



# Local Structure Plan

## Castledare

Lot 4 Fern Road and Lots 100 & 102 Castledare Place  
Wilson

## Document Control

<b>Reference</b>	0255
<b>Location</b>	Lot 4 Fern Road and Lots 100 & 102 Castledare Place, Wilson
<b>Client</b>	Richard Noble, on behalf of Trustees of the Christian Brothers in Western Australia Inc.
<b>Document Title</b>	Local Structure Plan
<b>Document File Name</b>	0255 20240201 sf Structure Plan.docx
<b>Document Date</b>	1 February 2024
<b>Document Version</b>	1
<b>Author</b>	Sean Fairfoul



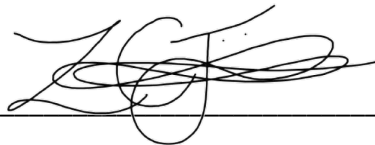
## Endorsement Page

This Structure Plan is prepared under the provisions of the City of Canning Local Planning Scheme No. 42.

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


**27 February 2024**

Signed for and on behalf of the Western Australian Planning Commission



---

An officer of the Commission duly authorised by the Commission pursuant to section 24 of the *Planning and Development Act 2005* for that purpose, in the presence of:

Witness :  

---

Date : 05 April 2024

Date of Expiry: 05 April 2034

## Amendments

Amendment No.	Summary of Amendment	Amendment Type	Date Approved by WAPC

Table 1 – Amendments



## Density Plans

Density Plan No.	Area of Density Plan Application	Date Approved by WAPC

Table 2 – Density Plans





## Executive Summary

This structure plan applies to land generally bound by Fern Road, Castledare Place, Bywater Way, Canning River and Castledare Village, being the land located within the inner edge of the line denoting the structure plan boundary on the Structure Plan Map. This structure plan will guide the development of residential uses and facilities associated with Castledare Miniature Railway.

A summary of all key statistics and planning outcomes of the structure plan is provided in Table 3 below:

Item	Data		Part 2 Reference
Total area covered by the Structure Plan	2.9848		1.2.2
Area of each land use proposed:	Hectares	Lot Yield	
- Residential	1.9073	44	4.3
- Public Open Space	0.1934	2	4.2
- Private Community Purposes	0.0004		
- Road Reserve	0.8841		
Estimated Number of Dwellings	44		4.3
Estimated Residential Site Density	23	Dwellings per site hectare	4.3
Estimated Population	114		4.3
Areas of Public Open Space	0.1934 hectares		
- Local Parks	(6.47% of Structure Plan Area)		
Adjoining Land Associated with SP			
- Regional Open Space	12.4825 ha (419% of subdivisible area)		

Table 3 – Structure Plan Summary

## Contents

Document Control.....	ii
Endorsement Page.....	iii
Amendments.....	iv
Density Plans.....	v
Executive Summary.....	vi
Contents .....	vii
List of Appendices .....	ix
<b>PART ONE - IMPLEMENTATION .....</b>	<b>10</b>
<b>1.0 Structure Plan Area .....</b>	<b>11</b>
<b>2.0 OPERATION .....</b>	<b>11</b>
<b>3.0 SUBDIVISION AND DEVELOPMENT REQUIREMENTS.....</b>	<b>11</b>
3.1 Density.....	11
3.2 Development Standards.....	11
3.3 Public Open Space .....	11
3.4 Site Attributes .....	12
3.4.1 Parks and Recreation Reserve.....	12
3.4.2 Principal Shared Path.....	12
3.4.3 Fencing.....	13
3.4.4 Emergency Access.....	13
<b>4.0 LOCAL DEVELOPMENT PLANS .....</b>	<b>13</b>
<b>5.0 Additional Information .....</b>	<b>14</b>
<b>PART TWO – EXPLANATORY SECTION .....</b>	<b>16</b>
<b>1.0 Planning Background .....</b>	<b>17</b>
1.1 Introduction and Purpose .....	17
1.2 Land Description.....	17
1.2.1 Location .....	17
1.2.2 Area and Land Use .....	17
1.2.3 Legal Description and Ownership .....	21
1.2.4 Proponent.....	21
<b>2.0 Planning Framework .....</b>	<b>22</b>

2.1	Zoning and Reservations .....	22
2.1.1	Metropolitan Region Scheme .....	22
2.1.2	City of Canning Local Planning Scheme No. 42 .....	22
2.2	Planning Strategies .....	25
2.2.1	Directions 2031 (2010) .....	25
2.2.2	Central Sub-Regional Planning Framework (2018) .....	25
2.3	Planning Policies .....	25
2.3.1	State Planning Policy 2.10 – Swan-Canning River System (2006) .....	25
2.3.2	State Planning Policy 3.7 – Planning in Bushfire Prone Areas .....	26
2.3.3	State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning .....	26
2.3.4	City of Canning Local Planning Strategy (2017) .....	26
2.3.5	City of Canning Local Housing Strategy (2014) .....	27
2.3.6	Local Planning Policy 9 – Tree Retention and Planting (2019) .....	27
2.4	Other Approvals and Decisions .....	27
2.5	Pre-Lodgement Consultation .....	28
<b>3.0</b>	<b>Site Conditions and Constrains .....</b>	<b>29</b>
3.1	Biodiversity and Natural Area Assets .....	29
3.1.1	Flora .....	29
3.1.2	Fauna .....	31
3.2	Landform and Soils .....	31
3.2.1	Acid Sulfate Soils .....	31
3.3	Hydrology .....	31
3.3.1	Groundwater .....	31
3.3.2	Surface Water .....	32
3.3.3	Wetlands .....	32
3.4	Noise .....	33
3.5	Bushfire Hazard .....	33
3.6	Heritage .....	34
3.6.1	Castledare Boys Home (Fmr) .....	34
3.6.2	Canning River Regional Park .....	35
3.6.3	Castledare Boys Home (Fmr) – Miniature Golf Course .....	35
3.7	Castledare Miniature Railway .....	35



3.8	Contamination .....	36
<b>4.0</b>	<b>Land Use and Subdivision Requirements .....</b>	<b>37</b>
4.1	Design and Vision .....	37
4.2	Public Open Space .....	39
4.3	Residential .....	39
4.3.1	Dwelling Target and Population .....	39
4.3.2	Density .....	40
4.4	Movement Networks .....	40
4.4.1	Existing Road Network .....	40
4.4.2	Proposed Road Network .....	40
4.4.3	Proposed Emergency Access .....	41
4.4.4	Public Transport Network .....	41
4.4.5	Cycle Networks.....	41
4.5	Water Management.....	42
4.6	Education Facilities.....	42
4.7	Infrastructure Coordination, Servicing and Staging.....	42
4.7.1	Earthworks .....	43
4.7.2	Services.....	43
4.8	Fencing .....	43
<b>5.0</b>	<b>Conclusion.....</b>	<b>44</b>

## List of Appendices

<b>Appendix 1 -</b>	<b>Environmental Assessment and Management Strategy</b>
<b>Appendix 2 -</b>	<b>Local Water Management Strategy + Letter from Hyd2o</b>
<b>Appendix 3 -</b>	<b>Transportation Noise Assessment</b>
<b>Appendix 4 -</b>	<b>Bushfire Management Plan</b>
<b>Appendix 5 -</b>	<b>Long Term Asbestos Management Plan</b>
<b>Appendix 6 -</b>	<b>Public Open Space Schedule</b>
<b>Appendix 7 -</b>	<b>Transport Impact Statement</b>
<b>Appendix 8 -</b>	<b>Infrastructure Servicing Report</b>
<b>Appendix 9 -</b>	<b>Tree Management Strategy</b>
<b>Appendix 10 -</b>	<b>Principal Shared Path Concept</b>

# PART ONE - IMPLEMENTATION

## 1.0 Structure Plan Area

This structure plan applies to:

- Lot 4 on Plan 2461, Volume 2140, Folio 818;
- Lot 100 on Deposited Plan 60726, Volume 2713, Folio 529; and
- Lot 102 on Deposited Plan 60726, Volume 2713, Folio 531,

being the land contained within the inner edge of the line denoting the structure plan boundary on the Structure Plan Map.

## 2.0 OPERATION

The date the structure plan comes into effect is the date the structure plan is approved by the WAPC.

## 3.0 SUBDIVISION AND DEVELOPMENT REQUIREMENTS

### 3.1 Density

Residential densities shall accord with the density code specified on the Structure Plan Map (Plan 1).

### 3.2 Development Standards

Variations to State Planning Policy 7.3: Residential Design Codes Volume 1 are permitted for residential development as follows (refer Table 4):

Table 4: R-Code Variations	
R-Codes Volume 1 Clause	Permitted Variation
5.1.2 Street setback	4m minimum primary street setback
5.1.3 Lot boundary setback	1.2m minimum lot boundary setback for walls not higher than 3.5m with major openings Boundary walls permitted to two side boundaries, for two thirds the length of boundary to one side, and one third the length of the boundary to the second side.
5.1.4 Open space	Minimum of 45% of the site to be provided as open space

Table 4 – R-Code Variations

### 3.3 Public Open Space

Public open space shall be provided generally in accordance with the Structure Plan Map (Plan 1).

The ceding of Parks and Recreation Reserve within Lot 4 Fern Road and Lot 102 Castledare Place, in addition to local Public Open Space as shown on the Structure Plan Map, shall be taken to satisfy the



10% public open space requirement of Liveable Neighbourhoods (2009) and Development Control Policy 2.3: Public Open Space in Residential Areas (2002).

### **3.4 Site Attributes**

Future subdivision and development is to address the site attributes relating to, *inter alia*, the need to provide an appropriate interface treatment to the adjoining Parks and Recreation reservation by providing for bushfire separation, legible access and fencing. In this regard, the associated management recommendations identified within Part 2 of the structure plan and the accompanying technical studies contained within the Appendices apply, where relevant.

#### **3.4.1 Parks and Recreation Reserve**

Subject to the approval of the Western Australian Planning Commission the Parks and Recreation reservation forms part of the Canning River foreshore and is to be transferred "as is" to the WAPC free of cost.

#### **3.4.2 Principal Shared Path**

Subject to the separate approval from the Department of Biodiversity, Conservation and Attractions, as required by the Swan and Canning Rivers Management Regulations 2007, a principal shared path should be located, designed and constructed in accordance with the following objectives:

- Provision of an appropriate interface and connection between structure plan area and foreshore;
- Improvement to the overall connectivity of the foreshore and the wider locality; and
- Provision of universal access along the foreshore.

To manage interface issues with the adjoining Parks and Recreation reservation, including the provision of access to and from the structure plan area, the proponent is to extend the principal shared path along the boundary of the reservation between Fern Road and Bywater Way.

The extension of the principal shared path is to occur prior to the transfer of land to the WAPC and may be dealt with at subdivision stage.

Connections between the principal shared path and the road network generally in accordance with Plan 1 and to the specifications of the City of Canning.

The detailed design and location of the principal shared path is to be generally in accordance with Principal Shared Path Reconstruction Plan and Cross Sections (drawings 2069-01-302 and 2069-01-303, Issue C) and is to be constructed to the specifications of the Department of Biodiversity, Conservation and Attractions and the City of Canning.

### 3.4.3 Fencing

Uniform fencing is to be constructed along the northern boundary of those lots that face Fern Road and the Parks and Recreation Reserve (except the portion containing the Castledare Miniature Railway car park). Unless otherwise agreed with the City of Canning, the fencing is to be of the following specifications:

- Height – 1.6 – 2.0m (above finished level of residential lots);
- Base – 1.2 – 1.6m limestone, brick or similar, with pillars to 2.0m in height above the finished level of the residential lots), evenly spaced; and
- Top – 0.4 – 0.6m semi-permeable panels (or similar) to ensure at least 50% permeability.

Uniform solid fencing to a maximum height of 2.0m may be constructed on the eastern boundary of the residential lot that abut the portion of Parks and Recreation Reserve that contains the Castledare Miniature Railway car park.

### 3.4.4 Emergency Access

A suitable easement is to be provided through the Castledare Miniature Railway car park and connecting to Castledare Place.

## 4.0 LOCAL DEVELOPMENT PLANS

Local development plans may be prepared for lots:

1. that obtain access from a laneway; and/or
2. abutting areas of public open space; and/or

and shall set out the following:

- a. street and boundary setbacks;
- b. dwelling orientation;
- c. fencing;
- d. open space;
- e. garage setbacks and width;
- f. vehicular and pedestrian access;
- g. parking requirements

- h. overshadowing; and
- i. visual privacy.

## 5.0 Additional Information

Table 5: Additional Information		
Additional Information	Approval Stage	Consultation Required
Acid sulfate soils self-assessment form	Condition of subdivision approval	Dept. of Water & Environmental Regulation
Bushfire management plan, as required	Subdivision	WAPC
Urban water management plan	Condition of subdivision approval	City of Canning
Landscape Plan	Condition of subdivision approval	City of Canning
Fauna Relocation Management Plan	Condition of subdivision approval	City of Canning
Detailed Engineering design for all internal access roads including street parking, intersection treatments and pedestrian access.	Condition of subdivision approval	City of Canning

Table 5 – Additional Information





**LEGEND**

- STRUCTURE PLAN AREA
- RESIDENTIAL - R25
- PUBLIC OPEN SPACE
- PARKS AND RECREATION RESERVE
- PRINCIPAL SHARED PATH
- EXISTING BUILDINGS TO BE RETAINED
- EXISTING RAILWAY
- PUBLIC ACCESS EASEMENT

# PART TWO – EXPLANATORY SECTION



## 1.0 Planning Background

### 1.1 Introduction and Purpose

This structure plan has been prepared on behalf of the Trustees of the Christian Brothers in Western Australia Inc., the landowner of Lots 4 & 102, in accordance with the WAPC's Structure Plan Framework (August 2015) and the City Canning Local Planning Scheme No. 42 to guide the development of land at Castledare.

The structure plan was originally prepared by Burgess Design Group with inputs from a multidisciplinary team comprising:

Aurora Environmental	<i>Long Term Asbestos Management Plan (2017)</i>
Emerge Associates	<i>Environmental Assessment and Management Strategy (2021)</i>
	<i>Wetland and Waterway Assessment (2019)</i>
	<i>Bushfire Management Plan</i>
KCTT	<i>Transport Impact Assessment (2021)</i>
Lloyd George	<i>Transportation Noise Assessment (2021)</i>
TABEC	<i>Engineering Servicing Report (2021)</i>
Hyd2o	<i>Local Water Management Strategy</i>

This original draft structure plan has been updated by Lateral Planning. Additional advice is provided by Hyd2o.

