site.

The ASS Risk Mapping suggests that the development is classified as C3 which is extremely low probability / low confidence.

This is supported by 1:50,000 regolith and landform mapping which suggests that the site covers an area comprising of colluvium soils which are not considered to present an ASS risk.

Site Location

Four locations within the site were investigated.

The test pit locations are shown marked on the structure plan provided in Figure 1 Appendix A and are described as:

- Site 2
- Site 17
- Site 19
- Site 22

Sampling was undertaken by BCE on 24 September 2012.

Site Inspection

The sites comprise of silt, sand, clay and gravel.

The water table was not encountered to 3m depth and is expected to exist well below the surface of the site.

Soil Sampling

Samples were taken at 0.25m intervals from each test pit.

Samples were taken from the following depths:

- Site 2 -: RL -0.25m to RL -3.0m
- Site 17 -: RL -0.25m to RL -3.0m
- Site 19 -: RL -0.25m to RL -3.0m
- Site 22 -: RL -0.25m to RL -3.0m

Photographs of the test pits are provided in Appendix B.

Test pit logs for the four test pits are provided in Appendix C.

Field Tests - determining presence of Acid Sulphate Soils (ASS) & Potential Acid Sulphate Soils (PASS)

Field pH tests have been conducted on the soil samples using a field pH meter. A calibration certificate for the meter is provided in Appendix D.

The pH test is an indicative exploratory tool to determine the presence of ASS.

The pH_{FOX} test is used to indicate the presence of iron sulfides or PASS. This test involves adding 30% hydrogen peroxide (pH adjusted to 4.5 – 5.5) to a sample of soil

A description of the field tests and their usefulness in identifying ASS and PASS is as follows.

1. Laboratory pH test (pH_f) i.e. pH of soil and water paste

The pH_f test measures the existing acidity of a "soil:water" paste, and is therefore used to help identify if ASS are present. If the measured pH of the soil paste is $pH_f < 4$, oxidation of sulfides has probably occurred in the past, indicating the presence of actual acid sulphate soils. Highly organic or heavily fertilised soils may also return a pH_f close to 4. A $pH_f > 4$ but < 5 indicates an acid soil, but the cause of the acidity will need to be further investigated by laboratory analysis. The pH_f test does not detect any unoxidised sulfides (i.e. potential acid sulphate soils (PASS)). For this reason this test must be used in conjunction with the pH_{FOX} test.

2. Laboratory pH peroxide test (pH_{FOX}) i.e. pH of soil and peroxide mix and reaction with peroxide

The pH_{FOX} test is used to indicate the presence of iron sulfides or PASS. This test involves adding 30% hydrogen peroxide (pH adjusted to 4.5 – 5.5) to a sample of soil. The testing of pH following addition of the soil to H_2O_2 is a qualitative method only and gives an indication of the intensity of acidification. If sulfides are present a reaction will occur. The reaction can be influenced by the amount of sulfides present in the sample, the presence of organic matter and the presence of manganese. Once the reaction has occurred the pH is measured.

The pH of the 30% H_2O_2 was measured at 5.1, which is within the normal range of 4.5 to 5.5, prior to the addition of any soil.

A combination of three factors is considered in arriving at a “positive field sulfide identification”:

A reaction with hydrogen peroxide. The strength of the reaction with peroxide is a useful indicator but cannot be used alone. Organic matter, coffee rock and other soil constituents such as manganese oxides can also cause a reaction. Care should be exercised in interpreting a reaction on surface soils and high organic matter soils such as peats and coffee rock and some marine clays. This reaction is rated NR = No reaction, VS = Very small reaction, S = Small reaction, M = Medium reaction, H = High.

The actual value of pH_{FOX} . If the $\text{pH}_{\text{FOX}} < 3$, and a significant reaction occurred, then it strongly indicates a PASS. The more the pH_{FOX} drops below 3 the more positive the presence of inorganic sulfides.

A much lower pH_{FOX} than field pH_{FOX} .

The lower the final pH_{FOX} value the greater the difference between the pH_{FOX} compared to the pH_f , the more indicative the presence of PASS. This difference may not be as great if starting with an already very acid pH_f (close to 4), but if the starting pH is neutral or alkaline then a larger change in pH should be expected.

Where fine shell, coral or carbonate, is present the change in pH may not be as large due to buffering. The “fizz test” (effervescence with 1 M HCl) should be used to test for carbonates and shell.

Laboratory Analysis

Two samples from each test pit were submitted to SGS laboratory for analysis. The SPOCAS standard analytical suite for ASS was completed on the samples.

Samples were retrieved from the following field locations:

- Site 2 : RL –0.25m : Sample No. 12BME9496
- Site 2 : RL –1.25m : Sample No. 12BME9496
- Site 17 : RL –0.25m : Sample No. 12BME9497
- Site 17 : RL –1.25m : Sample No. 12BME9497
- Site 19 : RL –0.25m : Sample No. 12BME9498
- Site 19 : RL –1.25m : Sample No. 12BME9498

- Site 22 : RL -0.25m : Sample No. 12BME9499
- Site 22 : RL -1.25m : Sample No. 12BME9499

Results

Results of Field Tests

The results of field tests completed on samples are contained in Appendix E.

Discussion of the results is as follows:

Field pH test (pH_f) i.e. pH of soil and water paste

The pH_f test results which all measured pH of the soil paste pH_f > 5.37 suggest that the soils tested are not acidic.

Field pH peroxide test (pH_{FOX}) i.e. pH of soil and peroxide mix and reaction with peroxide

The field samples tested generally registered either very minor or no reaction when 30% hydrogen peroxide (pH adjusted to 5.1) was added to the soil samples, indicating that sulfides are unlikely to be present.

The lowest value of pH_{FOX} of 5.13 suggests that the soil is not PASS.

A much lower pH_{FOX} than field pH_{FOX}.

Given that there was not a significant change between the pH_{FOX} compared to the pH_f, it would suggest that the soil is not PASS.

The "fizz test" (effervescence with 1 M HCl) registered only slight reaction with some samples indicating that the samples do not contain large amounts of carbonates and shell.

Results of Laboratory Tests

The acid sulfate test certificates supplied from SGS for the 8 samples are contained in Appendix F.

The key analytical parameters related to the determination of whether a disturbed site will need to be managed based on the presence of acid sulfate soils are:

- Titratable Actual Acidity (TAA)
- Equivalent Sulfur (S_{POS} / %S) and
- ANCE.

Titratable Actual Acidity (TAA):

The results of Titratable Actual Acidity indicate that actual or existing acidity is not an issue.

Equivalent Sulfur (S_{POS} / %S).

Action criteria as to when a disturbed site will need to be managed is stipulated at 0.03 % S for coarse-textured soils (sands to loamy sands), 0.06 % S for medium texture soils (sandy loams to light clays) and 0.1 % S for fine texture soils (medium to heavy clays and silty clays), where 1 to 1000 tonnes of material is to be disturbed.

Visual inspection of the particle size distribution of the silty clayey sand samples suggest that the soil type would most likely be considered a fine texture soil.

The results of the submitted samples are all below the permissible level for a fine texture soils (0.1%). These results are less than the action criteria and indicate that a Acid Sulfate Management Plan is not required be developed.

ANCE;

ANCE is the Acid Neutralising Capacity (Excess). It is a measure of net alkalinity, or a measure of the remaining neutralising capacity after all the potential acid has been neutralised. The *ANCE* results suggest that this soil does have some neutralising capacity.

In Acid-Base accounting terms:

$$\text{Net Acidity} = \text{Potential Acidity} + (\text{Actual and Retained Acidity}) - (\text{S}_{\text{POS}} + \text{ANCE}/\text{FF})$$

(where FF= 2 = safety or fineness factor to allow for incomplete reaction of natural shell (CaCO_3) material.

Actual and Retained Acidity are either absent (as determined by the TAA analyses) or not present at the pH values indicated (ie Retained Acidity is not generally an issue at pH > 4.5). So, the equation above is reduced to:

$$\text{Net Acidity} = \text{Potential Acidity} - (\text{S}_{\text{POS}} + \text{ANCE}/\text{FF})$$

For sample No. 12BME9496

$$\text{Net Acidity} = 0.01 - (0.01 + (0.01/2))$$

$$\text{Net Acidity} = - 0.005$$

A negative term for net Acidity indicates that there is no net Acidity, and that the soil is net neutralising. Such soils will not require liming in the event of their being disturbed.

Conclusions

Samples from the four sites have reported results less than the action criteria for acid sulfate soils, but which also suggest that there is some inherent neutralising capacity in the samples. These results indicate that there should not be any concern related to the disturbance of these soils during development.

Actual or potential acid sulfate conditions are below threshold levels which the DEC require the development of an acid sulfate management plan.

If you require any further information please contact Mr Lester Smith on 99 211 878.

Yours faithfully,


Lester Smith
Manager Engineering Services

Att: Appendix A – F

REFERENCES

Department of Environment and Conservation. IDENTIFICATION AND INVESTIGATION OF ACID SULFATE SOILS AND ACIDIC LANDSCAPES, May 2009.

Geological Survey of Western Australia. Geraldton. Bureau of Mineral Resources, Geology and Geophysics 1970.

Appendix B : Photographs

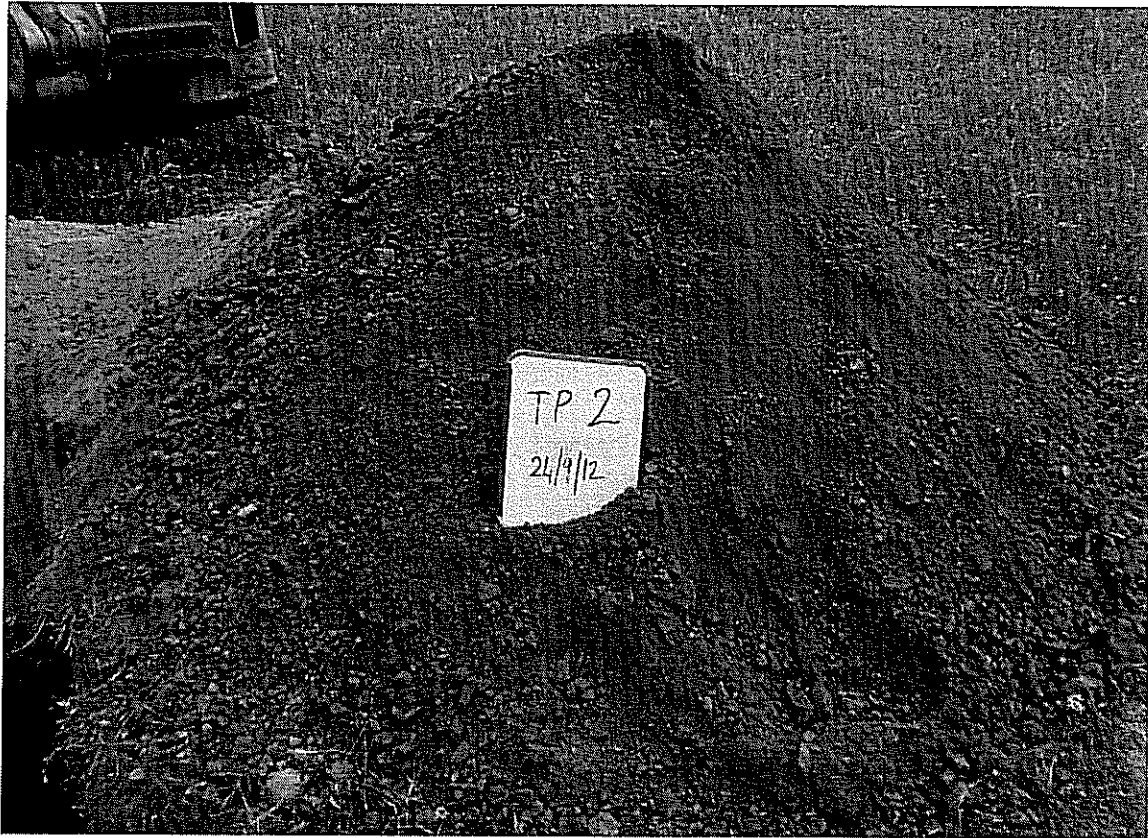


Figure 1 : Photograph of material excavated from Test Site 2.