### 1.2 Land Description

#### 1.2.1 Location

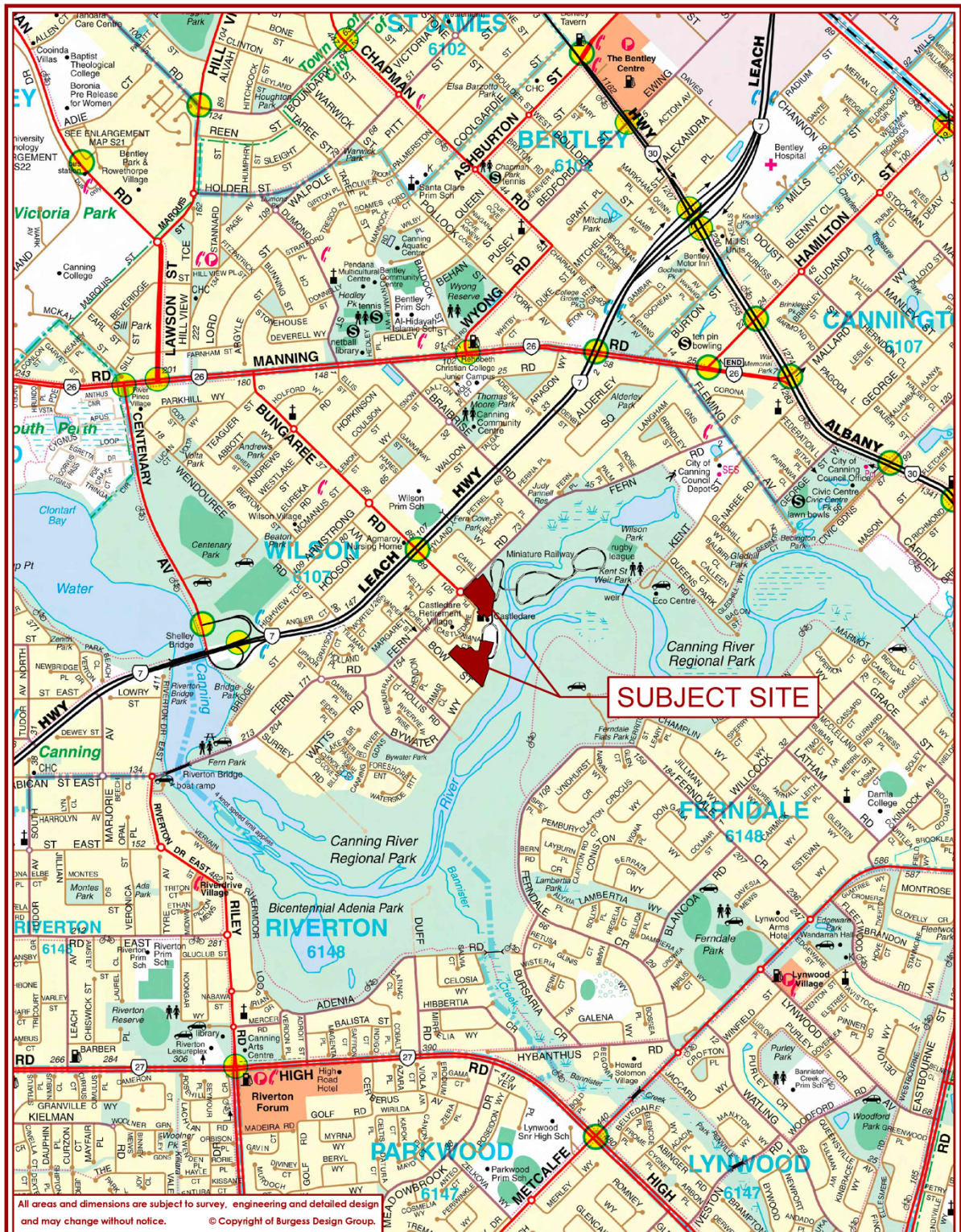
The site is located approximately 2 kilometres west of Westfield Carousel and 9km south of the Perth Central Business District. The site is generally bound by Fern Road, Castledare Place, Bywater Way, Canning River and Castledare Village (refer Figure 1 – Location Plan).

#### 1.2.2 Area and Land Use

The structure plan encompasses 2.9848ha of land. It is important to note that this area has been reviewed and updated to reflect the measured area of the site. This area does not include the overflow car park, or the portions of the principal shared path within the MRS Parks and Recreation Reserve.

The site is generally vacant but a small portion accommodates access to the car parking and other facilities associated with the Castledare Miniature Railway, together with additional parking and access to the Our Lady of Perpetual Help Catholic Church located on Lot 100 (refer Figure 2 – Aerial Photograph). The site contains scattered mature trees, though vegetation is heavily degraded due to historical clearing and the absence of any regrowth of understory.

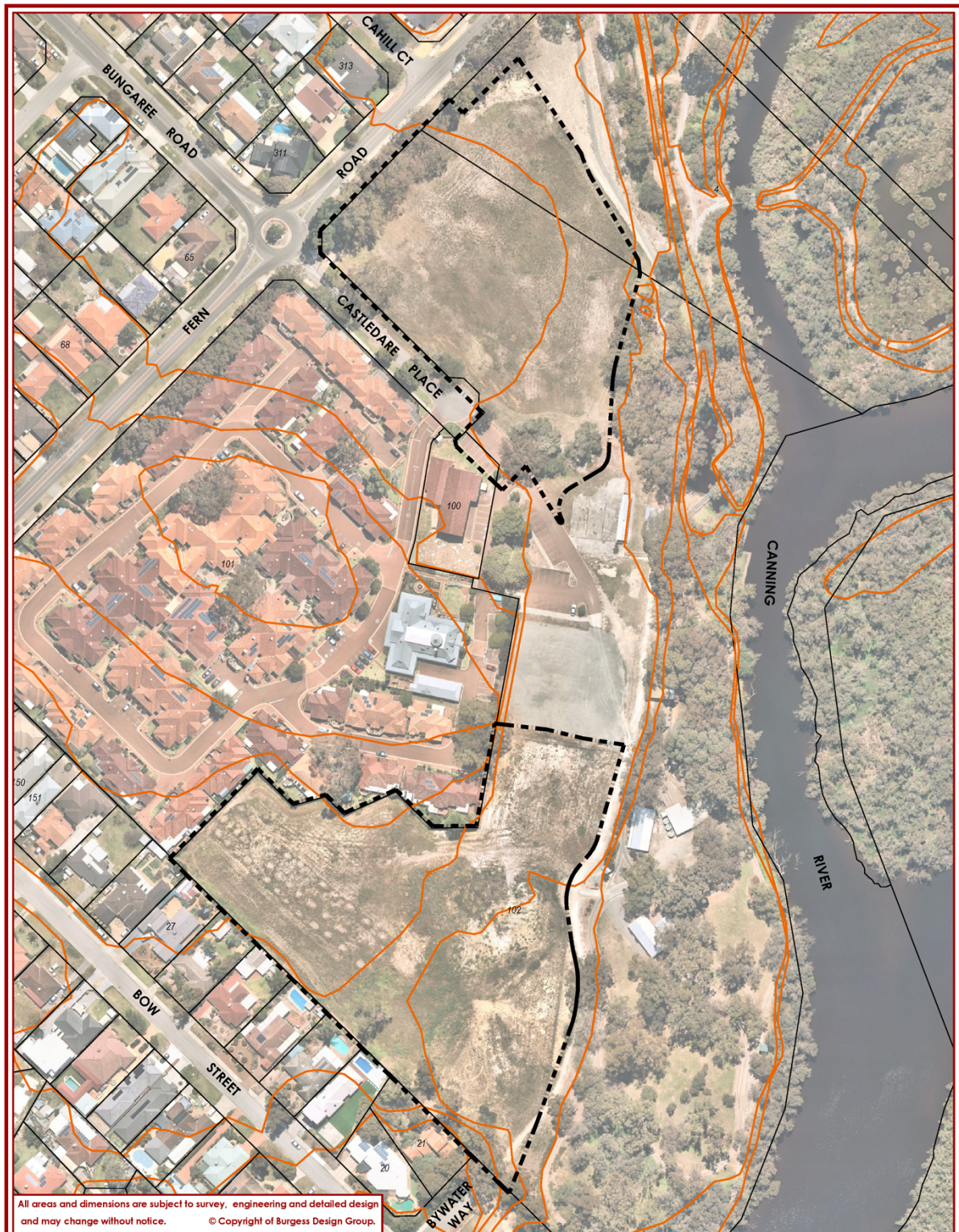




**FIGURE 1: LOCATION PLAN  
CASTLEDARE LOCAL STRUCTURE PLAN  
LOT 4 FERN RD & LOTS 100 & 102  
CASTLEDARE PL, WILSON**

**BURGESS DESIGN GROUP** PO Box 8779, Perth Business Centre 4849 P (08) 9328 4411 Plan No: RNC CAS 07-06-01 Client: RICHARD NOBLE  
TOWN PLANNING • URBAN DESIGN www.burgessdesigngroup.com.au F (08) 9328 4062 Date: 30.03.21 Planner: MS/MB **CITY OF CANNING**





0 200 400 600 800 1000m  
SCALE 1:20,000 (A4)

**FIGURE 2: AERIAL PHOTOGRAPH  
CASTLEDARE LOCAL STRUCTURE PLAN  
LOT 4 FERN RD & LOTS 100 & 102  
CASTLEDARE PL, WILSON**

**BURGESS DESIGN GROUP** PO Box 8779, Perth Business Centre 4849 P (08) 9328 6411 Plan No: RNC CAS 07-06-02 Client: RICHARD NOBLE  
TOWN PLANNING - URBAN DESIGN www.burgessdesigngroup.com.au F (08) 9328 4062 Date: 30.03.21 Planner: MS/MB **CITY OF CANNING**

### 1.2.3 Legal Description and Ownership

The land to which the structure plan applies can legally be described as:

- Lot 4 on Plan 2461, Volume 2140, Folio 818;
- Lot 100 on Deposited Plan 60726, Volume 2713, Folio 529; and
- Lot 102 on Deposited Plan 60726, Volume 2713, Folio 531.

### 1.2.4 Proponent

This structure plan has been prepared by Burgess Design Group on behalf of the Trustees for the Christian Brothers in Western Australia Inc., the landowner of Lots 4 & 102, and the appointed project managers, Richard Noble.

The landowner of Lot 100, The Roman Catholic Archbishop of Perth, has also been consulted during the preparation of this structure plan.

## 2.0 Planning Framework

### 2.1 Zoning and Reservations

#### 2.1.1 Metropolitan Region Scheme

Part of the site is zoned 'Urban' under the *Metropolitan Region Scheme* (MRS) and the balance is reserved for 'Parks and Recreation' (refer Figure 3 – MRS Map).

#### 2.1.2 City of Canning Local Planning Scheme No. 42

The City of Canning *Local Planning Scheme No. 42* currently designates the following over the site:

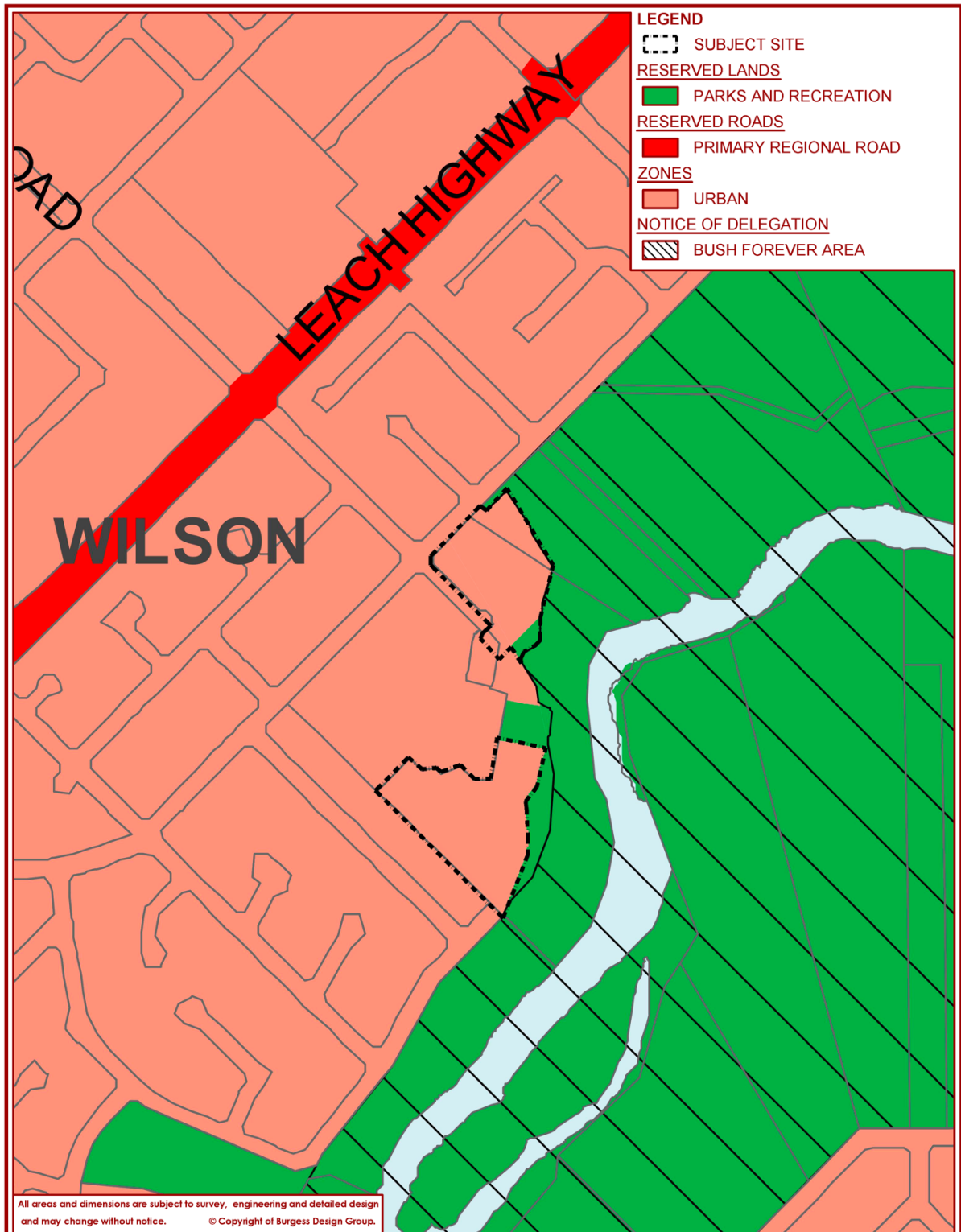
- Urban Development Zone;
- Private Community Purposes Zone; and
- MRS Parks and Recreation Reserve.

(Refer Figure 4 – LPS42 Map).

A Development Zone is required to give power to a structure plan under the Scheme. As such, this structure plan has been prepared in parallel to a scheme amendment that seeks to rezone the areas of Private Community Purposes Zone to the Urban Development Zone. This will facilitate the implementation of the structure plan.

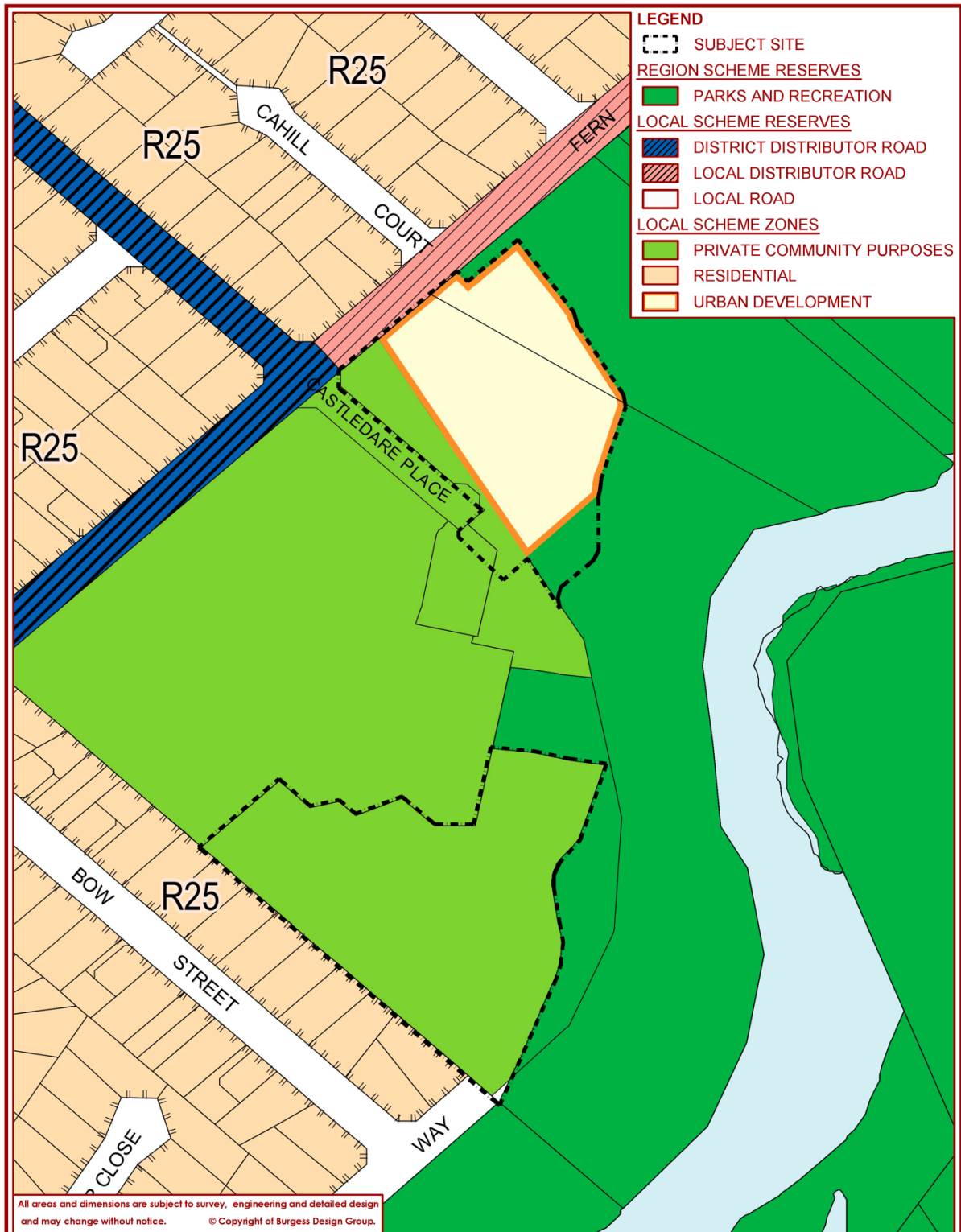
The area of MRS Parks and Recreation Reserve will not change, and this structure plan intends to act only as a guide for development within the Reserve.





**FIGURE 4: LOCAL PLANNING SCHEME NO. 42 MAP  
CASTLEDARE LOCAL STRUCTURE PLAN  
LOT 4 FERN RD & LOTS 100 & 102  
CASTLEDARE PL, WILSON**





**FIGURE 4: LOCAL PLANNING SCHEME NO. 42 MAP  
CASTLEDARE LOCAL STRUCTURE PLAN  
LOT 4 FERN RD & LOTS 100 & 102  
CASTLEDARE PL, WILSON**



**BURGESS DESIGN GROUP**  
TOWN PLANNING • URBAN DESIGN

PO Box 8779, Perth Business Centre 4849  
www.burgessdesigngroup.com.au

P (08) 9328 6411  
F (08) 9328 4062

Plan No: RNC CAS 07-06-04  
Date: 30.03.21

Client: RICHARD NOBLE  
Planner: MS/MB

**CITY OF CANNING**

## 2.2 Planning Strategies

### 2.2.1 Directions 2031 (2010)

*Directions 2031 (2010)* establishes the vision for future growth of the Perth Metropolitan and Peel regions. It envisages 'a world class liveable city; green, vibrant, more compact and accessible with a unique sense of place'.

The structure plan satisfies the objectives of *Directions 2031* in the following ways:

- The structure plan facilitates infill urban development that is efficient in its design and use of resources;
- The structure plan satisfies the density target of 15 dwellings per gross urban zoned hectare; and
- The development will help to support the ongoing sustainability and development of community services, amenities and infrastructure.

### 2.2.2 Central Sub-Regional Planning Framework (2018)

The *Central Sub-Regional Planning Framework (2018)* sets out an integrated planning framework for land use and infrastructure in the sub-region.

The structure plan complies with the key objectives of the framework, as follows:

- The structure plan responds directly to the ecological and social values of the site through comprehensive planning that will provide increased opportunities for recreation and landscape retention for the local community;
- The structure plan facilitates infill development that provides additional housing opportunities in the area and contributes to the efficient use of existing infrastructure and services; and
- The proposed development is of a scale and form that is consistent with surrounding residential character.

## 2.3 Planning Policies

### 2.3.1 State Planning Policy 2.10 – Swan-Canning River System (2006)

*State Planning Policy 2.10: Swan-Canning River System (2006)* aims to protect and enhance the social and environmental values of the river system.

The structure plan is consistent with the key objectives, as follows:

- Views from public places are protected by preserving view corridors from public roads and the Parks and Recreation Reserve;

- Development is of a type and scale that is consistent with the established character of the area;
- Existing trees have been retained wherever possible to ensure the landscape character is maintained;
- Places of cultural/heritage significance and how they relate to the river system are to be retained, including views from and to Castledare Boys Home (Heritage Description) and associated Miniature Golf Course;
- Opportunities for recreation will be enhanced, with over 12ha of adjoining land to be ceded to the Crown as a Parks and Recreation Reserve.

### **2.3.2 State Planning Policy 3.7 – Planning in Bushfire Prone Areas**

*State Planning Policy 3.7: Planning in Bushfire Prone Areas (2015)* aims to preserve life and reduce the impact of bushfire on property and infrastructure.

Portions of the site and its surrounds are located within a designated bushfire prone area. As such, a Bushfire Management Plan has been prepared to address the objectives of the policy, as set out in Section 3.5 of this report.

### **2.3.3 State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning**

*State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning (2019)* addresses noise from major transport corridors and its impact on nearby noise sensitive land uses.

Leach Highway is classified as a ‘major road’ under the policy. As such, a Transportation Noise Assessment has been undertaken to address the objectives of the policy, as set out in Section 3.4 of this report.

### **2.3.4 City of Canning Local Planning Strategy (2017)**

The *City of Canning Local Planning Strategy (2017)* is the key strategic urban planning document for the City.

The structure plan is consistent with the directions set out therein, as follows:

- The structure plan will facilitate infill subdivision within a comprehensive planning framework that will ensure a cohesive outcome;
- The ultimate development outcome will deliver improved recreational opportunities for the local community by facilitating the ceding of over 12ha of privately owned land, free of cost, as Parks and Recreation Reserve;
- Heritage and landscape values will be protected and enhanced by identifying and managing opportunities for sustainable retention into the future.

### 2.3.5 City of Canning Local Housing Strategy (2014)

The *City of Canning Local Housing Strategy (2014)* identified opportunities for improving the provision, growth, affordability, sustainability and design of housing.

The structure plan is consistent with the key principles as follows:

- The site is proximate to a number of key sites (refer Table 6 below);
- The site has good access to public transport services, including high frequency bus services on Leach Highway;
- Development will have excellent access to recreational opportunities and high- quality landscape value of the Canning River.

	Distance	Travel Time (minutes)			
		Drive	Bus	Bicycle	Walk
Curtin University	2.3km	6	20-25	13	33
Wilson Primary School	400m	-	-	2	7
Cannington Strategic Metropolitan Centre	2km	5	12-25	9	32

Table 6 – Local Attractions

### 2.3.6 Local Planning Policy 9 – Tree Retention and Planting (2019)

*Local Planning Policy 9: Tree Retention and Planting (2019)* facilitates tree retention to deliver healthy, vibrant and ecologically sustainable communities.

The structure plan is consistent with the objectives insofar that the design seeks to retain trees wherever it is practical to do so, with road design, the alignment of the dual-use path network and indicative lot layout all shaped by this commitment.

## 2.4 Other Approvals and Decisions

Parts of the site were rezoned under Metropolitan Region Scheme Amendment 1365/57. This Amendment effectively rationalised the boundary of the Parks and Recreation Reserve and Urban Zone to correspond with land capability and environmental values (including accommodating buffers to adjoining wetlands and suitable foreshore areas within the Parks and Recreation Reserve).

This structure plan has been prepared to implement urban uses as contemplated under Amendment 1365/57.

## 2.5 Pre-Lodgement Consultation

Agency	Date	Method	Outcome
Landowners	27/03/20 – 05/06/20	Advertising of MRS Amendment 1365/57	Key community concerns identified, including: traffic concerns; concerns about protecting suburban character; desire to preserve landscape character (trees) and protect the natural environment; desire to protect heritage features
Castledare Miniature Railway	Various	Various	Support given intent of the proposal; special design consideration given to access and interface for maintenance and operational purposes.
Wilson Wetlands Action Group	8 March 2021	Meeting	Advice provided by Richard Noble about the intent of the proposal; comments regarding importance of the natural environment to the community noted and considered in the design.
Local Government	Various	Various	Discussed intent of the proposal to facilitate ceding of P&R Reserve through urban development on vacant land; outlined goal to retain all healthy trees and miniature golf course; minor detailed design matters identified for consideration at later stages
Dept. of Planning, Lands and Heritage	Various	Meetings, MRS Amendment Process	In principle agreement reached as to intent to develop urban uses to facilitate ceding of P&R Reserve; MRS Amendment approved to facilitate development
Dept. of Water & Environmental Regulation	Various	MRS Amendment referral	District Water Management Strategy approved; draft Local Water Management Strategy provided for comment.
Dept. of Health & Dept. of Water & Environmental Regulation (Contamination)	Various	Various	Contamination remediation undertaken and status updated; <i>Long Term Asbestos Management Plan (2017)</i> approved

Table 7 – Consultation



### 3.0 Site Conditions and Constrains

The following technical studies and assessments have been undertaken to support the structure plan:

Aurora Environmental	<i>Long Term Asbestos Management Plan (2017)</i>
Emerge Associates	<i>Bushfire Management Plan (2021)</i>
	<i>Environmental Assessment and Management Strategy (2021)</i>
KCTT	<i>Transport Impact Assessment (2021)</i>
Lloyd George	<i>Transportation Noise Assessment (2021)</i>
TABEC	<i>Engineering Servicing Report (2021)</i>

The main findings of these reports are summarised below. A Context and Constraints Plan (refer Figure 5) has been prepared to illustrate the main issues discussed herein.