Figure 2 : Photograph of material excavated from Test Site 17.



Figure 3 : Photograph of material excavated from Test Site 19.



Figure 4 : Photograph of material excavated from Test Site 22.

Appendix C : Excavation Logs

BCE

TEST PIT LOG

TP 02

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 2	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 270248E / 6824925N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Yellow, sand is medium, non- plastic.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	0.5	L	0.3m: Clayey Gravelly SAND: Brown, laterite gravel and sand. Slightly plastic.	Dry	SC	B	Too gravelly for penetrometer testing. Sample taken at 0.8m depth. Sample No. 12BME9474. Tests for PSD, PI & MC completed.
	1.0	L	0.8m: Silty Clayey SAND: Brown, orange , red Slightly plastic.	Dry	SC	NS	Dry and cemented when excavated but material crumbles under finger pressure. Material looks ilke laterite particles but very soft. Acid sulfate testing completed at this site.
	1.5						
	2.0						
	2.5						
	3.0						
			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 17

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 17	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6823700N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
									In situ testing, additional observations
Groundwater not encountered	Natural ground	0	L		0.0m: Silty SAND: Orange / Brown, sand is medium, non- plastic.	Moist	SM	B	Top 200mm of soil contains rootlets.
		0.5							Penetrometer testing from 300mm below ground level -300mm(11,11,11).
		1.0							Sample taken at 0.5m depth. Sample No. 12BME9485. Tests for PSD & PI completed.
		1.5							Acid sulfate testing completed.
		2.0							Material lightly cemented when excavated.
		2.5							Material appears to have slightly higher moisture content from 1.5m depth.
		3.0							
					Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 19

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 19	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6824500N

Ground Water Origin	Depth (m)	Geological Unit Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
							in situ testing, additional observations
Groundwater not encountered Natural ground	0	L	0.0m: Silty SAND: Brown, sand is medium, non- plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
	1.0	L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Moist	CL	B	Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9487. Tests for PSD & PI completed. Acid sulfate testing completed.
	3.0		Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

BCE

TEST PIT LOG

TP 22

Sheet 1 of 1

CLIENT: Sutcliffe Road Joint Venture	JOB NUMBER: 12BCE	226
PROJECT: Moresby Heights Subdivision	DATE COMMENCED:	24/09/2012
SITE: Test Pit 22	DATE COMPLETED:	24/09/2012
LOCATION: Refer to test pit locality plan	LOGGED BY:	L Smith

Machine: Backhoe	RL: Natural Ground Surface
Excavation Depth: 3m	GDA Coordinate: 271500E / 6826000N

Ground Water	Origin	Depth (m)	Geological Unit	Strength / Density	Material Description type, colour, particle size, plasticity, minor components	Moisture Condition	USC Symbol	Sample	Field Records/Comments
									In situ testing, additional observations
Groundwater not encountered	Natural ground	0		L	0.0m: Silty SAND: Red, sand is medium, non-plastic. Rounded quartz particles.	Dry	SP-SM	NS	Top 200mm of soil contains rootlets.
		1.0		L	0.8m: Silty Clayey SAND: Red, grey, mottled. Plastic. Contains slight gravel fraction.	Dry	SC	B	Material difficult to excavate. Material cemented when excavated. Sample taken at 2.0m depth. Sample No. 12BME9490. Tests for PSD & PI completed. Acid sulfate testing completed.
		3.0			Test Pit Terminated at 3000mm depth.				

Produced By: L Smith
Checked By: R Fawcett

Appendix D : pH Meter Calibration Certificate.



Ttechrentals

Certificate of Calibration Conformance

Certificate Number : 21486

Reference : 457751

Model : TPS,WP-80

Asset Number : 200147

Description : TPS WP-80 pH and Temperature Meter

Date Calibrated : 23/05/12

Technician : Mark Civelli

Serial No. : U6888

Calibration valid for : 365 days.

The performance of the above listed equipment has been verified for measurement accuracy to the manufacturers relevant published specification, in accordance with our Quality Assurance Procedures, using the appropriate calibrated equipment, traceable to nationally recognised standards.

SOURCE ASSET 130245 CAL.SOLUTIONS REPORT 397088

DUE 10/09/13

Service Manager

QSF 326-1/B

Offices throughout Australia, New Zealand and Malaysia
TR Pty Ltd (Box 1185) 6 Joseph Street Blackburn North 3130 VIC Australia
Freecall 1800 632 652 P 03 9896 3000 F 03 9896 3099
www.techrentals.com.au
ABN 99 005 499 721

TR0147

Appendix E : Results of Acid Sulfate Field Testing.

Tested 28/09/12

Acid Sulfate pH Test

Site	Depth Of Sample													
	RL-0.25		RL-0.5		RL-0.75		RL-1.00		RL-1.25		RL-1.50		RL-1.75	
	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH
2	6.55	NR	6.84	NR	7.11	NR	7.30	NR	7.24	VS	7.52	NR	7.48	NR
17	6.43	VS	6.81	VS	6.62	VS	6.84	VS	6.98	VS	6.76	VS	6.60	VS
19	5.37	VS	5.42	S	6.16	S	6.17	VS	7.46	VS	7.46	VS	7.41	NR
22	5.63	S	6.53	S	6.10	S	6.20	NR	7.64	VS	7.45	NR	7.44	NR

Site 2 Sample No. 12BME 9496
 Site 17 Sample No. 12BME 9497
 Site 19 Sample No. 12BME 9498
 Site 22 Sample No. 12BME 9499

Site	Depth Of Sample											
	RL-2.00		RL-2.25		RL-2.50		RL-2.75		RL-3.00		RL-3.00	
	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH	Water	Hydrogen Peroxide Reactivity pH
2	7.65	NR	7.53	NR	7.53	NR	7.18	NR	7.67	NR	7.67	NR
17	6.78	NR	6.76	VS	5.61	VS	6.41	VS	6.70	NR	6.70	NR
19	7.40	NR	7.56	NR	7.41	NR	7.35	NR	7.59	NR	7.59	NR
22	7.50	NR	6.27	NR	6.21	NR	6.04	NR	7.25	NR	7.25	NR

Acid Sulfate: Hydrochloric Acid Test

Site	RL-0.25	RL-0.5	RL-0.75	RL-1.0	RL-1.25	RL-1.5	RL-1.75	RL-2.0	RL-2.25	RL-2.5	RL-2.75	RL-3.0
2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
17	NR	NR	NR	NR	NR	NR	NR	VS	VS	NR	NR	NR
19	NR	NR	NR	NR	VS	VS	VS	VS	VS	VS	VS	VS
22	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS

Legend (Reactivity)	
High	H
Medium	M
Small	S
Very Small	VS
None	NR

REQUIRED RANGE
 H₂O₂ buffers to 5.12 (4.5 to 5.5)

Appendix F : Results of Acid Sulfate Laboratory Testing.

CLIENT DETAILS

Contact **Lester Smith**
 Client **Blacktop Materials Engineering**
 Address **111 Anderson St Geraldton
WA**

Telephone **(08) 9921 1878**
 Facsimile **99655 730**
 Email **blacktop@westnet.com.au**

Project **Moresby Height Subdivision**
 Order Number **1096**
 Samples **B**

LABORATORY DETAILS

Manager **Ros Ma**
 Laboratory **SGS Newburn Environmental**
 Address **10 Reid Rd
Newburn WA 6105**

Telephone **(08) 9373 3500**
 Facsimile **(08) 9373 3556**
 Email **au.environmental.perth@sgs.com**

SGS Reference **PE071299 R0**
 Report Number **0000048064**
 Date Reported **15 Oct 2012**
 Date Received **04 Oct 2012**

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

SIGNATORIES



Michael McKay
Inorganic Team Leader - Waters

Sample Number	PE071299.001	PE071299.002	PE071299.003	PE071299.004
Sample Matrix	Soil	Soil	Soil	Soil
Sample Date	24 Sep 2012	24 Sep 2012	24 Sep 2012	24 Sep 2012
Sample Name	TP2 @ 0.25	TP2 @ 1.25	TP17 @ 0.25	TP17 @ 1.25

Parameter	Units	LCR	PE071299.001	PE071299.002	PE071299.003	PE071299.004
TAA (Titratable Actual Acidity) Method: AN219						
pH KCl*	pH Units	-	6.1	5.5	6.0	5.8
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	1.1	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	23	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	0.04	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	0.006	<0.005
Calcium (CaKCl)	%w/w	0.005	0.009	0.043	0.022	0.023
Magnesium (MgKCl)	%w/w	0.005	<0.005	0.021	<0.005	0.009

Parameter	Units	LCR	PE071299.001	PE071299.002	PE071299.003	PE071299.004
TPA (Titratable Peroxide Acidity) Method: AN218						
Peroxide pH (pH Ox)	pH Units	-	5.9	5.9	5.7	5.9
TPA as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	0.50	<0.25	<0.25
TPA as moles H+/tonne	moles H+/T	5	<5	10	<5	<5
TPA as S % W/W	%w/w S	0.01	<0.01	0.02	<0.01	<0.01
Titratable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Sulfidic Acidity as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Sulfidic Acidity as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as % CaCO3	% CaCO3	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
ANCE as S % W/W	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Peroxide Oxidisable Sulphur (Spox)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Peroxide Oxidisable Sulphur as moles H+/tonne*	moles H+/T	5	<5	<5	<5	<5
Sulphur (Sp)	%w/w	0.005	<0.005	0.006	<0.005	<0.005
Calcium (Cap)	%w/w	0.005	0.009	0.044	0.021	0.025
Reacted Calcium (CaA)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Reacted Calcium (CaA)*	moles H+/T	5	<5	<5	<5	<5
Magnesium (Mgp)	%w/w	0.005	<0.005	0.022	<0.005	0.010
Reacted Magnesium (MgA)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Reacted Magnesium (MgA)*	moles H+/T	5	<5	<5	<5	<5
Net Acid Soluble Sulphur as % w/w*	%w/w	0.005	-	-	-	-
Net Acid Soluble Sulphur as moles H+/tonne*	moles H+/T	5	-	-	-	-

Parameter	Units	LCR	PE071299.001	PE071299.002	PE071299.003	PE071299.004
SPOCAS Net Acidity Calculations Method: AN220						
s-Net Acidity	%w/w S	0.01	<0.01	0.05	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	30	<5	6
Liming Rate*	kg CaCO3/T	0.1	<0.1	2.3	<0.1	NA
Verification s-Net Acidity*	%w/w S	0.01	-	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	23	<5	6
Liming Rate without ANCE*	kg CaCO3/T	0.1	<0.1	1.8	<0.1	NA

Parameter	Units	LOR	PE071299.005	PE071299.006	PE071299.007	PE071299.008
Sample Number			PE071299.005	PE071299.006	PE071299.007	PE071299.008
Sample Matrix			Soil	Soil	Soil	Soil
Sample Date			24 Sep 2012	24 Sep 2012	24 Sep 2012	24 Sep 2012
Sample Name			TP19 @ 0.25	TP19 @ 1.25	TP22 @ 0.25	TP22 @ 1.25