*It is important to distinguish the site from the adjoining Parks and Recreation Reserve, particularly in the context of environmental values. To that end, the boundary of the Parks and Recreation Reserve was rationalised through Metropolitan Region Scheme Amendment 1365/57 to ensure it accommodates areas of environmental significance and necessary buffers. The commentary provided herein relates to Urban zoned land, being the Structure Plan Area or 'site', unless otherwise noted.*

#### 3.1 Biodiversity and Natural Area Assets

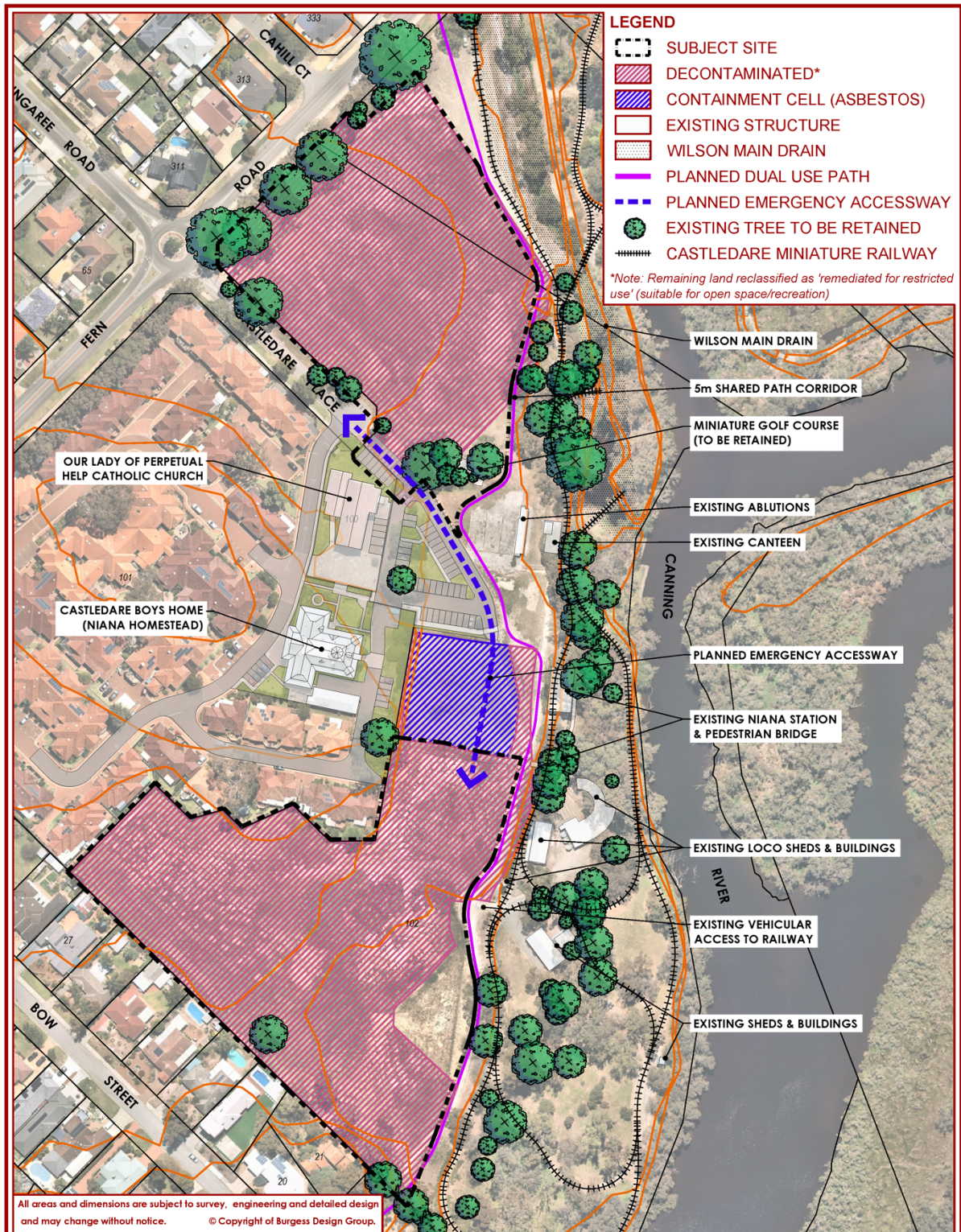
The *Environmental Assessment and Management Strategy (Emerge 2021)* found the site has been historically cleared, with remaining vegetation in completely degraded' condition and generally limited to isolated native and non-native mature trees (refer Appendix 1). The site does not contain significant environmental values, and is not considered to contribute to or provide any significant ecological linkage functionality.

Though the site contains limited environmental values, considerable effort has been made in the design of roads and designation of public open space to enable the retention of existing mature trees wherever practicable.

##### 3.1.1 Flora

Regional vegetation complex mapping shows 'Bassendean Complex – Central and South' and 'Swan Complex' occurring within the site. Due to historical clearing and the resulting absence of remnant vegetation, the site does not contain vegetation representative of either of these complexes.





**FIGURE 5: OPPORTUNITIES & CONSTRAINTS  
CASTLEDARE LOCAL STRUCTURE PLAN  
LOT 4 FERN RD & LOTS 100 & 102  
CASTLEDARE PL, WILSON**



0 200 400 600 800 1000m  
SCALE 1:20,000 (A4)

**BURGESS**  
TOWN PLANNING • URBAN DESIGN

DESIGN GROUP  
PO Box 8779, Perth Business Centre 4849  
www.burgessdesigngroup.com.au

P (08) 9328 6411  
F (08) 9328 4062

Plan No: RNC CAS 07-06-05 Client: RICHARD NOBLE  
Date: 30.03.21 Planner: MS/MB

**CITY OF CANNING**



Site specific investigations identified no native plant communities within the site. Approximately 0.17ha of non-native parkland cleared vegetation was identified in 'completely degraded' condition, with all remaining land described as 'cleared'.

No Threatened Ecological Communities, Priority Ecological Communities, or other State and Commonwealth listed species of conservation significance have been identified within the site and none are considered likely to occur due to the lack of native species and the absence of suitable habitat.

### **3.1.2 Fauna**

There is a low likelihood the site would provide important habitat for any fauna species, including species of conservation significance, because vegetation comprises limited stands of non-native vegetation that support low fauna habitat values.

The adjacent Canning River foreshore area provides more intact habitats for fauna to utilise. Notably, the development of the site will facilitate the ceding of over 12ha of Parks and Recreation Reserve along the Canning River, securing a contiguous, publicly owned foreshore reserve.

## **3.2 Landform and Soils**

The site has a south-easterly aspect, falling from approximately 5m Australian Height Datum in the west, to 2m to the east, along the Canning River.

Site specific geotechnical investigations identified sand fill with some construction rubble present to depths of up to 1.8m, underlain by loose medium-grained sand, and alluvial loams/clays closer to the Canning River.

### **3.2.1 Acid Sulfate Soils**

Regional mapping indicates that the site is classified as having a 'moderate to low' risk of Acid Sulfate Soils occurring within 3m of the natural soil surface.

Given the limited depth to groundwater and likely extent of excavation within the site to support the installation of services, and in particular sewer, soil investigations and management considerations are likely to be required as a condition of subdivision.

## **3.3 Hydrology**

### **3.3.1 Groundwater**

Groundwater beneath the site is a multi-layered system comprising:

- Perth-Superficial Swan aquifer;
- Perth-Leederville (confined) aquifer; and
- Perth-Yarragadee North (confined) aquifer.

Groundwater monitoring undertaken to inform the *Local Water Management Strategy (Hyd2o 2021)* (Appendix 2) found that the depth to groundwater varies from 0.7m to 2m below natural ground level.

Fill will be required to provide adequate separation to groundwater. It is not envisaged that subsoil drainage will be required. Detailed design and engineering is to be undertaken in accordance with a future Urban Water Management Plan to be prepared as a condition of subdivision approval.

### **3.3.2 Surface Water**

No surface water features occur within the site.

Surface water features in proximity of the site include:

- The Canning River, approximately 40m east of the site

Department of Water and Environmental Regulation modelling indicates the floodway and flood fringe of the Canning River does not extend into the site. All residential lots will have suitable clearance above the 100-year flood levels.

The Canning River and adjoining Reserve fall within the Swan Canning River Development Control Area under the *Swan and Canning Rivers Management Act 2006*. Development applications within or adjacent to the Development Control Area will be referred to the Department of Biodiversity, Conservation and Attractions for comment, and development should be consistent with its policies.

- The Wilson Main Drain, a constructed, open stormwater drain that discharges into the Canning River, located approximately 20m north east of the site.
- Geomorphic wetlands associated with the Canning River to the east of the site (see Section 3.3.3).

### **3.3.3 Wetlands**

A *Wetland and Waterway Assessment (Emerge 2019)* found the site does not contain any prominent natural wetland landform features or areas supporting intact native wetland vegetation (refer Appendix 1).

Adjacent wetlands and the Canning River foreshore are contained within the Parks and Recreation Reserve boundary as determined through Metropolitan Region Scheme Amendment 1365/57. The 100-year floodway, native riparian vegetation and suitable buffers thereto, together with public infrastructure (such as roads, the Castledare Miniature Railway and planned dual use path) and site-specific biophysical values were used as a basis for determining that boundary.

This approach was supported by the Department of Biodiversity Conservation and Attractions and the Department of Planning, Lands and Heritage. As such, the site is not impacted by any wetlands, associated buffers, or foreshore areas as they are wholly contained within the adjacent Reserve.

### 3.4 Noise

A *Transportation Noise Assessment (Lloyd George 2021)* has been prepared in accordance with the requirements of State Planning Policy 5.4: *Road and Rail Transport Noise and Freight Considerations in Land Use Planning (2019)* to assess noise levels in the vicinity of Leach Highway (refer Appendix 3).

The *Transportation Noise Assessment* found that noise levels are below the Outdoor Noise Target, and therefore, no mitigation measures are required.

### 3.5 Bushfire Hazard

Portions of the site are within a designated 'bushfire prone area'. As such, a *Bushfire Management Plan (Emerge April 2023)* has been prepared to satisfy the requirements of State Planning Policy 3.7: *Planning in Bushfire Prone Areas (2015)* (refer Appendix 4).

The *Bushfire Management Plan* demonstrates that the structure plan responds to the bushfire protection criteria in the following ways:

Bushfire Protection Criteria	Proposed Bushfire Management Strategy
Element 1 – Location	Future development will be located in an area subject to low or moderate bushfire risk, and outside of areas classified as BAL-40 or BAL-FZ. This will be achieved principally through the management of vegetation within the site in a low-risk state. It has been assumed that all vegetation surrounding the site will remain unchanged, including the continued management of areas currently managed by the Castledare Miniature Railway group, and thus development at the periphery of the site may need to respond through appropriate urban design and the application of higher building standards, as necessary.
Element 2 – Siting and Design	The structure plan, through the strategic location of public roads, public open space and the use of setbacks, provides suitable separation to enable a BAL rating of BAL-29 or lower for future development across the site.
Element 3 – Vehicular Access	The structure plan depicts a movement network that will facilitate two points of access, including the provision of an emergency accessway linking the northern and southern cells to provide an alternate means of escape in an emergency situation.
Element 4 – Water	Development will be serviced by a reticulated water supply, including fire hydrants installed by the developer to Water Corporation and Department of Fire and Emergency Services standards (generally being within 200m of any dwellings).

Table 8 – Bushfire Strategy Summary

An updated bushfire management plan will be required to support an application for subdivision approval. In the interim, all landowners are required to comply with the requirements of the annual firebreak notice to maintain fuel loads at appropriate levels.

Updates to the BMP have been undertaken, including the associated evolution of the foreshore considerations for the miniature railway and ensuring alignment with the foreshore management plan the railway have been implementing (which were not included at the time of preparing the previous BMP).

It is important to note that Figure 4 and Figure 5 show different information, and therefore will not look the same. Figure 4 shows the post-development vegetation classifications and exclusions, while Figure 5 shows the effective slope applicable to classified vegetation. Effective slope does not apply to excluded vegetation. This is why Plot 7 (which is for excluded vegetation) is not shown/has no colour applied in Figure 5. No change to the BMP is proposed to reflect these previous comments.

It is also important to note that the Plot 7 has been assessed as being 'low threat'. The nearest residential lot to any likely replanting within the rail loops is in excess of 27 metres, which is consistent with BAL-19 where a downslope of 0 – 5 degrees. These lots are already within the BAL-19 zone, as such should revegetation occur within the centre of the rail loops there is unlikely to be any further BAL rating impacts.

## **3.6 Heritage**

### **3.6.1 Castledare Boys Home (Fmr)**

Castledare Boys Home is on the State Heritage Office Register of Heritage Places (Place 04579) and is identified as 'management category 1 – exceptional significance' in the City of Canning Municipal Heritage Inventory, meaning that it is 'essential to the heritage of the locality' and that it should be 'retained and conserved in consultation with the Heritage Council of Western Australia'.

The Register Entry Assessment Documentation notes the significance of Castledare as being technically and socially innovative at a time of great public debate about the proper treatment of people who were intellectually handicapped and mentally ill. The Documentation also notes the architectural style of the homestead is uncommon in the City of Canning and has important associations with local identities and the development of Catholic education in Western Australia.

Castledare Boys Home falls outside of the site area, and its heritage value is not impacted by the Structure Plan. Importantly, vistas to the Canning River foreshore and adjacent Lady of Perpetual Help Catholic Church are retained; ensuring the context of the Place in its surrounds is preserved.

### **3.6.2 Canning River Regional Park**

The Canning River Regional Park (Place 26082) is identified as 'management category 1 – exceptional significance' in the City of Canning Heritage List, meaning that it is 'essential to the heritage of the locality' and that it should be 'retained and conserved in consultation with the Heritage Council of Western Australia'.

The Canning River Regional Park is located adjacent to the site, corresponding to the boundary of the Parks and Recreation Reserve. This Structure Plan does not propose to make any changes to the Reserve, and thus is not expected to have any negative impacts on the heritage values of the Place. It should be noted that this Structure Plan will facilitate the ceding of 12.5ha of Parks and Recreation Reserve to the Crown, free of cost, thereby securing public ownership of this portion of the Place.

### **3.6.3 Castledare Boys Home (Fmr) – Miniature Golf Course**

The Castledare Mini Golf Course (Place 17701) is identified as 'Management Category 4 – Limited Significance' in the City of Canning Municipal Heritage Inventory. The management objective of this classification is to photographically record the Place prior to major development or demolition.

Though not afforded statutory protection, the Structure Plan Map identifies the Mini Golf Course and surrounding trees for possible retention within a parcel of public open space. The Landscape Plan will determine the final configuration and finish of the open space and will determine whether the course will be restored or otherwise.

## **3.7 Castledare Miniature Railway**

The site abuts a portion of the Castledare Miniature Railway, including Niana Station, carriage and engine sheds, and other associated facilities and infrastructure.

A history compiled and published by Castledare Miniature Railway (Inc) indicates the Railway dates back to 1963, when the first train ran along a small line constructed for the Castledare Boys' Home Annual Field Day. The Railway and its grounds continue to be maintained by volunteers.

Castledare Miniature Railway (Inc) has provided its support for the proposal to cede the land on which it sits to the Crown as Parks and Recreation Reserve. This arrangement will allow the Railway to formalise its tenure on public land so that it can seek grant funding, which will help to ensure its financial sustainability into the future.

As noted above, the Castledare Miniature Railway and the associated car park are located within the Parks and Recreation Reserve and are therefore outside the boundaries of the Structure Plan area. The car park does form part of the emergency access for the bushfire management plan, with that access being secured by an easement.