TAA (Titrateable Actual Acidity) Method: AN219

Parameter	Units	LOR	PE071299.005	PE071299.006	PE071299.007	PE071299.008
pH KCl*	pH Units	-	5.5	5.7	5.9	5.7
Titrateable Actual Acidity	kg H2SO4/T	0.25	0.37	0.74	<0.25	0.74
Titrateable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	8	15	<5	15
Titrateable Actual Acidity (TAA) S%w/w	%w/w S	0.01	0.01	0.02	<0.01	0.02
Sulphur (SKC)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Calcium (CaKCl)	%w/w	0.005	0.009	0.033	0.014	0.024
Magnesium (MgKCl)	%w/w	0.005	<0.005	0.043	<0.005	0.037

TPA (Titrateable Peroxide Acidity) Method: AN218

Parameter	Units	LOR	PE071299.005	PE071299.006	PE071299.007	PE071299.008
Peroxide pH (pH Ox)	pH Units	-	5.7	6.5	5.5	6.4
TPA as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	0.62	<0.25	0.50
TPA as moles H+/tonne	moles H+/T	5	<5	13	<5	10
TPA as S % WW	%w/w S	0.01	<0.01	0.02	<0.01	0.02
Titrateable Sulfidic Acidity as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titrateable Sulfidic Acidity as kg H2SO4/tonne	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titrateable Sulfidic Acidity as S % WW	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as % CaCO3	% CaCO3	0.01	<0.01	<0.01	<0.01	<0.01
ANCE as moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
ANCE as S % WW	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Peroxide Oxidisable Sulphur (Spos)*	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Peroxide Oxidisable Sulphur as moles H+/tonne*	moles H+/T	5	<5	<5	<5	<5
Sulphur (Sp)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Calcium (Cap)	%w/w	0.005	0.010	0.032	0.017	0.031
Reacted Calcium (CaA)*	%w/w	0.005	<0.005	<0.005	<0.005	0.008
Reacted Calcium (CaA)*	moles H+/T	5	<5	<5	<5	<5
Magnesium (Mgp)	%w/w	0.005	<0.005	0.046	<0.005	0.051
Reacted Magnesium (MgA)*	%w/w	0.005	<0.005	<0.005	<0.005	0.014
Reacted Magnesium (MgA)*	moles H+/T	5	<5	<5	<5	12
Net Acid Soluble Sulphur as % w/w*	%w/w	0.005	-	-	-	-
Net Acid Soluble Sulphur as moles H+/tonne*	moles H+/T	5	-	-	-	-

SPOCAS Net Acidity Calculations Method: AN220

Parameter	Units	LOR	PE071299.005	PE071299.006	PE071299.007	PE071299.008
a-Net Acidity	%w/w S	0.01	0.01	0.04	<0.01	0.04
a-Net Acidity	moles H+/T	5	9	24	<5	23
Liming Rate*	kg CaCO3/T	0.1	NA	1.8	<0.1	1.7
Verification a-Net Acidity*	%w/w S	0.01	-	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	9	18	<5	18
Liming Rate without ANCE*	kg CaCO3/T	0.1	NA	NA	<0.1	NA

MB blank results are compared to the Limit of Reporting
 LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
 DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

TAA (Titratable Actual Acidity) Method: ME-(AU)-(ENV)AN219

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH KCl*	LB051217	pH Units	-	6.0	0%	99%
Titratable Actual Acidity	LB051217	kg H2SO4/T	0.25	<0.25	0%	NA
Titratable Actual Acidity (TAA) moles H+/tonne	LB051217	moles H+/T	5	<5	0%	93%
Titratable Actual Acidity (TAA) S%w/w	LB051217	%w/w S	0.01	<0.01	0%	93%
Sulphur (SKCl)	LB051217	%w/w	0.005	<0.005	0%	108%
Calcium (CaKCl)	LB051217	%w/w	0.005	<0.005	20%	116%
Magnesium (MgKCl)	LB051217	%w/w	0.005	<0.005	22%	110%

TPA (Titratable Peroxide Acidity) Method: ME-(AU)-(ENV)AN218

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Peroxide pH (pH Ox)	LB051217	pH Units	-	6.3	1%	98%
TPA as kg H2SO4/tonne	LB051217	kg H2SO4/T	0.25	<0.25	2%	91%
TPA as moles H+/tonne	LB051217	moles H+/T	5	<5	2%	91%
TPA as S % W/W	LB051217	%w/w S	0.01	<0.01	2%	91%
Titratable Sulfidic Acidity as moles H+/tonne	LB051217	moles H+/T	5		0%	
Titratable Sulfidic Acidity as kg H2SO4/tonne	LB051217	kg H2SO4/T	0.25		0%	
Titratable Sulfidic Acidity as S % W/W	LB051217	%w/w S	0.01		0%	
ANCE as % CaCO3	LB051217	% CaCO3	0.01	<0.01	0%	NA
ANCE as moles H+/tonne	LB051217	moles H+/T	5	<5	0%	NA
ANCE as S % W/W	LB051217	%w/w S	0.01	<0.01	0%	NA
Peroxide Oxidisable Sulphur (Spos)*	LB051217	%w/w	0.005		0%	
Peroxide Oxidisable Sulphur as moles H+/tonne*	LB051217	moles H+/T	5		0%	
Sulphur (Sp)	LB051217	%w/w	0.005	<0.005	0%	100%
Calcium (Cap)	LB051217	%w/w	0.005	<0.005	15%	108%
Magnesium (Mgp)	LB051217	%w/w	0.005	<0.005	15%	105%

Order 1096
 Project Moresby Height Subdivision

Sample Name
 Description
 Sample Date
 Matrix

Job Number	Method Name	Analyte Name	Units	Reporting Limit
PE071299	TAA (Titrateable Actual Acidity)	pH KCl	pH Unit	0
PE071299	TAA (Titrateable Actual Acidity)	Titrateable Actual Acidity	kg H ₂ SO ₄ /ton	0.25
PE071299	TAA (Titrateable Actual Acidity)	Titrateable Actual Acidity	moles H ⁺ /ton	5
PE071299	TAA (Titrateable Actual Acidity)	Titrateable Actual Acidity	%w/w S	0.01
PE071299	TAA (Titrateable Actual Acidity)	Sulphur (SKCl)	%w/w	0.005
PE071299	TAA (Titrateable Actual Acidity)	Calcium (CaKCl)	%w/w	0.005
PE071299	TAA (Titrateable Actual Acidity)	Magnesium (MgKCl)	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Peroxide pH (pH Ox)	pH Unit	0
PE071299	TPA (Titrateable Peroxide Acidity)	TPA as kg H ₂ SO ₄ /ton	kg H ₂ SO ₄ /ton	0.25
PE071299	TPA (Titrateable Peroxide Acidity)	TPA as moles H ⁺ /ton	moles H ⁺ /ton	5
PE071299	TPA (Titrateable Peroxide Acidity)	TPA as S % W/W	%w/w S	0.01
PE071299	TPA (Titrateable Peroxide Acidity)	Titrateable Sulfidic Acidity	moles H ⁺ /ton	5
PE071299	TPA (Titrateable Peroxide Acidity)	Titrateable Sulfidic Acidity	kg H ₂ SO ₄ /ton	0.25
PE071299	TPA (Titrateable Peroxide Acidity)	Titrateable Sulfidic Acidity	%w/w S	0.01
PE071299	TPA (Titrateable Peroxide Acidity)	ANCE as % CaCO ₃	% CaCO ₃	0.01
PE071299	TPA (Titrateable Peroxide Acidity)	ANCE as moles H ⁺ /ton	moles H ⁺ /ton	5
PE071299	TPA (Titrateable Peroxide Acidity)	ANCE as S % W/W	%w/w S	0.01
PE071299	TPA (Titrateable Peroxide Acidity)	Peroxide Oxidisable	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Peroxide Oxidisable	moles H ⁺ /ton	5
PE071299	TPA (Titrateable Peroxide Acidity)	Sulphur (Sp)	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Calcium (Cap)	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Reacted Calcium (C)	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Reacted Calcium (C)	moles H ⁺ /ton	5
PE071299	TPA (Titrateable Peroxide Acidity)	Magnesium (Mgp)	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Reacted Magnesium	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Reacted Magnesium	moles H ⁺ /ton	5
PE071299	TPA (Titrateable Peroxide Acidity)	Net Acid Soluble Sulphur	%w/w	0.005
PE071299	TPA (Titrateable Peroxide Acidity)	Net Acid Soluble Sulphur	moles H ⁺ /ton	5
PE071299	SPOCAS Net Acidity Calculation	s-Net Acidity	%w/w S	0.01
PE071299	SPOCAS Net Acidity Calculation	a-Net Acidity	moles H ⁺ /ton	5
PE071299	SPOCAS Net Acidity Calculation	Liming Rate	kg CaCl ₂ /ton	0.1
PE071299	SPOCAS Net Acidity Calculation	Verification s-Net Acidity	%w/w S	0.01
PE071299	SPOCAS Net Acidity Calculation	a-Net Acidity without Sulphur	moles H ⁺ /ton	5
PE071299	SPOCAS Net Acidity Calculation	Liming Rate without Sulphur	kg CaCl ₂ /ton	0.1



PE071299.001	PE071299.002	PE071299.003	PE071299.004	PE071299.005
TP2 @ 0.25	TP2 @ 1.25	TP17 @ 0.25	TP17 @ 1.25	TP19 @ 0.25
24/9/2012	24/9/2012	24/9/2012	24/9/2012	24/9/2012
Soil	Soil	Soil	Soil	Soil
Result	Result	Result	Result	Result
6.1	5.5	6.0	5.9	5.5
<0.25	1.1	<0.25	<0.25	0.37
<5	23	<5	<5	8
<0.01	0.04	<0.01	<0.01	0.01
<0.005	<0.005	0.006	<0.005	<0.005
0.009	0.043	0.022	0.023	0.009
<0.005	0.021	<0.005	0.009	<0.005
5.9	5.9	5.7	5.9	5.7
<0.25	0.50	<0.25	<0.25	<0.25
<5	10	<5	<5	<5
<0.01	0.02	<0.01	<0.01	<0.01
<5	<5	<5	<5	<5
<0.25	<0.25	<0.25	<0.25	<0.25
<0.01	<0.01	<0.01	<0.01	<0.01
<0.01	<0.01	<0.01	<0.01	<0.01
<5	<5	<5	<5	<5
<0.01	<0.01	<0.01	<0.01	<0.01
<0.005	<0.005	<0.005	<0.005	<0.005
<5	<5	<5	<5	<5
<0.005	0.006	<0.005	<0.005	<0.005
0.009	0.044	0.021	0.025	0.010
<0.005	<0.005	<0.005	<0.005	<0.005
<5	<5	<5	<5	<5
<0.005	0.022	<0.005	0.010	<0.005
<0.005	<0.005	<0.005	<0.005	<0.005
<5	<5	<5	<5	<5
N.A.	N.A.	N.A.	N.A.	N.A.
N.A.	N.A.	N.A.	N.A.	N.A.
<0.01	0.05	<0.01	<0.01	0.01
<5	30	<5	6	9
<0.1	2.3	<0.1	NA	NA
N.A.	N.A.	N.A.	N.A.	N.A.
<5	23	<5	6	9
<0.1	1.8	<0.1	NA	NA

PE071299.006	PE071299.007	PE071299.008	
TP19 @ 1.25	TP22 @ 0.25	TP22 @ 1.25	
24/9/2012	24/9/2012	24/9/2012	
Soil	Soil	Soil	
	Result	Result	Result
	5.7	5.9	5.7
	0.74 <0.25		0.74
	15 <5		15
	0.02 <0.01		0.02
<0.005	<0.005	<0.005	
	0.033	0.014	0.024
	0.043 <0.005		0.037
	6.5	5.5	6.4
	0.62 <0.25		0.50
	13 <5		10
	0.02 <0.01		0.02
<5	<5	<5	
<0.25	<0.25	<0.25	
<0.01	<0.01	<0.01	
<0.01	<0.01	<0.01	
<5	<5	<5	
<0.01	<0.01	<0.01	
<0.005	<0.005	<0.005	
<5	<5	<5	
<0.005	<0.005	<0.005	
	0.032	0.017	0.031
<0.005	<0.005		0.008
<5	<5	<5	
	0.046 <0.005		0.051
<0.005	<0.005		0.014
<5	<5		12
N.A.	N.A.	N.A.	
N.A.	N.A.	N.A.	
	0.04 <0.01		0.04
	24 <5		23
	1.8 <0.1		1.7
N.A.	N.A.	N.A.	
	16 <5		16
NA	<0.1	NA	

Appendix E

Dial Before You Dig

NO ATCO GAS AUSTRALIA ASSETS RECORDED

Ms Debra Taylor
AECOM Australia
PO Box 263
Geraldton
Wa, 6530

Job No: 5272295
Sequence No: 24244289
Date of Issue: 16/02/2012
Phone: 0899204800
Mobile: Not Supplied
Fax: 0899217265

DBYD Utility Registration Name: 70852 - ATCO Gas Australia

DBYD Location: hackett Rd, Waggrakine, WA, 6530

Our records indicate that there are **NO ATCO Gas Australia underground Assets/Pipes present in the vicinity of the above enquiry, however please read all the information and conditions below.**

ATTENTION: This response to your inquiry has been interpreted from details in your requested DBYD picture location request only (not any street address you gave). It is your duty to ensure the accompanying plan/s match your geographical area of works.