### 3.8 Contamination

Extensive remediation works were completed between 2016 and 2017 to address asbestos contamination resulting from uncontrolled fill practices during the 1970's. Numerous site investigations have been undertaken, including:

- Preliminary Contamination Assessment (Golder Associates 1999);
- Preliminary Contamination Investigation at Castledare (ATA 2001);
- Preliminary Site Investigation Castledare Miniature Railway (Coffey Environments 2013)
- Immediate Human Health Risk Assessment and Environmental Site Assessment Report (Coffey Environments 2014)
- Preliminary and Detailed Site Investigation Castledare Miniature Railway (Coffey Environments 2015);
- Remediation Action Plan (Aurora Environmental 2015);
- Asbestos Investigation, Western Embankment of Stormwater Drain, Lot 4 Fern Road (Aurora Environmental 2016);
- Asbestos in Soil Investigation Report (Aurora Environmental 2016);
- Summary of Soil and Groundwater Investigations (Aurora Environmental 2017); and
- Long Term Asbestos Management Plan (Aurora Environmental 2017).

Contaminated fill material within the urban areas was removed and the underlying natural surface was validated as being 'decontaminated' in accordance with the *Contaminated Sites Act 2003*, ensuring its suitability for residential uses. The excavated fill was enclosed in a purposely constructed containment cell that forms part of a car park for the Castledare Miniature Railway.

The containment cell and contaminated areas within parkland and adjacent to the site within the Parks and Recreation Reserve were remediated using a 'cap and contain' strategy to achieve a 'remediated for restricted use' classification under the *Contaminated Sites Act 2003*. For practical purposes, these areas have been sufficiently remediated to facilitate their safe, ongoing use as parkland.

The approved *Long Term Asbestos Management Plan (Aurora Environmental 2017)* (Appendix 5) sets out requirements, roles and responsibilities to ensure proper management of contamination into the future.

## 4.0 Land Use and Subdivision Requirements

### 4.1 Design and Vision

The Structure Plan guides the development of two residential cells, one off Castledare Place in the north and the other off Bywater Way to the south. A Concept Plan has been prepared to illustrate a potential development outcome for the site (Figure 6)

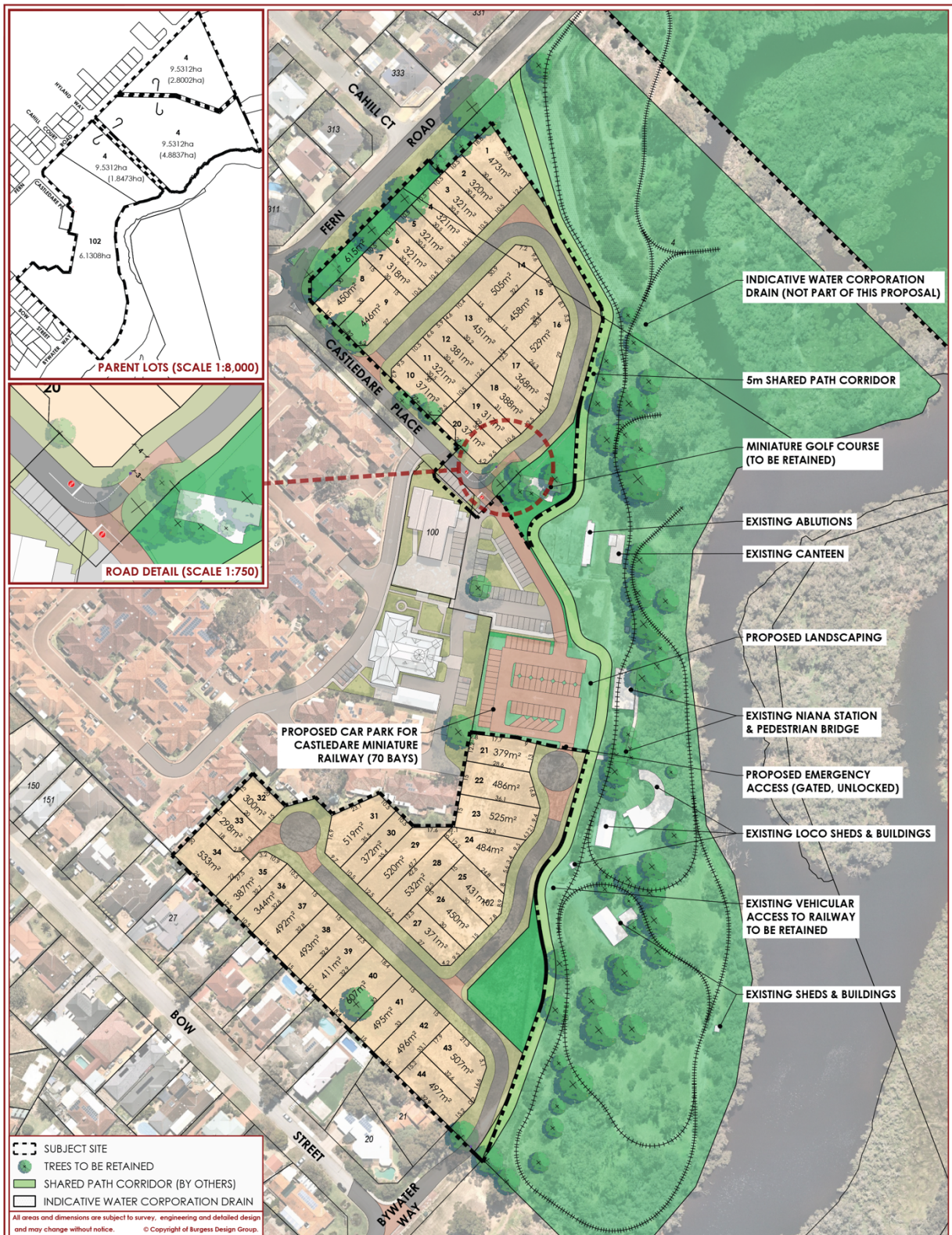
Despite falling on privately held, vacant land, the site carries strong associations for the local community with the historic Castledare Boys Home and Canning River Regional Park, as well as through its informal use for recreational purposes. Similarly, existing vegetation on the site has no significant environmental value, but is nonetheless important to the landscape character of the area.

The design of the Structure Plan will enhance the social value of the site and protect the environmental values of the adjoining foreshore area and wetlands. This will be achieved by:

- Maintaining sight lines from approaching streets to the Canning River, thereby preserving associations of local character with the River for residents and visitors, including views from Bungaree Road, that acts as an important entry to the area;
- Retaining mature trees along Fern Road to preserve the green, leafy vista that acts as a gateway to Castledare and visually extends adjacent parkland to adjoining residential areas;
- Conserving the Castledare Boys Home Miniature Golf Course, which despite being afforded no statutory protection, will help to enhance the heritage value by telling a story of Castledare's past role in education and care for the disadvantaged, and encouraging its ongoing use to improve engagement;
- Providing a formalised interface to the adjoining Parks and Recreation Reserve that responds to environmental values, comprising principally of public roads and a planned dual use path that will act as an edge to the Castledare Miniature Railway and significant wetland areas to the north-east;
- Preserving as many mature trees as practically possible within the site, with current urban design and engineering concepts indicating all existing trees in healthy condition can be retained.

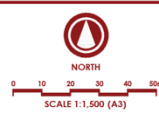
Importantly, the Structure Plan will also facilitate the ceding of over 12ha of privately held land to the Crown, free of cost, as Parks and Recreation Reserve. This will formalise public access and ownership of the Reserve. This will also allow the Castledare Miniature Railway group to formalise its tenure and management arrangements of the land it occupies, and will allow it to seek grant funding to secure its financial viability into the future.





**FIGURE 6: CONCEPT PLAN**  
**LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE**  
**WILSON**  
**CITY OF CANNING**

Plan No: RNC CAS 02-02-01 Client: RICHARD NOBLE  
Date: 14.04.21 Planner: MS/MB





## 4.2 Public Open Space

The structure plan proposes two parcels of public open space; encompassing 1,934m<sup>2</sup> of land and representing a 6.47% net POS contribution (refer Appendix 6).

In addition, 12.4825ha of Parks and Recreation Reserve is proposed to be ceded, free of cost, to the Crown. (Ordinarily, such land would need to be acquired at considerable cost through the Metropolitan Region Improvement Fund). This represents 419% of the subdivisible area, for combined total of 425.12% net open space contribution.

In accordance with clause 3.3.2 of Development Control Policy 2.3: Public Open Space in Residential Areas (2002), the combined area of local open space and Parks and Recreation Reserve is considered to more than satisfy the 10% public open space requirement. This includes the suitable local and regional recreational and amenity functions the reserve will play, together with the relatively vast extent of land being ceded, comprising 425.47% of the subdivisible area.

While both public open space areas will include a drainage disposal elements, both areas will be usable for use for the majority of the year.

With respect to the northern open space area, this area currently includes a number of trees and the miniature golf course. It is planned to retain the existing vegetation. An assessment of the miniature golf course will be undertaken as part of the preparation of the landscape plan. The final design will be in accordance with this landscape plan, which should be a condition of subdivision approval.

The applicant also intends to construct a principal shared path between Fern Road and Bywater Way, primarily within the Parks and Recreation Reserve. The path will connect to the existing path. Portions of the path will be located within the road reserves so that it is located approximately 300mm from the back of the kerb line. The path will generally be constructed to match the finished levels of the residential development, specifically the finished road and associated kerb levels. A suitable batter will be provided between the path and the remainder of the Parks and Recreation Reserve. Construction will occur prior to the finalisation of the overall subdivision of the Structure Plan area.

It is important to note that the Swan and Canning Rivers Management Regulations 2007 requires that a separate permit is required. The applicant will seek approval from DBCA prior to works commencing.

## 4.3 Residential

### 4.3.1 Dwelling Target and Population

The structure plan area is expected to yield approximately 44 dwellings across a total of 1.9073ha of residential land. This provides a density of 23 dwellings per site hectare. This

satisfies the minimum density target of 22 dwellings per site hectare set out in *Liveable Neighbourhoods 2009*.

An average of 2.6 persons per household (Wilson in the 2016 Census) would provide for a total population of approximately 114 people in the structure plan area.

### 4.3.2 Density

The structure plan prescribes an R25 density code for residential uses.

The proposed density code is consistent with surrounding development and is thus expected to provide for development of a type and scale that is in keeping with the existing residential character of Wilson.

## 4.4 Movement Networks

A *Transport Impact Statement* report has been prepared to assess the impacts of development and the proposed movement network (refer Appendix 7). This report found that development within the Structure Plan area is expected to generate a total of 295 additional vehicle movements per day, equating to 36 trips during peak hour. The impact of development is expected to be minimal, contributing less than 1% to the total traffic volume in the area.

### 4.4.1 Existing Road Network

The site has access and frontage to a number of existing roads; however, none currently traverse the site. A summary of existing roads is provided in Table 9 below:

Road	Existing Width	Proposed Width	Classification
Existing roads fronting the structure plan area			
Castledare Place	16m	Unchanged	Access Street C
Fern Road	20m	Unchanged	Local Distributor
Bywater Way	20m	Unchanged	Access Street C
Other roads within the vicinity of the structure plan area			
Bow Street	20m	Unchanged	Access Street C
Bungaree Road	20m	Unchanged	Distributor B
Leach Highway	40m	Unchanged	Primary Distributor

Table 9 – Road Widths

Due to the low impact generated by development (less than 1% of current volumes) no upgrades are required to the existing road network.

### 4.4.2 Proposed Road Network

The proposed roads comprise a simple network of Access Streets, all with priority control intersections.

The design provides a road interface between residential uses and parkland, acting as a buffer to areas of environmental significance and bushfire risk, while maximising opportunities for passive surveillance and public access to the landscape.

#### 4.4.3 Proposed Emergency Access

It is proposed to provide an emergency access via the car park area associated with the Castledare Miniature Railway and the existing car park associated with the church. Rights of carriageway will be secured via an easement as part of the subdivision process. To allow for flexibility with respect to the final layout of parking bays the initial easement will extend over the whole of this area. This is reflected on the Structure Plan map (Plan 1).

Given the current standard of finish of the car park and the expected infrequent use of this area as an emergency access, no additional construction works are required. Any ongoing maintenance will be undertaken by either the Castledare Miniature Railway or the City of Canning, subject to the requirements of any lease.

#### 4.4.4 Public Transport Network

There are a number of existing bus routes surrounding the site, as set out in Table 10 below.

Route	Description	Peak Frequency	Off-Peak
72	Perth – Cannington	5	30
178	Perth – Bull Creek Stn	60	60
179	Bull Breek Stn – Perth	10	60
509	Bull Creek Stn – Cannington Stn	20	20

Table 10 – Bus Routes

#### 4.4.5 Cycle Networks

A summary of the cycle network is provided in Table 11 below:

Existing Cycle Network	
Fern Road & Bywater Way (to Canning River Gdns)	Shared Path
Upnor Street & Bridge Street	Good road riding environment
Centenary Avenue	Perth Bicycle Network Shared Path
Planned Cycle Network	
Fern Road to Bywater Way (within Parks and Recreation Reserve)	Shared Path
Internal Access Streets	Good road riding environment

Table 11 – Cycle Network

The most significant planned change to the cycle network is the planned shared path corridor linking existing paths on Fern Road and Bywater Way, which in turn provide excellent access to the regional path network (for both commuting and recreation).

## 4.5 Water Management

A *Local Water Management Strategy (Hyd2o 2021)* has been prepared to support and guide future development (Appendix 2).

The recommended approach to water management for the structure plan area includes:

- Onsite retention of the first 15mm of rainfall in biofiltration areas (within public open space per water sensitive urban design principles) and soakwells (within lots) to provide water quality treatment;
- Use of a pipe road drainage system to convey the 5-year event;
- Events exceeding the first 15mm are to travel towards the Canning River as diffuse overland flow to mimic the pre-development hydrology; and
- Establish minimum habitable floor levels at least 0.5m above the 100-year flood level of the Canning River.

The framework set out within the Local Water Management Strategy will be refined through the preparation of an urban water management plan at subdivision stage.

It is important to note that the LWMS included the Castledare Railway car park, despite this area being outside the Structure Plan area. The car park was included to demonstrate that the car park drainage could be accommodated without any adverse impact to the Structure Plan or the Regional Open Space reserve. This is outlined in the advice from Hyd2o, dated 16 August 2023.

## 4.6 Education Facilities

*Liveable Neighbourhoods (2009)* and *Draft Operational Policy 4.2: Planning for School Sites (2020)* generally require the provision of one public primary school per 1,500 dwellings. As the structure plan area is expected to accommodate 44 dwellings, development is not considered to be of a sufficient scale to justify additional educational facilities.