IF YOU SEE, HEAR, SMELL OR OTHERWISE DETECT GAS, LEAVE THE IMMEDIATE AREA AND THEN CALL 13 13 52

Our records indicate that ATCO Gas Australia Pty Ltd gas infrastructure **IS NOT PRESENT** in the vicinity of and/or surrounding area of the above enquiry. This response relates only to ATCO Gas Australia assets. Your Duty of Care requires that personnel must at all times comply with, and have on site, this information sheet and the accompanying plan(s). All plans are subject to this information sheet. You should also refer to the "Questionnaire for works near ATCO Gas Australia infrastructure" on page [5] of this document, which must be read and all questions answered. If you answer "yes" to any of the questions you must contact ATCO Gas Australia during business hours on 1300 926 755.

All information provided is to be used as a guide only (see Disclaimer item 5). It does not absolve you or third parties from your Duty of Care obligations, including to take additional precautions where work has the potential to impact on gas assets, public safety or the environment, or from your duties at law (including Reg 3.21 of the Occupational Safety and Health Regulations 1996).

WARNINGS

- No works of any type within 15 metres of any **HIGH PRESSURE** gas infrastructure without prior approval from ATCO Gas Australia.
- **NO HOT WORK** within 15 metres of any gas infrastructure except in compliance with applicable laws & Australian Standard 1674. **DO NOT** let heat sources or hot works impact on gas infrastructure and take into consideration that the ground or adjacent structures may also be capable of transmitting heat so as to circumvent protection afforded by a heat shield or barrier.
- **DANGER** Gas can cause asphyxiation and is flammable. Keep all ignition sources well away (eg flames, matches/lighters, sparks, electrical devices, vehicles or engines, mobile phones, cameras).
- Gas pipes must not be unsupported or left without adequate cover or protection without prior approval from ATCO Gas Australia.
- Damage to the pipe coating or pipe itself can be very dangerous if not given immediate attention. Report any damage to ATCO Gas Australia immediately on 13 13 52. Do not attempt to repair any damaged gas infrastructure.
- No alteration or removal of live or abandoned gas infrastructure without prior written approval from ATCO Gas Australia.
- Any abandoned or proposed gas infrastructure indicated on the gas plans must be treated as live.
- Never assume the location or depth of any gas infrastructure. Pipes may not follow straight lines or maintain a constant depth. Always check carefully (eg by careful hand digging of potholes).
- Unauthorised repairs or tampering with gas infrastructure may result in prosecution under *the Energy Operators (Powers) Act 1979*. ATCO Gas Australia reserves all rights to recover compensation for loss or damage to its gas infrastructure or other property including for indirect or consequential losses.

PLANS:

Plans provided are current for **30 days only** from date of request. You must use current plans at all times.

Plans do not show all gas service lines (which connect gas mains to individual meter positions). See condition 3(c) below.

Plans (including the location of pipes, services, infrastructure and boundaries) are **approximate only**. You must safe and proper procedures - including **potholing** (see condition 4 below)

Plans are not a guide as to gas availability for connection purposes.

To call ATCO Gas Australia: weekdays from 8am to 4pm, call – 1300 926 755

after hours, weekends and emergencies, call – 13 13 52

CONDITIONS FOR WORKS IN THE VICINITY OF ATCO GAS AUSTRALIA ASSETS

1. Compliance with Warnings

You must comply with the Warnings contained in this information sheet and the accompanying plan(s).

2. Compliance with “General Guidelines for Third Party Works”, applicable laws and duty of care

All work (including but not limited to using Excavator’s Augers, Directional, drilling machines, ‘Ditch Witch’ type trenching machine, Loader, Dozer, Skid Steer (Bob Cat)) must comply with all applicable requirements in the “General Guidelines for Third Party Works” and with all applicable laws and Australian Standards. All due care must be exercised to locate any gas infrastructure in the vicinity and when conducting any works near them.

3. All Gas Infrastructure

All work that may have any impact upon any gas infrastructure (see 3(a), (b) and (c) below for examples) should be carefully planned with notification to ATCO Gas Australia well in advance of commencement (see “General Guidelines for Third Party Works” for required lead times and contact details engineering.services@atcogas.com.au). Amongst other things, this includes excavation of or near gas pipelines, boring/drilling, crossings of pipelines (including by other underground infrastructure e.g. drains, power cables, etc), road works and structural installations. In addition:

a. High Pressure Pipelines (HP, PEHP > 110, CHP, FHP)

No works of any type are permitted within 15 metres of these pipelines without prior approval from ATCO Gas Australia. For approvals contact ATCO Gas Australia on 1300 926 755.

You must ascertain the location of any high pressure pipeline, in relation to your proposed work by:

- i. locating a straight line between two high pressure warning signs and
- ii. assessing the distance from this line to your proposed work area.

ATCO Gas Australia may require stand-by supervision during your works and will advise of attendance requirements.

b. Medium (MP), Medium-Low (MLP), Low (LP) and other Pipeline Pressures

These pipelines are installed in most streets throughout the Perth metro area and several country centres. Main valves, regulator sets and test points also exist at intervals along these pipelines. Where work may impact upon these pipelines or assets then ATCO Gas Australia must be contacted as per item 3 above.

c. Gas Services and Meters

If a gas meter is installed on a property, an underground gas service pipe will run from the meter position to the gas main in the street. Plans do not show all gas service lines, but their presence must be anticipated. Most gas meter boxes installed since 1996, most gas meter boxes will include a sticker giving approximate guidelines for the gas service line location. All due care must be exercised to locate any gas services in the vicinity and when conducting any works near them.

4. Compliance with Safe Work Practices

It is your responsibility to have and comply with adequate safe work practices and procedures.

Without limiting your obligations:

PLAN - The complete Dial Before You Dig documentation and plans must always be on site and referred to for the duration of work. Refer to regulation 3.21 of the *Occupational Safety and Health Regulations 1996* and the Utility Providers “Code of Practice” for further useful information.

POTHOLE - Using current Dial Before You Dig plans, all gas pipes should be located (including any deviation in the direction of a gas pipe) by exposing them by careful digging using a HAND SHOVEL. Where the proposed work is parallel to a gas pipeline, pothole every 5 metres along the entire route. Damage to the pipe coating or to the pipe itself can create a very dangerous situation if not given immediate attention. If damage does occur, it must be reported to ATCO Gas Australia immediately on Ph. 13 13 52.

PROTECT - Supervise and monitor all excavations near gas infrastructure using a dedicated spotter. Where any gas infrastructure is required to be exposed, adequate protection of the gas infrastructure is required to prevent potential damage. Also implement appropriate controls when conducting 'hot work' (in accordance with AS 1674) in the vicinity of the ATCO Gas Australia GDS such as; isolation; separation distance; the placement of an effective non-combustible barrier of sufficient size and thermal resistance for the intensity, type and duration of heat exposure; gas monitoring; monitoring the environment surrounding the ATCO Gas Australia GDS to ensure it is not being impacted by the work, and other controls as necessary.

5. Disclaimer & further terms

- a. Nothing in this document, any accompanying plan or the "General Guidelines for Third Party Works" (together called "**Documents**") purports to exclude or modify any term, condition or warranty to the extent that by law it cannot lawfully be excluded or modified by agreement or notice, including but not limited to those contained in Schedule 2 of the *Competition and Consumer Act 2010* (Cth) and corresponding provisions of state legislation.
- b. If any of ATCO Gas Australia Pty Ltd or their respective related entities, officers, employees, agents, contractors or advisers (together called "**Associates**") is liable for a breach of a term, condition or warranty described in paragraph 5(a) above, its liability is, to the fullest extent permitted by law, limited to any one or more of the following as it determines in its absolute discretion:
 - i. in relation to goods supplied by them, replacing or repairing the goods, supplying an equivalent item, paying the cost of replacing or repairing the goods or paying the cost of acquiring or hiring an equivalent item; and
 - ii. in relation to services supplied by them, the re-supply of the services or the payment of the cost of having the services re-supplied.
- c. Subject to paragraphs 5(a) and (b), but otherwise despite any other provision in the Documents, no representation or warranty is made or given (whether expressly or by implication) by any of ATCO Gas Australia or their respective Associates in respect of any information contained or referred to in any of the Documents or in any other communication from ATCO Gas Australia concerning any of the Documents or the subject matter of any of the Documents ("**Information**"). In particular, but without limiting the generality of the foregoing limitation, none of ATCO Gas Australia or their respective Associates makes any warranty or representation as to the truth, accuracy, completeness, reliability, currency, timeliness, quality or fitness for any purpose of or the standard of care taken in the preparation of any Document or Information (including, but not limited to, the accuracy of the scale of, or the location of any thing or symbol shown on, any plan or diagram).
- d. Subject to paragraphs 5(a) and (b), to the maximum extent permitted by law, none of ATCO Gas Australia or their respective Associates is liable to any person or other body ("**Recipient**") who receives or otherwise obtains access to all or any part or parts of the Documents or Information, in any way (including, but not limited to, liability for negligence, breach of statutory duty or lack of care) in respect of any cost, expense, damages, loss or liability, including, but not limited to:
 - i. any financial or economic loss, cost, expense or damage, including but not limited to loss of production, loss of profit, loss of revenue, loss of use, loss of contract, loss of goodwill or loss of business opportunity;
 - ii. any new or increased costs or expenses, including but not limited to financing or operating costs;
 - iii. any failure to achieve any actual or anticipated saving in respect of any cost or expense;
 - iv. any cost, expense, damage or loss resulting from any liability of the Recipient to any other person or body howsoever and whensoever arising,suffered or incurred by the Recipient in relation to, or in connection with, the disclosure to them of, or use of, or reliance on, all or any part or parts of the Documents or Information.

- e. By using any Document or Information each Recipient is taken to represent and warrant to ATCO Gas Australia that the Recipient will comply with the conditions and other terms referred to in the Documents or Information, including but not limited to conditions that:
- i. the Recipient must comply with the conditions in numbered paragraphs 1 to 4 above and this paragraph 5;
 - ii. as between ATCO Gas Australia and each Recipient, ATCO Gas Australia owns the Information and all rights and title in and to the Information are to remain vested in ATCO Gas Australia;
 - iii. no Recipient has any right, title or interest in the Information or, except as expressly provided for in the Documents, any licence or right to copy, alter, modify, publish or otherwise use or deal with the Information without prior written approval from ATCO Gas Australia;
 - iv. ATCO Gas Australia makes no representation and gives no warranty as to its right to disclose any Information;
 - v. the Recipient relies on any Information entirely at its own risk and expense;
 - vi. the Recipient must undertake its own independent due diligence and investigations in relation to the Information;
 - vii. none of ATCO Gas Australia or their respective Associates owes the Recipient any duty of care in respect of the Information; and
 - viii. none of ATCO Gas Australia or their respective Associates is under any obligation to correct, update or revise any Documents or Information.