The nearest existing public primary school is Wilson Primary School, located 260m north-west of the site.

## 4.7 Infrastructure Coordination, Servicing and Staging

An *Infrastructure Servicing Report (TABEC 2021)* has been prepared to support the structure plan (refer Appendix 8). This report confirms the site is capable of being provided with all essential services and infrastructure. A summary of the report is provided below.

#### **4.7.1 Earthworks**

Cut to fill earthworks, together with some imported fill, will be required to achieve level building envelopes and ensure future lot levels are compatible with abutting residential development.

Preliminary earthworks models indicate it should be possible to retain a large number of trees, including those within the Parks and Recreation Reserve, along Fern Road and Castledare Place, and in the vicinity of the Miniature Golf Course (one tree will need to be removed to accommodate a narrowed road pavement) and the Bywater Way entry (with a minor deviation to the road pavement).

#### **4.7.2 Services**

Essential water, wastewater and power services are available in near proximity to the site and are capable of servicing the proposed development with necessary upgrades and extensions. As such, there is no undue impediment to service the development.

### **4.8 Fencing**

Uniform fencing is to be constructed along the northern boundary of those lots that face Fern Road and the northern and eastern boundaries of those lots fronting the Parks and Recreation Reserve.

The portion of the fencing that fronts the reserve is intended to accommodate public art and accordingly will be predominately solid fencing.

The other uniform fencing will include a visually permeable element on the upper portions.

The following specification is proposed:

- Height – 1.6 – 2.0m (above finished level of residential lots);
- Base – 1.2 – 1.6m limestone, brick or similar, with pillars to 2.0m in height above the finished level of the residential lots), evenly spaced; and
- Top – 0.4 – 0.6m semi-permeable panels (or similar) to ensure at least 50% permeability.

## 5.0 Conclusion

This structure plan has been prepared in accordance with the planning framework adopted by the City of Canning and the Western Australian Planning Commission, and reflects the advice received during consultation with other agencies.

The overall form of the structure plan is considered to be relatively simple; comprising two residential development cells within a carefully designed setting that aims to maximise the social and landscape value of the site, and to protect the environmental value of adjoining areas.

This structure plan is thus considered to provide a robust and well considered framework to guide the ongoing development of Wilson.

Appendix One

**Environmental Assessment and  
Management Strategy**



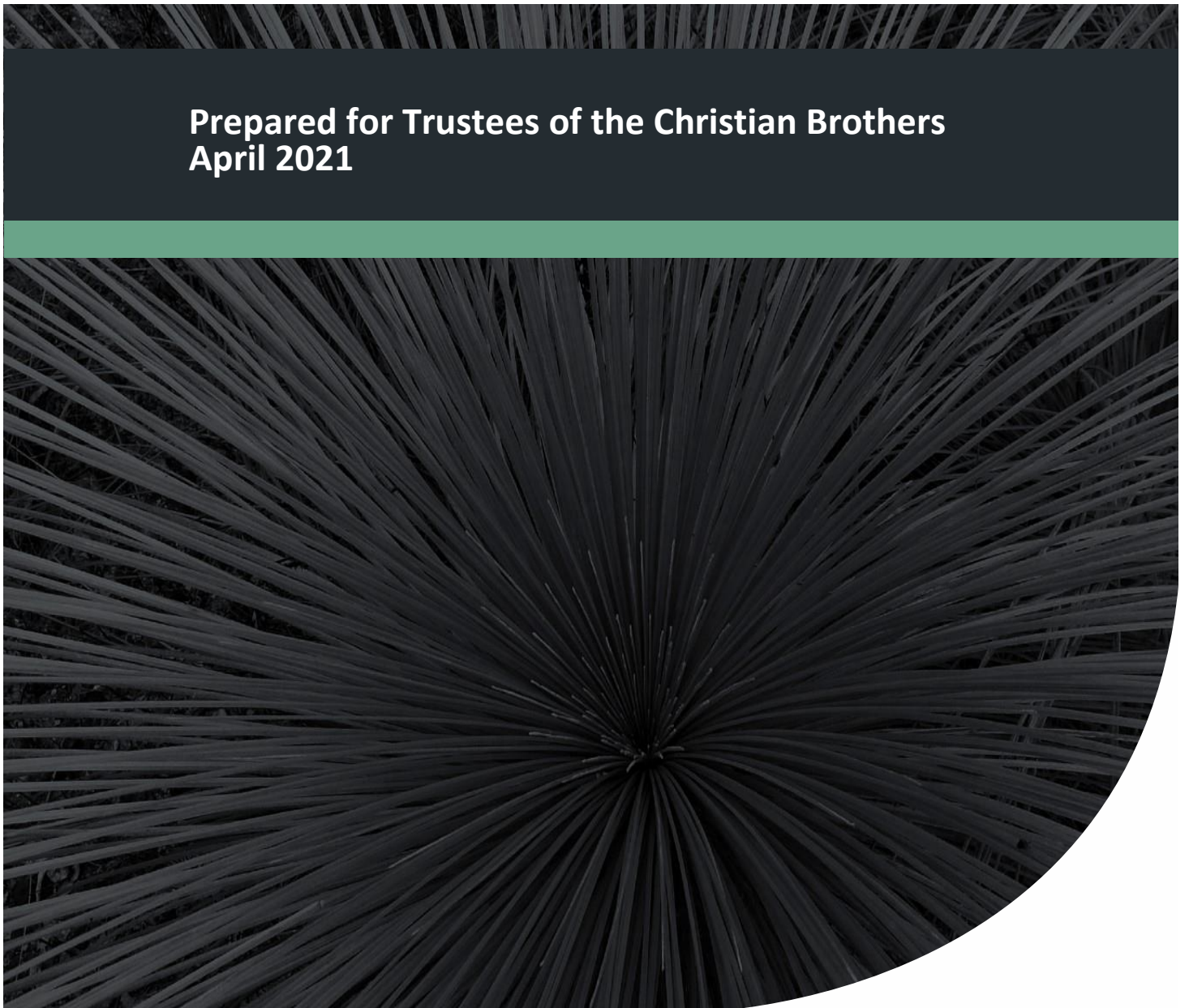
# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson

Local Structure Plan

Project No: EP19-105(13)

**Prepared for Trustees of the Christian Brothers  
April 2021**





# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## Document Control

<b>Doc name:</b> Environmental Assessment and Management Strategy Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan					
<b>Doc no.:</b> EP21-006(02)--04 PPS					
Version	Date	Author		Reviewer	
1	March 2021	Pascal Scholz	PPS	Andreas Biddiscombe	ADB
		Bianca Bertelli	BRB		
Issued to client.					
A	April 2021	Andreas Biddiscombe	ADB	Andreas Biddiscombe	ADB
	Updated to address project team comments.				

© 2021 Emerge Associates All Rights Reserved. Copyright in the whole and every part of this document belongs to Emerge Associates and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Emerge Associates.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## Executive Summary

Richard Noble on behalf of the Trustees of the Christian Brothers (the proponent) are seeking to progress the *Castledare Local Structure Plan* (herein referred to as the 'structure plan'). The structure plan proposes residential land uses within part of Lot 4 Fern Road and part of Lot 102 Castledare Place, Wilson (herein referred to as 'the site'). This *Environmental Assessment and Management Strategy* is the principal supporting environmental document for the structure plan.

The site is 3.19 hectares and is zoned 'Urban' under the Metropolitan Region Scheme (MRS) and 'Urban Development' and 'Private Community Purposes' under the City of Canning Local Planning Scheme (LPS) No. 42. An amendment to the City of Canning LPS No. 42 will be progressed concurrently with the structure plan to rezone the portion of the site zoned 'Private Community Purposes' to enable future urban development in accordance with the structure plan.

The relevant environmental attributes and values of the site are summarised as follows:

- The site is bound by existing residential areas to the west and the Canning River foreshore to the east, which is reserved for 'Parks and Recreation' under the MRS and contains the Castledare Miniature Railway, which is proposed to be maintained in the long-term.
- The site is gently sloping from 2 metres Australian Height Datum (m AHD) in the eastern portion of the site adjacent to the Canning River, to 5 m AHD in the western portion of the site.
- Soil types beneath the site comprises sand fill with some construction rubble present to depths of up to 1.8 m, underlain by sand or alluvial loams and clays closer to the Canning River.
- The entirety of the site is classified as having a 'moderate to low' risk of acid sulfate soils.
- The site has been historically cleared, with remaining vegetation generally limited to isolated native and non-native mature trees. All vegetation is in 'completely degraded' condition.
- The site does not contain any native plant communities, nor any threatened or priority ecological communities or threatened or priority flora species.
- Bush Forever site 224 occurs adjacent to (and outside of) the site, associated with Canning River Regional Park.
- The site does not support any surface water features. The Canning River watercourse is located approximately 40 m to the east. The site is situated outside of the 1% annual exceedance probability (AEP) floodplain for the Canning River.
- Site-specific wetland assessments have determined the site does not contain any wetland features. Wetlands associated with the Canning River occur adjacent to the site.
- No Registered Aboriginal Sites intersect the site. One Other Heritage Place (ID 15910) intersects part of the site, associated with a historical quartz artefact scatter. Subsequent site-specific Aboriginal heritage investigations determined there were no Aboriginal heritage impediments to the redevelopment of the area. Overall, there is a low likelihood of unrecorded Aboriginal heritage values occurring within the site due to historical disturbances.
- One non-indigenous heritage place occurs within the northern portion of the site; *Castledare Boys Home (fmr) – Miniature Golf Course* (ID 17701). This is not afforded statutory protection.
- The site is identified as bushfire prone in the *WA Map of Bush Fire Prone Areas* (OBRM 2019).
- The site has been subject to historical filling activities and has since been remediated such that it is now classified as 'Decontaminated' under the *Contaminated Sites Act 2003*.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



Overall, the site contains limited environmental values. Notwithstanding, the structure plan layout incorporates the following spatial considerations in response to environmental and heritage values:

- Strategic location and provision of road reserves and POS areas to align with existing mature trees, to enable their future retention as part of the subdivision and development process.
- Strategic location and provision of a POS area to provide for the retention of the Castledare miniature golf course, which has local heritage value.
- Alignment of POS areas with proposed stormwater management infrastructure to provide for the management of surface water runoff generated from future residential land uses.

The environmental management strategy for future planning and development stages includes:

- Acid Sulfate Soils: completion of ASS investigations and preparation and implementation of an Acid Sulfate Soil and Dewatering Management Plan, if required. Likely to be triggered if deep excavation for the installation of services is required within the site.
- Flora and vegetation: retention of isolated mature trees within public open space areas and road reserves, subject to confirmation through detailed landscape and engineering design. Secure a clearing permit pursuant to Part V of the *Environmental Protection Act 1986* for any required clearing of native vegetation that precedes subdivision approval.
- Terrestrial fauna: prepare and implement a Fauna Relocation Management Plan, if required, to minimise the potential risk of fauna interactions during construction.
- Hydrology and wetlands: prepare and implement an Urban Water Management Plan, based on the Local Water Management Strategy prepared to support the structure plan.
- Aboriginal heritage: As part of future ground disturbing activities, implement suitable Aboriginal heritage management protocols to manage unexpected finds. If Aboriginal heritage values protected under the *Aboriginal Heritage Act 1972* are identified during works, then consent under Section 18 of the Act may be required.
- Non-indigenous heritage: incorporate heritage place 17701 *Castledare Boys Home (fmr) – Miniature Golf Course* into the landscape design process, such that is appropriately retained within POS and enhanced to enable future public use of the area.

Overall, the environmental attributes and values of the site can be accommodated within the structure plan design, or can be managed appropriately through the future planning and development stages in line with the relevant state and local government legislation, policies, guidelines and best management practices.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## Table of Contents

<b>Executive Summary .....</b>	<b>ii</b>
<b>1 Introduction .....</b>	<b>1</b>
1.1 Background .....	1
1.2 Purpose of this report .....	1
1.3 Assessment scope .....	2
<b>2 Existing Environment .....</b>	<b>3</b>
2.1 Landform and soils .....	3
2.1.1 Topography .....	3
2.1.2 Landform, soils and geology .....	3
2.1.3 Acid Sulfate soils .....	4
2.2 Biodiversity and natural area assets .....	4
2.2.1 Flora and vegetation .....	4
2.2.1.1 Regional context .....	4
2.2.1.2 Site specific investigations .....	5
2.2.1.3 Plant communities .....	5
2.2.1.4 Vegetation condition .....	6
2.2.1.5 Threatened and Priority Ecological Communities .....	6
2.2.1.6 Significant flora .....	7
2.2.2 Terrestrial fauna .....	7
2.2.3 Bush Forever .....	7
2.2.4 Ecological linkages .....	7
2.2.5 Environmentally Sensitive Areas .....	8
2.2.6 City of Canning Local Biodiversity Strategy .....	8
2.3 Hydrology .....	8
2.3.1 Groundwater .....	8
2.3.2 Surface water .....	9
2.3.3 Swan Canning River Development Control Area .....	10
2.3.4 Wetlands .....	10
2.4 Heritage .....	12
2.4.1 Indigenous heritage .....	12
2.4.2 Non-Indigenous heritage .....	13
2.5 Bushfire .....	15
2.6 Other land use considerations .....	16
2.6.1 Historic and existing land uses .....	16
2.6.2 Potential site contamination .....	16
2.6.3 Surrounding land uses .....	17
<b>3 The Proposal .....</b>	<b>18</b>
3.1 Historical planning context .....	18
3.2 Local Structure Plan .....	18
3.3 Future planning approvals process .....	19
<b>4 Environmental Assessment and Management Strategies .....</b>	<b>20</b>
4.1 Acid sulfate soils .....	20
4.1.1 Policy framework, site context and management objectives .....	20
4.1.2 Structure plan layout considerations for acid sulfate soils .....	20
4.1.3 Future acid sulfate soils management requirements .....	20
4.2 Flora and vegetation .....	21
4.2.1 Policy framework, site context and management objectives .....	21
4.2.2 Structure plan considerations for flora and vegetation .....	21