Gas Main and Service Identification

LEGEND

1. Pipe Diameter (mm)

2. Pipe Material:

CI = Cast Iron PE = Polyethylene

GI = Galvanised Iron PVC = PVC

ST = Steel

3. Alignment (in metres from property line)

4. Pressure in main (eg MP = Medium Pressure)

5. Off Line Service- service may not be a straight line to meter. (Warning – OLS may not always be shown on plan. See item 3c above)

6. Service valve in the vicinity

(Note: Service Valves may be "Buried")

7. Pre-Laid Service laid in Common Trench

8. Main Status: (See warnings page 1)

AB = Abandoned Mains

CT = Mains in Common Trench

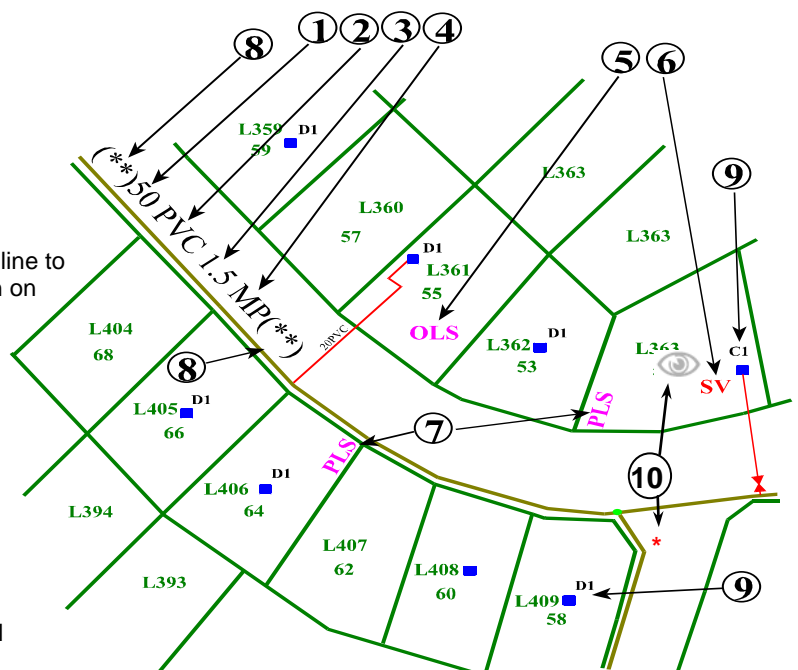
PROP = Proposed Mains

9. Customer Connection: Does not indicate actual location of meter position

D1 = Domestic

C1 = Commercial

10. **Additional detail available and must be obtained if within area of proposed works - see page 2 above**



IF YOU SEE, HEAR, SMELL OR OTHERWISE DETECT GAS, LEAVE THE IMMEDIATE AREA AND THEN CALL 13 13 52

Questionnaire for Works near ATCO Gas Australia Infrastructure

The accompanying documentation must be read and the following questions answered and instructions followed when planning and **before commencing any work**.

	Questions	Yes	No
1	Will any works be within 15 metres of any High Pressure gas infrastructure?		

If answered **Yes** you must contact the ATCO Gas Australia **High Pressure Coordinator** to seek prior approval on **1300 926 755** between 08:00 hours – 16:00 hours (Monday – Friday, except public holidays).

If you answer **Yes** to any of the following questions you must contact ATCO Gas Australia **Engineering Services** to seek prior approval on **(08) 9499 5200** between the above hours. Plan ahead and allow sufficient time for ATCO Gas Australia Engineering Services to consider your request.

	Question	Yes	No
2	Will any works require the use of a vibrating roller within 15 metres of any gas mains?		
3	Will any works involve boxing the ground out to a depth of 300mm or more for the construction of a road/car park or crossover/driveway over a gas main?		
4	Will any works affect water flows or drainage, eg. surface drainage, within 15 metres of any gas mains?		
5	Will any works involve traversing any gas infrastructure with any heavy vehicle or plant (eg. cranes, agitators or trucks)?		
6	Will any works involve stockpiling of spoil, dangerous goods or any other materials over any gas infrastructure?		
7	Will any works or structure (eg. fencing) obstruct access to gas infrastructure?		
8	Will any works involve placing infrastructure eg. cable, pipes etc. that will not comply with the minimum separation distances to the gas infrastructure: 300mm crossing, 500mm parallel?		
9	Will any works involve blasting that could affect any gas infrastructure?		
10	Will any works involve the installation of electrical infrastructure to operate above 22kV in the vicinity of any steel gas infrastructure?		

If unsure, please contact ATCO Gas Australia Engineering Services on **(08) 9499 5200**.

IMPORTANT: it is your responsibility to **TAKE CARE** to comply with all requirements of ATCO Gas Australia Engineering Services (including their 'Additional Information for Works near ATCO Gas Australia Infrastructure'), the ATCO Gas Australia Dial Before You Dig cover sheets and maps and all applicable laws and standards



Telstra Corporation Limited

DUTY OF CARE

IMPORTANT:

Please read and understand all the information and disclaimers provided below.

Sketches and Plans provided by Telstra are circuit diagrams only and indicate the presence of telecommunications plant in the general vicinity of the geographical area shown; exact ground cover and alignments cannot be given with any certainty and cover may alter over time. Telecommunications plant seldom follow straight lines and careful on site investigation is essential to uncover and reveal its exact position.

Due to the nature of Telstra plant and the age of some cables and records, it is impossible to ascertain the location of all Telstra plant. The accuracy and/or completeness of the information can not be guaranteed and, accordingly Telstra plans are intended to be indicative only.

"DUTY OF CARE"

When working in the vicinity of telecommunications plant you have a legal "Duty of Care" that must be observed.

It is the responsibility of the owner and any consultant engaged by the owner, including an architect, consulting engineer, developer, and head contractor to design for minimal impact and protection of Telstra plant. Telstra will provide plans and sketches showing the presence of its network to assist at this design stage.

It is the owner's (or constructor's) responsibility to:-

- a) request plans of Telstra plant for a particular location at a reasonable time before construction begins. If you have any doubts as to the exact location of Telstra Plant, we strongly recommend that you engage an Accredited plant Locator in your area;
- b) visually locate Telstra plant by hand digging or using non destructive water jet method (pot holing) where construction activities may damage or interfere with Telstra plant (see "Essential Precautions and Approach Distances" section for more information); and
- c) contact Telstra's **Plan Services** (see below for details) if Telstra plant is wholly or partly located near planned construction activities.

DAMAGE:

ANY DAMAGE TO TELSTRA'S NETWORK MUST BE REPORTED TO 132203 IMMEDIATELY.

The owner is responsible for all plant damage when works commence prior to obtaining Telstra plans, or failure to follow agreed instructions.

Telstra reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

EMERGENCY SITUATIONS

Emergency situations are unplanned and include (amongst other things):

- damaged or faulty underground or aerial power cables / poles
- burst/leaking water mains
- burst/leaking sewer mains.
- burst/leaking gas pipes
- any other emergency situation that may impact Telstra network.

NOTE: failure to lodge requests in time for normal maintenance work is not deemed as an emergency.

During working hours - in emergency situations, urgent requests for plans or information relating to the location of Telstra network are to be made direct to the Dial Before You Dig Service.
Note that a fast response can be provided if a request is made on line with a supplied return email address between 5am-10pm AEST 7days a week.

Outside Normal Business hours or outside hours of automated responses - in emergency situations , urgent requests for plans or information relating to the location of Telstra network are to be made direct to Telstra on phone **1800 801 801**

NATURAL DISASTERS

Natural Disasters include (amongst other things):

- Earthquakes
- Cyclones
- Floods; and
- Tsunami

In the case of such events, urgent requests for plans or information relating to the location of Telstra network can be made directly to Telstra Network Integrity Team Managers as follows:

NSW - Peter Garth 0419 263 445

QLD - Tony Kent 0419 727 397

VIC/TAS - David Povazan 0417 300 947

SA/NT/WA - Dave Ballard 0419 807 901

PLAN SERVICES

For all Telstra DBYD (Dial Before You Dig) map enquiries please contact Telstra Plan Services

email - **Telstra.Plans@team.telstra.com**

fax - **(02) 4961 3714**

phone - **1800 653 935** (for urgent, onsite or optic fibre enquiries)

Please note - to make an enquiry the plans must be current (within 60 days of issue). If your plans have expired you will need to submit a new request via DBYD.

ASSET RELOCATIONS

You are not permitted to relocate or alter any Telstra assets or network under any circumstance.

For all enquiries relating to the relocation of Telstra assets please phone **1800 810 443** or email **F1102490@team.telstra.com**

CONCERNING TELSTRA PLANS:

Please note the following:

- For plans of Telstra locations contact **Dial Before You Dig** at least 2 business days prior to digging. (**www.1100.com.au** or phone **1100**)
- Fast response can be provided by Telstra if an email address is supplied. (if posted, this may take up to one week or longer to receive plans)
- Telstra plans and information provided are **valid for 60 days** from the date of issue.
- Telstra owns and retains the copyright in all plans and details provided in conjunction with the applicant's request. The applicant is authorised to use the plans and details only for the purpose indicated in the applicant's request. The applicant must not use the plans or details for any other purpose. The plans and details should be disposed of by shredding or any other secure disposal method after use.
- Telstra plans or other details are provided only for the use of the applicant, its servants, or agents. **The applicant may not give the plans or details to other parties, and may not generate profit from commercialising the plans or details.**
- Please contact Telstra **Plan Services** (see above for details) immediately should you locate Telstra assets not indicated on these plans.
- Telstra, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Telstra against any claim or demand for any such loss or damage.
- Please ensure Telstra plans and information provided remains on-site at all times throughout your construction phase.

ESSENTIAL PRECAUTIONS and APPROACH DISTANCES:

NOTE: If the following clearances cannot be maintained, please contact Telstra Plan Services (see above for details) for advice on how best to resolve this situation.

1. On receipt of plans and sketches and before commencing excavation work or similar activities near Telstra's plant, **carefully locate this plant first** to avoid damage. Undertake prior manual exposure such as potholing when intending to excavate or work **closer** to Telstra plant than the following approach distances.

Where Telstra's plant is in an area where road and footpaths are well defined by kerbs or other features a minimum clear distance of 600mm must be maintained from where it could be reasonably presumed that plant would reside.

In non established or unformed reserves and terrain, this approach distance must be at least 1.5 metres.

In country/rural areas which may have wider variations in reasonably presumed plant presence, the following minimum approach distances apply:

- a) Parallel to major plant: 10 metres (for IEN, optic fibre and copper cable over 300 pairs)
- b) Parallel to other plant: 5 metres

NOTE: Even manual pot-holing needs to be undertaken with extreme care, commonsense and employing techniques least likely to damage cables. For example, orientate shovel blades and trowels parallel to the cable rather than digging across the cable.

If construction work is parallel to Telstra plant, then careful hand digging or using non destructive water jet method (pot-holing) at least every 5m is required to establish the location of all plant, hence confirming nominal locations before work can commence.

2. Maintain the following minimum clearance between construction activity and **actual location** of Telstra Plant.

Jackhammers/Pneumatic Breakers	<i>Not within 1.0m of actual location.</i>
Vibrating Plate or Wacker Packer Compactor	<i>Not within 0.5m of Telstra ducts. 300mm compact clearance cover before compactor can be used across Telstra ducts.</i>
Boring Equipment (in-line, horizontal and vertical)	<i>Not within 2.0m of actual location. Constructor to hand dig or use non-destructive water jet method (pot-hole) and expose plant.</i>
Heavy Vehicle Traffic (over 3 tonnes)	<i>Not to be driven across Telstra ducts (or plant) with less than 600mm cover. Constructor to check depth via hand digging.</i>
Mechanical Excavators, Farm ploughing and Tree Removal	<i>Not within 1.0m of actual location. Constructor to hand dig or use non-destructive water jet method (pot-hole) and expose plant.</i>

All Telstra pits and manholes should be a minimum of 1.2m in from the back of kerb after the completion of your work.

All Telstra conduit should have the following minimum depth of cover **after the completion of your work:-**

- **Footway 450mm**
- **Roadway 450mm at drain invert and 600mm at road centre crown**

For clearance distances relating to Telstra pillars, cabinets and RIMs/RCMs please contact Telstra Plan Services (see above for details).

FURTHER ASSISTANCE:

Assistance can be obtained by contacting Telstra **Plan Services**

Where on-site location is provided, the owner is responsible for all hand digging or use non-destructive water jet method (pot-holing) to visually locate and expose Telstra plant.

If plant location plans or visual location of Telstra plant by digging reveals that the location of Telstra plant is situated wholly or partly where the owner plans to work, then **Telstra's Network Integrity Group** must be contacted through Telstra **Plan Services** to discuss possible engineering solutions.

NOTE:

If Telstra relocation or protection works are part of the agreed solution, then payment to Telstra for the cost of this work shall be the responsibility of the principal developer or constructor. The principal developer or constructor will be required to provide Telstra with the details of their proposed work showing how Telstra's plant is to be accommodated and these details must be approved by the Regional Network Integrity Manager prior to the commencement of site works.

RURAL LANDOWNERS - IMPORTANT INFORMATION

Where Telstra owned cable crosses agricultural land, Telstra may provide a once off free on-site electronic cable location. The Telstra Plan Services operator will provide assistance in determining whether a free on-site location is required.


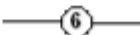




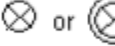



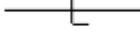

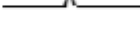



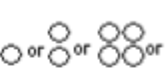
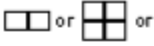
Please note:

- The exact location, including depth of cables can only be verified by pot holing, which is not covered by this service.
- This service is only available to assist private rural land owners.
- This service covers one hour on-site only. Additional time can be purchased directly from the Accredited Plant Locator.

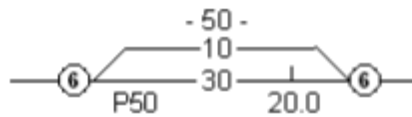
For further information including terms and conditions, please contact Telstra Plan Services on phone **1800 653 935**.

PRIVACY NOTE

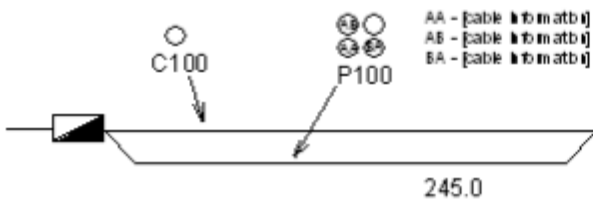
Your information has been provided to Telstra by DBYD to enable Telstra to respond to your DBYD request. Telstra keeps your information in accordance with its privacy statement entitled "Protecting Your Privacy" which can be obtained from Telstra either by calling 1800 039 059 or visiting our website at www.telstra.com.au/privacy

A GUIDE TO READING PLANS		Telstra Corporation Limited ABN 33 05 1175 556									
	Exchange (major cable present)		Cable jointing pit (number indicating pit type)								
	Footway access chamber (can vary from 1-lid to 12-lid)		Buried cable jointing pit (number indicating pit type)								
	Roadway access chamber		Elevated cable joint (above ground joint on buried cable)								
 or 	Pillar/cabinet (above the ground / free standing)		Cable loop (direct buried)								
	Above ground complex equipment housing (eg RIM) Please Note: This equipment is powered by 240V electricity.		Telstra Plant in shared utility trench								
	PT Public telephone Please Note: This equipment is powered by 240V electricity.		Aerial Cable (above ground)								
	Direct buried cable		Aerial cable (attached to joint use pole e.g. power)								
	Optical fibre cable direct buried										
	Single to multiple round conduit Configurations 1, 2, 4, 9 respectively (Attached text denotes conduit type and size) P100	<p style="text-align: center;">Some examples of conduit type and size:</p> <p>A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware. Conduit sizes <i>nominally</i> range from 20mm to 100mm.</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">P50</td><td style="padding: 2px;">50mm PVC conduit</td></tr> <tr><td style="padding: 2px;">P100</td><td style="padding: 2px;">100mm PVC conduit</td></tr> <tr><td style="padding: 2px;">A100</td><td style="padding: 2px;">100mm asbestos cement conduit</td></tr> <tr><td style="padding: 2px;">E 85</td><td style="padding: 2px;">85mm square earthenware conduit</td></tr> </table>		P50	50mm PVC conduit	P100	100mm PVC conduit	A100	100mm asbestos cement conduit	E 85	85mm square earthenware conduit
P50	50mm PVC conduit										
P100	100mm PVC conduit										
A100	100mm asbestos cement conduit										
E 85	85mm square earthenware conduit										
	Multiple square conduit Configurations 2, 4, 6 respectively (Attached text denotes conduit type and size) E85										

Some examples of how to read Telstra plans:



One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits, 20.0m apart, with a direct buried 30-pair cable along the same route.



Two separate conduit runs between two footway access chambers (manholes) 245m apart. A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along the same route.

WARNING: Telstra's plans show only the presence of cables and plant. They only show their position relative to road boundaries, property fences etc. at the time of installation and Telstra does not warrant or hold out that such plans are accurate thereafter due to changes that may occur over time.

DO NOT ASSUME DEPTH OR ALIGNMENT of cables or plant as these vary significantly.

The customer has a DUTY OF CARE when excavating near Telstra cables and plant. Before using machine excavators TELSTRA PLANT MUST FIRST BE PHYSICALLY EXPOSED BY SOFT DIG (potholing) to identify its location.

Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Electronic plans - PDF and DWF maps

If you have received Telstra maps via email you will have received the maps as either a PDF file (for smaller areas) or DWF file (for larger area requests). If you are unable to launch any one of the softcopy files for viewing and printing, you may need to download and install one or more of the free viewing and printing products such as Adobe Acrobat Reader (for PDF files) or Autodesk Design Review 2010 (for DWF files) available from the internet.

PDF files

PDF is the default softcopy format for all requests that range in size from 0 metres (eg point requests) to requests up to approx *500m in length. (*depends on geographic location of request). The PDF file is formatted to A3 portrait sheet however it can be printed on any size sheet including from A4 to AO, either as the full sheet or selected areas to suit needs and legibility. (to print a selected area zoom up and print "current view"). If there are multiple layers of Telstra network you may receive up to 2 sheets in the single PDF file attachment supplied. There are three types or layers of network normally recorded - local network, mains cables or a combined layer of local and mains (usually displayed in rural or semi rural areas). If mains cable network is present in addition to local cables (ie as separate layer in a particular area), the mains will be shown on a separate sheet. The mains cable information should be read in conjunction with the local cable information.

DWF files

This is the default softcopy format for all requests that are over 500m in length. Maximum length for a DWF automated response is approx 2500m - depending on geographic location of request (non automated longer). The DWF files differ from PDF in that DWF are vector files made up of layers that can be turned on or off and are not formatted to a specific sheet size. This makes them ideal for larger areas and for transmitting over email etc.

How to view Telstra DWF files -

Telstra DWF files come with all layers turned on. You may need to turn individual layers on or off for viewing and printing clarity. Individual layer names are CC (main cable/conduit), DA (distribution or local area network) and sometimes a combined layer - CAC. Layer details can be viewed by either picking off the side menu or by selecting 'window' then 'layers' off the top menu bar. Use 'layers' to turn individual layers off or on. (double click or right click on layer icon.)

How to print Telstra DWF files -

DWF files can be printed on any size sheet. They can be printed in their entirety or by selected areas of interest. Some DWF coverage areas are large and are not suited to printing legibly on a single A4 sheet - you may need several prints if you only have an A4 printer. Alternately an A3, A1 or larger printer should be used. To print, zoom in or out and then by changing the 'print range' settings you can print what is displayed on your screen to suit your paper size. If you only have a small printer eg A4 you may need to zoom until the text legible on your screen for it to be legible on the print. (which is why you may need several prints). To print what is displayed on your screen the 'view' setting should be changed from 'full page' to 'current view'. The 'current sheet' setting should also be selected. You may need to print layers separately for clarity and legibility. (details above on how to turn layers on or off)

How to change the background colour from white to black (when viewing) Telstra DWF files -

If using Autodesk Design Review the background colour can be changed by selecting "Tools" then "options" then "sheet". Tick the box "override published paper colors" and select the colour required using the tab provided.

Further information

If you require further assistance with supplied PDF or DWF plans eg with legibility or you believe there maybe missing information please contact Telstra Plan Services. (contact details above - you will need to supply the Telstra sequence number of the plan request.)

Telstra automated plan service

Telstra provides an automated plan response for the majority of DBYD requests received (currently around 80%). Requestors must supply a current email address on their request to DBYD and must also be able to accept a standard format ie PDF or DWF. An automated response can be provided a lot faster than the alternative which is a mailed hardcopy. This can avoid unnecessary

delays in waiting to arrive. Being sought directly to a worksite and can be available 7 days a week. The automated system can be configured for individual requestors to receive either PDF/DWF (where small requests are PDF and larger requests are DWF) or alternately all in DWF (both small and large requests). Please contact Plan Services for further details or to be configured. Please note all requests over *500m (approx) in size can only be supplied in DWF format and there are size limits on what can be provided. (* actual size depends on geographic location of requested area)

Data Extraction Fees

In some instances a data extraction fee may be applicable for the supply of Telstra information. Typically a data extraction fee may apply to - large projects, requests to be supplied in non standard formats, excessive hardcopy printing or requests for non digging purposes. Further details can be obtained by contacting Telstra Plan Services.

ACCREDITED PLANT LOCATORS (For your area)

On-site assistance should be sought from an **Accredited Plant Locator** if the telecommunications plant cannot be located within 2.5 metres of the locations indicated on the drawings provided.

On-site advice should be obtained from a Telstra accredited Asset Plant Locator who is highly skilled in locating Telstra plant. In the case where Telstra plant is outside a recognised road reserve Telstra recommends that Telstra Plan Services are contacted for assistance prior to engaging an accredited Asset Plant Locator.

Telstra does not permit external parties (non-Telstra) to conduct work on our network. Only Telstra staff or Telstra contractors are allowed to enter our manholes, open our pits, ducts, etc.

Please note it is a criminal offence under the *Criminal Code Act 1995*(Cth) to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

Should your projects require cable location, you **MUST** engage an accredited Asset Plant Locator (a list of which is provided with the Dial Before You Dig plans). Alternatively you may seek your own accreditation through our registered training partner Coates Hire Training which is the only approved training provider for Asset Plant Location accreditation for Telstra's network. You may contact Coates Hire Training on

1300 657 867 or visit **www.coateshire.com.au**

For the assistance of customers an accredited Asset Plant Locator can perform any of the following activities if requested to do so by the owner:

- review Telstra's plans to assess the approximate location of Telstra plant;
- advise owners of the approximate location of Telstra plant according to the plans;
- advise owners of the best method for locating Telstra plant;
- advise owners of the hazards of unqualified persons attempting to find the exact location of Telstra plant and working in the vicinity of Telstra plant without first locating its exact position; and
- perform trial hole explorations by hand digging (pot-holing) to expose Telstra plant with a high degree of skill, competence and efficiency and utilising all necessary safety equipment.