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



4.2.3	Future management requirements.....	21
4.3	Terrestrial Fauna .....	22
4.3.1	Policy framework, site context and management objectives .....	22
4.3.2	Structure plan considerations for fauna .....	22
4.3.3	Future management requirements.....	22
4.4	Hydrology.....	23
4.4.1	Management objectives.....	23
4.4.2	Structure plan layout considerations for hydrology .....	23
4.4.3	Future management requirements.....	24
4.5	Wetlands.....	24
4.5.1	Policy framework, site context and management objectives .....	24
4.5.2	Structure plan considerations for wetlands.....	25
4.5.3	Future management requirements.....	25
4.6	Aboriginal heritage.....	25
4.6.1	Policy framework, site context and management objectives .....	25
4.6.2	Structure plan layout considerations for Aboriginal heritage.....	25
4.6.3	Future management requirements.....	25
4.7	Non-Indigenous Heritage.....	26
4.7.1	Policy framework, site context and management objectives .....	26
4.7.2	Structure plan layout considerations for non-indigenous heritage .....	26
4.7.3	Future management requirements.....	27
<b>5</b>	<b>Implementation Framework .....</b>	<b>28</b>
<b>6</b>	<b>Conclusion .....</b>	<b>29</b>
<b>7</b>	<b>References.....</b>	<b>30</b>
7.1	General references .....	30
7.2	Online references.....	30

## List of Tables

Table 1: Regional vegetation complex descriptions (Hedde et al. 1980). .....	4
Table 2: Geomorphic wetland management categories (DBCA 2017).....	11
Table 3: City of Canning heritage place categories and definitions (CoC 2017).....	13
Table 4: Non-indigenous heritage places within and adjacent to the site .....	13
Table 5: Environmental management framework implementation table .....	28

## List of Plates

Plate 1: Non-native parkland cleared vegetation in ‘completely degraded’ condition.....	5
Plate 2: Cleared areas in ‘completely degraded’ condition.....	6
Plate 3: Heritage place ID 17701 Castledare Boys Home (fmr) – Miniature Golf Course.....	14
Plate 4: OBRM (2019) ‘Bushfire prone areas’ within and surrounding the site .....	15

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## Figures

- Figure 1: Site Location
- Figure 2: MRS Zones and Reserves
- Figure 3: Soils and Topography
- Figure 4: Acid Sulfate Soil Mapping
- Figure 5: Plant Communities
- Figure 6: Vegetation Condition
- Figure 7: Environmental Features
- Figure 8: Hydrological Features
- Figure 9: Wetland Features
- Figure 10: Heritage Places

## Appendices

### **Appendix A**

Castledare Local Structure Plan (Burgess Design Group 2021)

### **Appendix B**

Wetland and Waterway Assessment (Emerge Associates 2019)

# Environmental Assessment and Management Strategy

## Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
CCW	Conservation Category Wetland
EAMS	Environmental Assessment and Management Strategy
ESA	Environmentally Sensitive Area
IBRA	Interim Biogeographic Regionalisation of Australia
LWMS	Local Water Management Strategy
MNES	Matters of National Environmental Significance
MUW	Multiple Use Wetland
PEC	Priority Ecological Community
REW	Resource Enhancement Wetland
TEC	Threatened Ecological Community
UWMP	Urban Water Management Plan

Table A2: Abbreviations – Legislation and policies

Legislation and policies	
AH Act	<i>Aboriginal Protection Act 1972</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
CS Act	<i>Contaminated Sites Act 2003</i>
EP Act	<i>Environmental Protection Act 1986</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>

Table A4: Abbreviations – Planning and building terms

Planning and building terms	
MRS	Metropolitan Region Scheme
LPS	Local Planning Scheme



# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



Table A3: Abbreviations – Organisations

Organisations	
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity Conservation and Attractions
DoEE	Department of Environment and Energy (now Department of Agriculture, Water and the Environment)
DoW	Department of Water (now Department of Water and Environmental Regulation)
DPAW	Department of Parks and Wildlife (now Department of Biodiversity, Conservation and Attractions)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
WAPC	Western Australian Planning Commission

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 1 Introduction

### 1.1 Background

Richard Noble on behalf of the Trustees of the Christian Brothers (the proponent) are seeking to progress the *Castledare Local Structure Plan* (herein referred to as the 'structure plan') (**Appendix A**). The structure plan proposes residential land uses within part of Lot 4 Fern Road and part of Lot 102 Castledare Place, Wilson (herein referred to as 'the site').

The site is 3.19 hectares (ha) in size and located within an established urban area, approximately 9.5 km south-east of the Perth CBD within the City of Canning. It is bound by Fern Road and existing residential development to the north, the Canning River foreshore area and Castledare Miniature Railway (containing tracks, station, signal boxes, workshops and visitor parking) to the south and east, Castledare Place, Castledare Village gated community and Our Lady of Perpetual Help Catholic Church to the west. The location of the site is shown in **Figure 1**.

The site is zoned 'Urban' under the Metropolitan Region Scheme (MRS) (**Figure 2**), and 'Private Community Purposes' and 'Urban Development' under the City of Canning Local Planning Scheme (LPS) No. 42. The land uses proposed in the structure plan align with the MRS zoning of the site, and include residential (R25) areas, in addition to public open space (POS) areas, an internal road network and a dual use pathway (DUP) along the eastern boundary of the site (within the adjacent MRS 'parks and recreation' reserve). An amendment to the City of Canning LPS No. 42 for the southern portion of the site will be progressed concurrently with the structure plan.

The site is currently vacant land and has historically been cleared of native vegetation, with a review of aerial imagery indicating that this clearing occurred prior to 1965 for agricultural uses. Scattered trees remain along the perimeter of the site and are most likely planted. Future residential subdivision and development of the site will aim to retain and protect selected individual trees within areas of managed POS and residential lots.

### 1.2 Purpose of this report

This Environmental Assessment and Management Strategy (EAMS) is the principal supporting environmental document for the local structure planning process, providing a synthesis of information regarding the environmental values and attributes of the site. It is consistent with the Western Australian Planning Commission's (WAPC) *Structure Plan Framework* (WAPC 2015) and it:

- identifies and assesses the existing environmental values and attributes of the site (**Section 2**)
- discusses the land use planning context and the proposed structure plan (**Section 3**)
- discusses how the proposed structure plan layout responds to the existing environment and outlines the proposed future environmental management strategy (**Section 4**)
- describes how the environmental management strategy will be implemented (**Section 5**)
- summaries the structure plan response to the existing environmental values and attributes of the site (**Section 6**).

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 1.3 Assessment scope

Emerge Associates (Emerge) was engaged to undertake this environmental assessment to document the existing environmental attributes and values of the site and ensure that any relevant environmental values can be accommodated within the structure plan, and/or managed through future stages of planning and development of the site. This involved utilising a range of information sources including local and regional reports, databases, mapping and site-specific investigations, including:

- Various publicly available databases and information sources
- *Wetland and Waterway Assessment - Lot 4 and 102 Fern Road, Wilson* (Emerge Associates 2019)
- *Geotechnical Investigation Report - Proposed Residential Subdivision Castledare, Lots 4 and 202 Fern Road, Wilson* (CMW Geosciences Pty Ltd 2015)
- *Bushfire Management Plan - Lot 4 Fern Road and Lot 102 Castledare Place, Wilson* (Emerge Associates 2021)
- *Local Water Management Strategy - Lots 4 & 102 Fern Rd, Wilson* (Hyd2o Hydrology 2021)
- *Preliminary (Contaminated) Site Investigation (PSI) (Non-Intrusive) – Castledare Miniature Railway, Lot 4 and Part of Lot 102, Fern Road* (Coffey Environments 2013)
- *Long Term Asbestos Management Plan - Lot 4 and Lot 102 Fern Road, Wilson* (Aurora Environmental 2017)
- *Environmental Statement Lot 4 and Lot 102 Fern Road Wilson, Western Australia* (Aurora Environmental 2018)
- *Proposed MRS Zoning Summary Lots 4 Fern Road & 102 Castledare Place Wilson* (Burgess Design Group 2017).

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 2 Existing Environment

The outcomes of previously completed investigations, in addition to further site-specific targeted investigations, have informed the identification and assessment of the existing environmental attributes and values within the site and are discussed in further detail below.

### 2.1 Landform and soils

#### 2.1.1 Topography

The site is gently sloping from approximately 2 metres Australian Height Datum (m AHD) in the eastern portion of the site adjacent to the Canning River, up to 5 m AHD in the western portion of the site, as shown in **Figure 3**.

#### 2.1.2 Landform, soils and geology

Regional soil association mapping indicates that the majority of the site is within the Bassendean soil association, with the north-east corner within the Swan soil association (Churchward and McArthur 1980). The Bassendean association is described as 'sand and plains with low dunes and occasional swamps; iron or humus podzols; areas of complex steep dunes' and the Swan complex is described as 'alluvial terraces with red earths and duplex soils'.

The Geological Survey of Western Australia, indicates the site is underlain by the 'Sand (S8)' soil unit, as shown in **Figure 3**. This soil unit is described as 'very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin' (Gozzard 1986). East of the site, adjacent to the Canning River, alluvial deposits comprising clayey sandy silt occur.

CMW Geosciences Pty Ltd (2015) completed geotechnical investigations across the site and determined the ground conditions were generally consistent with the published geology. Soil types comprised sand fill with some construction rubble present to depths of up to 1.8 m, underlain by loose medium grained sand, and alluvial loams/clays closer to the Canning River. The following subsurface sequence was determined:

- FILL/TOPSOIL/SILTY SAND: silty sand, dark brown, grass cover and 200 mm root zone
- (POSSIBLE) FILL/SAND: typically medium dense to dense, dark grey, grey and brown, fine to medium grained
- SAND (SP): typically medium dense, pale grey to orange brown, fine to medium grained
- SANDY CLAY/CLAYEY SAND (CH/SC): firm to stiff orange, brown mottled grey, low to high plasticity.

The site is not known to contain any restricted landforms or unique geological features (CMW Geosciences Pty Ltd 2015).

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 2.1.3 Acid Sulfate soils

Acid Sulfate Soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. However, when oxidised, ASS can pose issues through the production of sulphuric acid, which can present a range of risks for the surrounding environment, infrastructure and human health.

The Department of Water and Environmental Regulation (DWER) provides broad-scale mapping indicating areas of potential ASS risk (DWER 2019). A review of the DWER mapping indicates that the entirety of the site is classified as having a 'moderate to low' risk of ASS occurring within 3 m of the natural soil surface, as shown in **Figure 4**.

## 2.2 Biodiversity and natural area assets

### 2.2.1 Flora and vegetation

#### 2.2.1.1 Regional context

Native vegetation can be described and mapped at different scales or units in order to illustrate general patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides the Swan Coastal Plain into floristic subregions (Environment Australia 2000). The site is contained within the Perth Subregion (SWA02) of the Swan Coastal Plain which is a low lying coastal plain, mainly covered with woodlands. The region is dominated with *banksia* sp. or tuart (*Eucalyptus gomphocephala*) on sandy soils, swamp sheoak (*casurina obesa*) on outwash plains and Paperbark (*Melaleuca* sp.) in swampy areas (DEC 2002).

Regional vegetation complex mapping for the Swan Coastal Plain (Heddle *et al.* 1980) delineates the various vegetation types which would have occurred across the region prior to European settlement. Based on this mapping, two vegetation complexes have been mapped as occurring within the site, as summarised in **Table 1** and shown in **Figure 5**.

Table 1: Regional vegetation complex descriptions (Heddle *et al.* 1980).

Complex	Description
Bassendean Complex-Central and South	'Woodland of <i>Eucalyptus marginata</i> (Jarrah) - <i>Allocasuarina fraseriana</i> (Sheoak) - Banksia species to low woodland of Melaleuca species, and sedgelands on the moister sites. This area includes the transition of <i>Eucalyptus marginata</i> (Jarrah) to <i>Eucalyptus todtiana</i> (Pricklybark) in the vicinity of Perth.'
Swan Complex	'Fringing woodland of <i>Eucalyptus rudis</i> (Flooded Gum) - <i>Melaleuca raphiophylla</i> (Swamp Paperbark) with localised occurrence of low open forest of <i>Casuarina obesa</i> (Swamp Sheoak) and <i>Melaleuca cuticularis</i> (Saltwater Paperbark).'

Due to historical clearing of the site and the resulting absence of remnant vegetation, the site does not contain vegetation representative of these complexes.



## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 2.2.1.2 Site specific investigations

An ecologist from Emerge Associates completed an assessment of flora, vegetation, waterway and wetland values within the of the site and adjacent foreshore area on 14 February and 11 March 2019. The results of the assessment were documented in the *Wetland and Waterway Assessment* (Emerge Associates 2019) provided in **Appendix B**.

The site was traversed by foot during the survey and changes in landforms, soils, vegetation composition and vegetation conditions were recorded. An inventory of flora species observed was recorded and the condition of the vegetation assessed using methods from Keighery (1994).

### 2.2.1.3 Plant communities

Emerge Associates (2019) did not identify any native plant communities within the site, and noted almost all of the site has been historically cleared of native vegetation. The majority of the site has been cleared, with some small areas of predominantly non-native parkland cleared vegetation. Plant communities identified within the site are described in **Table 1** and shown in **Figure 5**.

Table 2: Plant communities identified within the site (Emerge Associates 2019).

Plant Community	Description	Area (ha)
<b>Non-native parkland cleared</b>	Forest of predominantly non-native trees over weeds and planted vegetation ( <b>Plate 1</b> ).	0.17
<b>Cleared</b>	Disturbed cleared areas comprising non-native weeds and/or planted vegetation ( <b>Plate 2</b> ).	3.00



Plate 1: Non-native parkland cleared vegetation in 'completely degraded' condition

# Environmental Assessment and Management Strategy

## Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



Plate 2: Cleared areas in 'completely degraded' condition

### 2.2.1.4 Vegetation condition

Emerge Associates (2019) assessed the site to support primarily non-native vegetation in 'completely degraded' condition (**Figure 6**), due to the low number and cover of native species.

### 2.2.1.5 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TECs) are ecological communities recognised as rare or under threat and therefore warrant special protection. TECs are afforded statutory protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the State *Biodiversity Conservation Act 2016* (BC Act).

An ecological community under consideration for listing as a TEC at a State level, but which does not yet meet survey criteria or has not been adequately defined, or which is rare but not currently threatened, is referred to as a 'Priority Ecological Community' (PEC). Whilst PECs are not afforded statutory protection in Western Australia, they are considered during statutory approval processes.