A list of Accredited Plant Locators operating in your area is attached. Accredited Plant Locators are certified by Telstra to perform the tasks listed above. Owners may engage Accredited Plant Locators to perform these services, however Telstra does not give any warranty in relation to these services that Accredited Plant Locators are competent or experienced to perform any other services.

The attached list provides the names and contact details for Accredited Plant Locators who service your area and can provide you with assistance in locating Telstra plant on site. These organisations have been able to satisfy Telstra that they have a sound knowledge of telecommunications plant and its sensitivity to disturbance; appropriate equipment for locating telecommunications plant and competent personnel who are able to interpret telecommunications plans and sketches and understand safety issues relevant to working around telecommunications plant. They are also able to advise you on the actions which should be taken if the work you propose will/could result in a relocation of the telecommunications plant and/or its means of support.

We recommend that you engage the assistance of one of these Accredited Plant Locators as a step towards discharging your Duty of Care obligations when seeking the location of Telstra's telecommunications plant.

Please Note:

- Each Accredited Plant Locator is NOT permitted to provide depth of communications plant unless physically exposed by hand digging.
- The details of any contract, agreement or retainer for site assistance to locate telecommunications plant shall be for you to decide and agree with the organisation engaged. Telstra is not a party to any contract entered into between an owner and an Accredited Plant Locator. The Accredited Plant Locators are able to provide guidance concerning the extent of site investigations required.
- Payment for the site assistance will be your responsibility and payment details should be agreed before the engagement is confirmed.
- Telstra does not accept any liability or responsibility for the performance of or advice given by an Accredited Plant Locator. Accreditation is an initiative taken by Telstra towards the establishment and maintenance of competency standards. However, performance and the advice given will always depend on the nature of the individual engagement.
- Each Accredited Plant Locator has been issued with a certificate which confirms the Accreditation. Every 2 years Telstra will reassess the accreditation and where appropriate will issue a letter confirming the accreditation for the next 2 years. You

have the right to request the organisation you engage to show evidence of their ID card.

- Neither the Accredited Plant Locator nor any of its employees are an employee or agent for Telstra and Telstra is not liable for any damage or loss caused by the Accredited Plant Locator or its employees.
- The attached list contains the current names and contact details of Accredited Plant Locators who service your area, however, these details are subject to change.

IDEA FOR CONSIDERATION:

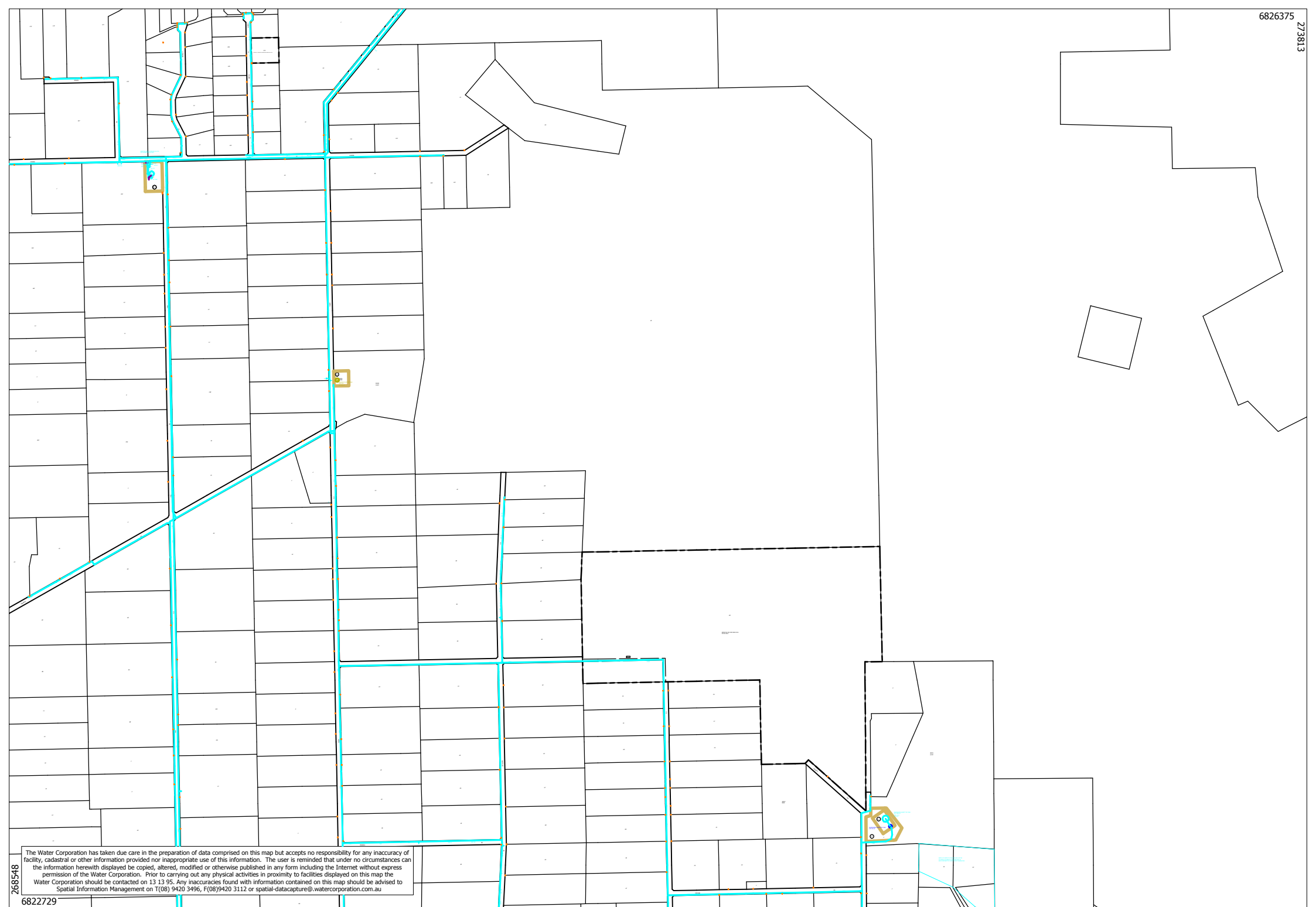
Telstra offer free Cable Awareness Presentations & Advanced Cable Reading Presentations, if you believe you or your company would benefit from this offer please contact Network Integrity on 1800 810 443 or **F1102490@team.telstra.com**

Telstra Accredited Plant Locators - Western Australia. (more than one page)

If a physical location is required please contact a Telstra accredited locator from the list below. (fees apply)

Name & areas covered	Contact details
A1 Stop Locating Shop (trading as Cable Locates & Consulting) - Singleton, Perth metro and Southwest	(08) 9537 3030 or 0409 115 517 Fax: (08) 9586 8775
A & E Contracting - Hazelmere	(08) 9274 5450 Fax: (08) 9274 5450
Abaxa / WH Location Services	(08) 9256 0100 Fax: (08) 9256 2922
Advance Scanning Services Pty Ltd - Belmont All of Western Australia	(08) 9277 7500 or 0427 755 260 Fax: (08) 9277 7166
Associate Contracting Electrical Pty Ltd Karratha	(08) 9144 4825 or 0417 932 683 Fax: (08) 9144 4845
Australian Underground Survey Solutions Pty Ltd - Narre Warren All Areas	(03) 9700 2311 or 0419 488 883 Fax: (03) 9314 1568
Award Contracting Metro and Country Areas	(08) 9242 2113 Mob 0411 878 895 Fax: (08) 9246 1818
Ballantyne Electrical Pty Ltd - Dunsborough	0439 998 062
Beaulieu Holdings Narrogin, Within 200Km radius	(08) 9881 4734 or 0429 101 810 Fax: 9881 5851
Big Rock Leak Detection, Dunsborough - South West of WA	(08) 9756 7237 or 0427 048 070 Fax: (08) 9756 7237
Brad Scott Electrics, Busselton - South West	0409 933 365 Fax: (08) 9751 4434
Bunbury Telecom Services South West WA.	0407 997 505 Fax: (08) 9745 3954
Busselton Contracting Southern WA District	0427 913 201 Fax: (08) 9754 2369
Busselton Water - Busselton	(08) 9781 0513 Fax (08) 9754 1075
Concrete Radar Imaging Solutions - Ellenbrook Perth and Surrounding Suburbs	0457 002 747 Fax: (08) 6296 7968
Diversified Services Aust. P/L - Bibra Lake	(08) 9494 2000 or 0418 907 889 Fax: (08) 9494 1222
Ertech Pty Ltd - Kalgoorlie Goldfields	0419 190 531 Fax: (08) 9091 2617
Find Wise Location Services - Joondalup	(08) 9561 1865 Fax: 08 9561 1866
Fitzy's Mini Loads and Excavations - Carnarvon Carnarvon, Gascoyne Districts, Coral Bay, Exmouth, Sharkbay Districts, Onslow	0429 939 450 Fax: (08) 9941 2023
Gas It Pipe Contracting - Davenport	(08) 9726 0166 Fax: (08) 9726 0167
Graham Dunlop Trenching	(08) 9622 3596 Mob: 0429 994 180 Fax: (08) 9622 3596
Geographe Underground Services	0417 990 530
Jacksons Utility Location Service - Pakenham	0417 511 114
J&S Castlehow Electrical Services	(08) 9841 4888 Fax: 9841 5252
JWA Locating Service - Mt Helena	0419 935 215 Fax (08) 9295 2003
Katanning Area Telephones Great Southern WA	(08) 9821 1197 or 0419 930 646 Fax (08) 9821 1306
Kellercom P/L Port Pirie Eyre Peninsula, Yorke Peninsular, Far North, Flinders Ranges, Mid North	(08) 8632 5123 or 0428 600 077 Fax: (08) 8633 4792
Leak Search All of Western Australia	(08) 9791 8329 or 0411 731 440 Fax (08) 9791 8306
LivePower- Construction & Plant	(08) 9248 6233 Fax (08) 9248 6277

Lloyds Earthmoving <i>Central Wheatbelt</i>	(08) 9622 7660 Fax (08) 9622 7662
Mid Coast Contracting <i>Cervantes, Jurien Bay, Greenhead Head, Leeman, Lancelin and Dandaragan</i>	(08) 9652 7777 or 0429 330 034 Fax (08) 9652 7777
MJB Nominees - Hannans	(08) 9091 8606 Fax (08) 9022 7504
Morris Electrical Services - Margaret River <i>South West of WA</i>	(08) 9758 7861 or 0429 311 323 Fax (08) 9758 7861
MP Electrolocation Pty Ltd - Mosman Park	0404 046 636
Patriot Tankers - Ormeau <i>Gold Coast, Brisbane, Ipswich, Sunshine Coast</i>	1800 Patriot or 0414 493 904 Fax: (07) 3287 5987
Pipeline Technology Services	(08) 8351 7000 or 0419 878 220 Fax:(08) 8159 7537
Power Down Under Pty Ltd - Mandurah <i>Mandurah, Perth Metro, Country</i>	0418 903 225 Fax (08) 9534 8226
R & L Transport - Carnarvon <i>Gascoyne Area</i>	0407 476 544
Riverina Horizontal Boring Pty Ltd - Wodonga	(02) 6059 1788 or 0419 149 153 Fax: (02) 6059 5090
SM Doyle - Albany	(08) 9842 2811 or 0417 928 179
Somerset Hill (WA) Pty Ltd <i>Denmark, 500Km radius of Denmark</i>	(08) 9840 9036 or 0428 409 036 Fax (08) 9840 9536
Spotters Asset Locations Pty Ltd - Freemantle <i>Perth Metro & Country</i>	0459 130 677 Fax (08) 9433 4400
Streamline Underground Services <i>South West Western Australia</i>	(08) 9752 3025
Subsurface Detection Pty Ltd	(08) 9453 1989 or 0422 232 335 Fax (08) 9453 9957
Tru-Line Excavations & Plumbing Pty Ltd - Geraldton	1800 Truline or 0427 239 949 Fax: (08) 9923 9949
Underground Services Australia - Bayswater	(08) 9272 0126
WA Service Locators - Iluka	0409 105 397 Fax (08) 9304 0668



The Water Corporation has taken due care in the preparation of data comprised on this map but accepts no responsibility for any inaccuracy of facility, cadastral or other information provided nor inappropriate use of this information. The user is reminded that under no circumstances can the information herewith displayed be copied, altered, modified or otherwise published in any form including the Internet without express permission of the Water Corporation. Prior to carrying out any physical activities in proximity to facilities displayed on this map the Water Corporation should be contacted on 13 13 95. Any inaccuracies found with information contained on this map should be advised to Spatial Information Management on T(08) 9420 3496, F(08)9420 3112 or spatial-datacapture@watercorporation.com.au

268548

6822729



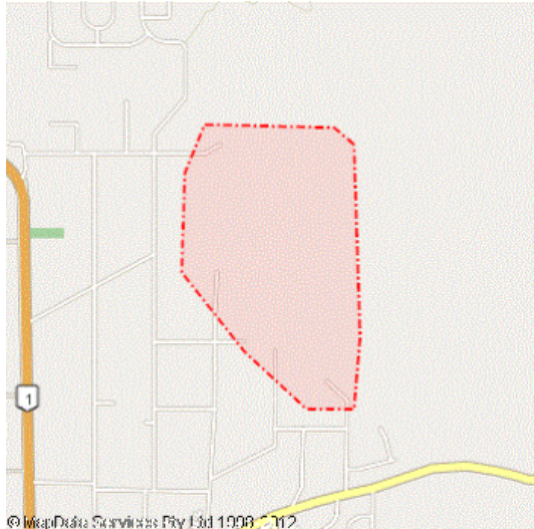
Caller Details

Contact: Ms Debra Taylor
Company: AECOM Australia
Address: PO Box 263
GERALDTON WA 6530

Caller Id: 670362
Mobile: Not Supplied
Email: debra.taylor@aecom.com
Phone: 0899204800
Fax: 0899217265

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Not Supplied
Working on Behalf of: Not Supplied
Enquiry Date: 16/02/2012
Start Date: 27/02/2012
End Date: 05/03/2012
Address: hackett Rd
Waggrakine WA 6530
Job Purpose: Design
Onsite Activity: Planning & Design
Location of Workplace: Both
Location in Road: CarriageWay, Footpath, Nature Strip

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
design purposes

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Potheole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at www.1100.com.au
- For more information on safe excavation practices, visit www.1100.com.au

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
24244287	Western Power	1300769345	Notified.
24244288	Telstra, WA	1800653935	Notified.
24244289	ATCO Gas Australia	131352	Notified.
24244290	Water Corporation WA	0894248115	Notified.

END OF UTILITIES

APPENDIX 8

UXO Clearance (September 2006)

IN REPLY, PLEASE QUOTE
605-05-01

GHD
76 Forrest Street
GERALDTON WA 6530

FESA Unexploded Ordnance Services
Telephone: (08) 9331 7218
Facsimile: (08) 9331 5928
E-mail: aarnold@fesa.wa.gov.au
ABN: 39 563 851 304

Attention: Ms C Miller

Dear Cathee

UNEXPLODED ORDNANCE RECONNAISSANCE OF LOTS 80 & 81 HACKETTS ROAD, WAGGRAKINE - GERALDTON

Further to the Unexploded Ordnance field reconnaissance carried out by FESA UXO Services on the 14th September 2006, on Lots 80 & 81 Hackett's Road, Geraldton.

As witnessed, a limited field investigation with the support of an electro magnetic Metal detector was carried out by myself over several areas of interest within the area of Lots 80 & 81 Hackett's Road. Those sites that I chose for the limited investigations I considered to be the most likely affected areas if the Department of Defence had in fact, fired explosive munitions onto the property during training exercises in WW11. The sites consisted of elevated features that would have represented good targets for artillery or infantry training exercises, however, after conducting the limited investigative searching, no such evidence (fragmentation from exploded munitions, actual artillery projectiles, mortars or other produce) was located to support this theory. Whilst several items of small arms munitions (a spent 410 shot gun cartridge, .22 calibre cartridge case and a .303 calibre projectile) were found, these were not of military origins, but from normal farm culling/shooting activities. Whilst .303 calibre projectiles would normally be associated with infantry training from the WW11 period, many ex service Lee Enfield .303 Rifles and ammunition stocks were released by the Commonwealth and widely used by farmers and other individuals in the post WW11 period, prior to more stringent licensing and gun controls introduced in the 60s and 70s. Had a quantity of these projectiles been found during the limited search, it would be reasonable to assume that infantry units may have conducted small arms training in the area. This may still be the case however, but as this type of munition is not considered UXO (ball ammunition in small arms manufacture does not contain explosives) no further searching will be required.

After careful consideration, I have now come to the conclusion that this particular region of the Red Peak Artillery Range as identified in the WA UXO Register of former Department of Defence Training Areas – WW11 (Site C-303, N126) poses a minimal risk as far as UXO Contamination is concerned. In this regard, no further searching for UXO is recommended prior to the development of this site. It would appear that the training activities as mentioned in the war Diaries from which the details of the Red Peak area were first identified, are that the risk areas lie more to the east of Lots 80 & 81, in the area stretching between Mount Fairfax, Red Peak and Wokatherra/Yetna on the eastern side of the Moresby Flat Topped Range.

Please be advised that this Office will make recommendations to the Department of Planning and Infrastructure (Geraldton Office) to apply a "UXO Advice Note" only to any referral received for the proposed development of Lots 80 & 81 Hackett's Road, Waggrakine, advising that the risk of UXO contamination is considered to be absolute minimal and that no further searching for UXO is necessary, nor required prior to the proposed development of the site. This "Advice note" will then be reflected in the WAPC Reference: Approval Subject to Conditions, and will be worded similar to the following:

The Fire and Emergency Services Authority of Western Australia (FESA) advises that historical research has revealed that during the past 100 years, former elements of the Australian Defence Forces may have conducted training and/or operational activities within or close to the area of the proposed subdivision. It is possible that as a result of these activities, the subject area may contain unexploded ordnance (UXO). Whilst it is considered that the possible risk from UXO on the land subject to this approval is minimal, an absolute guarantee that the area is free from UXO cannot be given. Should, during subdivisional works, or at any other time, a form or suspected form of UXO be located, FESA has advised that the following process should be initiated:

- 1. Do not disturb the site of the known or suspected UXO;*
- 2. Without disturbing the immediate vicinity, clearly mark the site of the UXO;*
- 3. Notify FESA of the circumstances/situation as quickly as possible; and*
- 4. Maintain a presence near the site until advised to the contrary by a member of FESA, the Western Australian Police Service or Defence Forces.*

Further advice on this issue may be obtained by contacting the Unexploded Ordnance Unit, Fire and Emergency Services Authority of Western Australia

Having said that and despite the sample searching conducted, no absolute guarantee can be given by this Office that Lots 80 & 81 are in fact, completely free of UXO. In the unlikely event that you and your Company locate a UXO or suspect UXO during your research site investigations, please follow the above process and let me know ASAP.

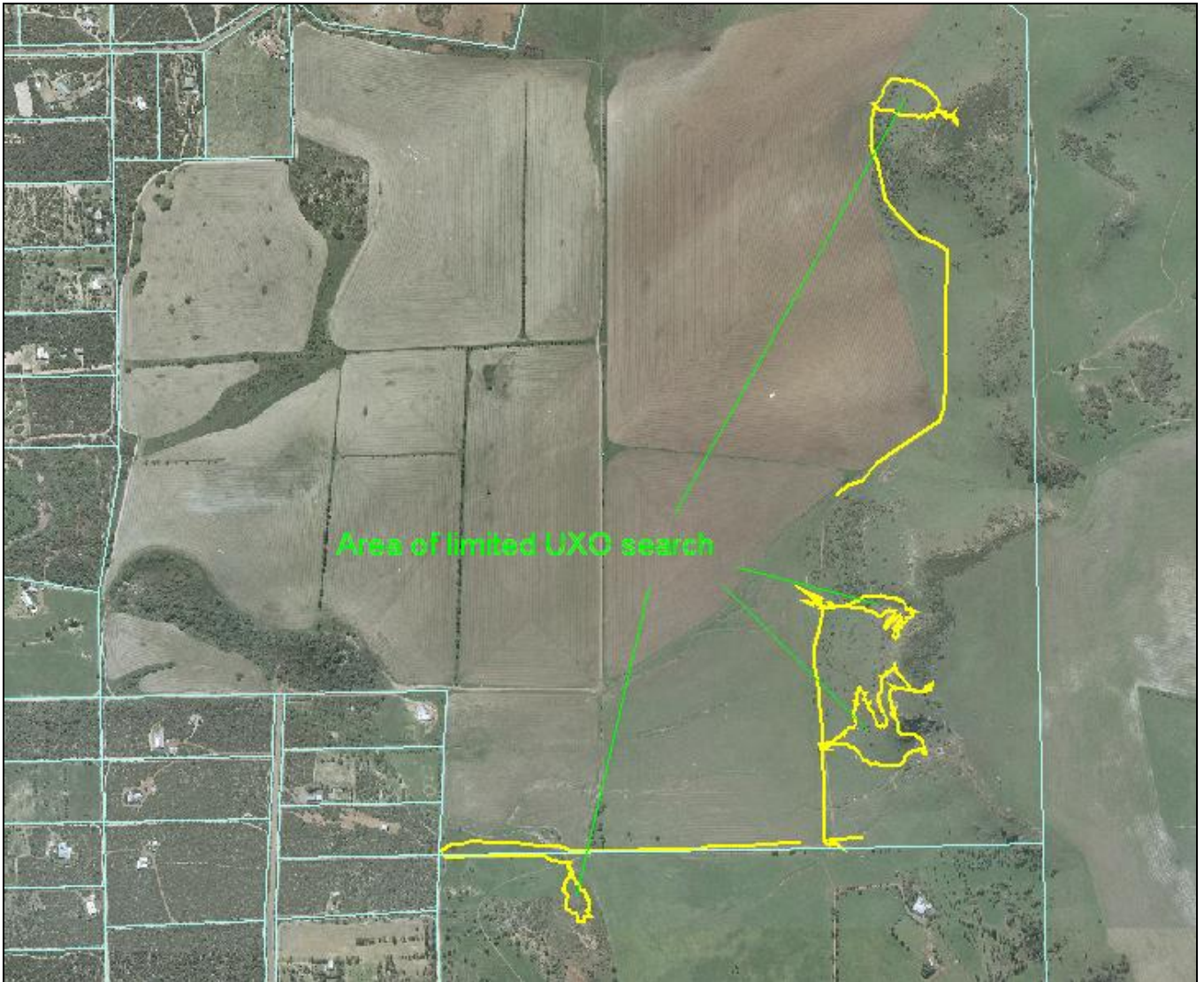
I have included a map on the following page showing the GPS track of most of the vehicle path, and the four search areas investigated for your records.

Again, I thank you for your company whilst on site and look forward to working with you again in the future as I am sure that the occasion will arise where GHD will be involved with other developments within potential UXO sites.

Yours sincerely

Andrew Arnold
FESA UXO LIAISON OFFICER
19 September 2006

**UXO Reconnaissance including limited detector search of several elevated areas
Lots 80 & 81 Hackett's Road, Waggrakine - Geraldton
Conducted by FESA UXO Services on the 14th September 2006**



Items of interest found



View looking south west over Lots 80-81 from top of ridge

Andrew Arnold
FESA UXO Liaison Officer