A search of State and Commonwealth TEC and PEC databases was completed prior to the flora and vegetation assessment. These database searches indicated that multiple TECs and PECs have previously been recorded within 10 km of the site. However, EmERGE Associates (2019) did not identify any TECs or PECs within the site and concluded that none are likely to occur within the site due to the lack of native species and absence of suitable habitat, as a result of historical clearing.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 2.2.1.6 Significant flora

Certain flora species that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. A search of State and Commonwealth listed threatened and priority flora databases was completed prior to the flora and vegetation assessment. These database searches indicated that multiple species of conservation significance have the potential to occur within 10 km of the site. However, in consideration of the existing environment of the site, none of these species were identified as potentially occurring within the site due to the high level of historical disturbance and absence of suitable habitat and native vegetation.

### 2.2.2 Terrestrial fauna

The likelihood that the site would provide important habitat for any fauna species (including species of conservation significance) is low, given the site primarily comprises cleared areas and non-native vegetation which support low fauna habitat values. The adjacent Canning River foreshore area provides more intact habitats for fauna to utilise, which will not be impacted by future residential subdivision and development of the site.

### 2.2.3 Bush Forever

The Government of Western Australia's *Bush Forever Policy* (Government of WA 2000) is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of *Bush Forever* (BF) is to protect comprehensive representations of all original vegetation complexes by targeting a minimum of 10% of each for protection. BF sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

The site does not intersect any BF sites, as shown in **Figure 2**. BF site 224 occurs adjacent to the site, and covers a large area extending from Riverton to Langford, associated with the Canning River Regional Park. Land within BF site 224 currently supports a combination of conservation and recreational land uses.

### 2.2.4 Ecological linkages

Ecological or biodiversity linkages are described as areas of native vegetation which provide a corridor or linkage (typically linear) between patches of vegetation to allow movement of flora and fauna and their genetic material through the landscape, helping to maintain metapopulations.

Ecological linkages are often continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor. The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), has identified and mapped regional ecological linkages within the Perth Metropolitan Region.

One regional ecological linkage is mapped as intersecting the site and follows the general alignment of the adjacent Canning River (**Figure 7**). Given the site has been historically cleared and does not contain significant environmental values, the site is not considered to contribute to or provide any significant ecological linkage functionally.



## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 2.2.5 Environmentally Sensitive Areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding values such as significant wetlands, threatened flora, threatened communities and *Bush Forever* sites. Within an ESA none of the exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* apply. However, exemptions under Schedule 6 of the EP Act still apply, which includes any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

The majority of the site intersects a mapped ESA (**Figure 7**). As outlined above, the site contains little to no native vegetation and any required clearing of isolated native vegetation is anticipated to be undertaken in accordance with a future subdivision approval. Such clearing would be exempt from requiring a clearing permit under Schedule 6 of the EP Act, which is not affected by mapped ESAs.

### 2.2.6 City of Canning Local Biodiversity Strategy

The City of Canning endorsed its Local Biodiversity Strategy in June 2018, which outlines a 20 year action plan for the protection and strategic management of natural areas. The strategy aims to:

- Increase the protection status of significant biodiversity in the City, across all land tenure.
- Appropriately manage local natural areas to reduce threats to biodiversity.
- Increase the viability and resilience of natural areas by establishing buffers and ecological linkages; considering the impacts of climate change.
- Increase the distribution and abundance of fauna, including threatened fauna.
- Increase local community awareness and support for biodiversity conservation.

The strategy identifies 'areas of priority conservation action', which represent remaining natural areas with high priority for retention and conservation, which should be considered as part of future land use planning decision making processes.

The strategy does not identify any 'areas of priority conservation' within the site. External to the site, the strategy identifies a strip of remnant native vegetation within the MRS 'Parks and Recreation' reserve adjacent to the Canning River as an 'area of priority conservation'. This area will not be impacted by future residential subdivision and development of the site.

## 2.3 Hydrology

### 2.3.1 Groundwater

Information on the regional groundwater conditions obtained from the DWER *Water Information Reporting* portal (DWER 2019a) indicates the groundwater beneath the site is a multi-layered system comprised of the:

- Perth – Superficial Swan aquifer
- Perth – Leederville (confined) aquifer
- Perth – Yarragadee North (confined) aquifer.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



The Department of Water Perth Groundwater Map (DWER 2018) indicates historical maximum groundwater levels across the site range from approximately 2.5 m AHD in the south east portion of the site to 5 m AHD in the north west portion of the site. Based on the topographic contours, groundwater is expected to be located near the natural soil surface, with a depth to groundwater ranging from approximately 1 m to 3 m across the site. Groundwater is expected to generally flow in a south-easterly direction towards the Canning River.

Hyd2o Hydrology (2021) installed three groundwater monitoring bores within the site on 5 September 2016, and completed monthly monitoring from September 2016 until August 2018. Depth to groundwater was measured to vary across the site between 0.7 m to 2 m below ground surface.

Groundwater investigations completed by Hyd2o Hydrology (2021) indicate that groundwater beneath the site is likely to be brackish (salinity ranging between 1,000mg/L and 10,000mg/L) given proximity to the Canning River, with low levels of metals and nutrients that reflect background groundwater quality attributed to a long-established urban area. Whilst total nitrogen and total phosphorus concentrations in groundwater were observed to be above the ANZECC water quality guidelines, they represent typical groundwater nutrient values for the Swan Coastal Plain.

The DWER *Online Water Register* indicates that within the City of Canning groundwater sub area, the superficial aquifer is not fully allocated and therefore groundwater is available for abstraction should this be required for temporary construction purposes or long-term irrigation of public open space areas.

Further information regarding the groundwater characteristics of the site is provided in the Local Water Management Strategy (LWMS) prepared by Hyd2o Hydrology (2021) to support the structure plan.

## 2.3.2 Surface water

No surface water features occur within the site.

Surface water features occurring in proximity to the site include:

- The Canning River watercourse located approximately 40 m east of the site.
- Water Corporation's Wilson Main Drain, located approximately 20 m east of the site which comprises a constructed, open stormwater drain that discharges to the Canning River. The central portion of this drain has been revegetated with native wetland plant species.
- Geomorphic wetlands associated with the Canning River to the east of the site, discussed in **Section 2.3.4**.

DWER undertake flood modelling for the Canning River, which was most recently updated in 2015. The 1% Annual Exceedance Probability (AEP) floodway and flood fringe for the Canning River does not extend into the site (**Figure 8**). Development levels within the site will be such that all residential lots will have suitable clearance above the 1% AEP flood levels of the Canning River.



## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 2.3.3 Swan Canning River Development Control Area

The Swan Canning River Development Control Area (DCA) is established under the *Swan and Canning Rivers Management Act 2006* (SCRM Act 2006) and includes the waters of the Swan and Canning rivers, and adjoining land where it is reserved for 'Parks and Recreation' under the MRS. The DCA is administered by the Department of Biodiversity Conservation and Attractions (DBCA) – Rivers and Estuaries Division and triggers the need for any development applications within or adjacent to the DCA to be referred to DBCA for comment and advice.

DBCA (incorporating the former Swan River Trust) has prepared a number of policy documents that relate to the Canning River foreshore reserve and may be applicable to residential development proposals, including:

- *Policy 42 – Planning for the land use, development and permitting affecting the Swan Canning Development Control Area*
- *Policy 45 - Planning for miscellaneous structures and facilities in the Swan Canning Development Control Area*
- *Policy 48 – Planning for development setback requirements affecting the Swan Canning Development Control Area*
- *Policy 49 – Planning for stormwater management affecting the Swan Canning Development Control Area*
- *Policy 50 – Planning for dewatering affecting the Swan Canning Development Control Area*

The northern portion of the site is mapped within the Swan Canning River DCA (**Figure 8**). However, the mapped DCA boundary currently aligns with the historical extent of the MRS 'Parks and Recreation' reserve which formerly intersected the site, but which has recently been rezoned as part of MRS Amendment 1365/57. As such, it is likely that the DCA will be amended in the future such that it reflects the current extent of the adjacent MRS 'Parks and Recreation' reserve, such that it would no longer intersect the site.

### 2.3.4 Wetlands

Wetlands are 'areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries' (Wetlands Advisory Committee 1977). Wetlands can further be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill et al. 1996).

DBCA maintain the *Geomorphic Wetlands of the Swan Coastal Plain* database, which categorises individual wetlands into specific management categories based on their attributes and management objectives. Wetland types are based on landform shape and water permanence, whilst management categories of wetlands are determined based on hydrological, biological and human use features. The three wetland management categories are outlined in **Table 2**.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



Table 2: Geomorphic wetland management categories (DBCA 2017)

Management category	Description of wetland	Management objectives
Conservation (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies.
Resource enhancement (REW)	Modified or degraded but still supporting substantial attributes and functions	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple use (MUW)	Few remaining important wetland attributes and functions but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

A review of the Geomorphic Wetlands of the Swan Coastal Plain dataset (DBCA 2014) identified part of one CCW (UFI 7151 - Shelley Bridge Floodplain) intersecting the south-west corner of the site (**Figure 9**). This CCW is associated with a section of the Canning River and is classified as an estuary-peripheral basin (which implies potential for tidal influence).

Emerge Associates (2019) characterised wetland and waterway values of conservation significance within and adjacent to the site (**Appendix B**), based on the observed on-site biophysical conditions. The assessment determined the site does not contain any prominent natural wetland landform features or areas supporting intact native wetland vegetation, including the mapped portion of CCW UFI 7151 intersecting the site. As such, the portion of CCW UFI 7151 mapped within the site is considered to be erroneous and does not require protection or further management as part of future residential subdivision and development of the site.

Other wetlands of conservation significance in close proximity to the site include:

- CCW UFI 14809 associated with the Canning River floodplain (seasonally inundated flat) approximately 40 m north-east of the site. Emerge Associates (2019) concluded wetland's mapped extent was inaccurate, but the CCW management category was appropriate.
- CCW UFI 13316 associated with the Canning River waterbody. The entirety of UFI 13316 lies within the adjacent MRS 'Parks and Recreation' reserve, outside of the site.

The *Wetland and Waterway Assessment* also assessed the extent of Canning River foreshore reserve proposed in MRS Amendment 1365/57. The 100 Year ARI floodway, native riparian vegetation and a 50 m buffer from the outer extent of native riparian vegetation were used as basis for defining a foreshore area for the Canning River and associated wetlands. The recommended foreshore area extent was confirmed by DBCA and DPLH as appropriate, given the presence of existing public infrastructure (i.e. roads), the absence of any biophysical values, and/or the extent of historic soil and landform modification that had resulted through soil remediation activities undertaken by the landowner. The agreed foreshore area extent informed the realigned extent of the MRS 'Parks and Recreation' reserve established through MRS amendment 1365/57 and adequately protects the wetland and waterway values of the Canning River adjacent to the site and accommodates all necessary wetland buffers.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 2.4 Heritage

#### 2.4.1 Indigenous heritage

DPLH maintain the Aboriginal Heritage Inquiry System (AHIS) under the *Aboriginal Heritage Act 1972*, which contains information on 'Registered Aboriginal Sites' and 'Other Heritage Places' throughout Western Australia. Based on a review of the AHIS database, undertaken in accordance with the *Aboriginal Heritage Due Diligence Guidelines* (DAA 2013):

- The site does not contain any Registered Aboriginal Sites. One Registered Aboriginal Site occurs outside of and adjacent to the site (DPLH ID 3538 'Canning River').
- The site contains part of one Other Heritage Place (DPLH ID 15910 'Castledare artefacts'), as shown in **Figure 10**.

European heritage investigations of Lot 101 (adjacent to the site) completed in 1996 identified four quartz artefacts in the south-western portion of Lot 102 (within the site). Due to the potential Aboriginal heritage values of the artefacts, McDonald Hales and Associates (1997) subsequently completed an archaeological survey and Aboriginal community consultation within Lot 102 (within the site). As part of this survey, one isolated quartz artefact was recorded in the south-west of the site. McDonald Hales and Associates (1997) concluded that:

- Lot 102 has been subject to long-term disturbances resulting from European land-uses, including vegetation clearing, farming, sand quarrying and extensive filling of the land (including construction and demolition waste containing asbestos material).
- The identified artefact was located in a disturbed context and did not represent a constraint to development.
- No previously recorded or new ethnographic sites were identified.
- Overall, there were no Aboriginal heritage impediments to the redevelopment of the area.

The location of the quartz artefact identified by McDonald Hales and Associates (1997) was lodged pursuant to the *Aboriginal Heritage Act 1972* and is associated with the mapped extent of Other Heritage Place ID 15910, as shown in **Figure 10**. Since being listed in the late 1990s, Other Heritage Place ID 15910 has not been considered by the Aboriginal Cultural Materials Committee to determine whether it meets the definition of a Registered Aboriginal Heritage Site, pursuant to Section 5 of the *Aboriginal Heritage Act 1972*.

In addition to being heavily disturbed by historical filling of the land, the southern portion of the site was also excavated between 2016 and 2017 as part of remediation works to remove any remaining asbestos containing material. These remediation works were undertaken in accordance with procedures to assist with the identification and management of any unexpected heritage material encountered during excavation works. No artefacts were identified onsite during these works. In this context, and given the conclusions made by McDonald Hales and Associates (1997), there is considered to be a low likelihood of unrecorded Aboriginal heritage values occurring within the site.

Any residual risk of identifying potential Aboriginal heritage sites can be addressed through the future subdivision and development process, discussed in **Section 4.6**.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 2.4.2 Non-Indigenous heritage

In order to determine the actual or potential presence of sites or features of non-indigenous heritage significance within the site, a review of readily available information at a federal, state and local government level was undertaken to determine if any of the following occur within the site:

- World Heritage Sites
- National Heritage Places
- Commonwealth Heritage Places
- Places listed in the State Register of Heritage Places
- Places listed in the City of Canning TPS no. 42 Heritage List (statutory list)
- Places listed in the City of Canning Municipal Heritage Inventory (non-statutory list).

The City of Canning defines different categories of heritage places, as provided in **Table 3**.

Table 3: City of Canning heritage place categories and definitions (CoC 2017)

Applicable listing	Category	Definition
TPS no. 42 Heritage List (statutory)	1: Exceptional significance	Essential to the heritage of the locality. Rare or outstanding example.
	2: Considerable significance	Very important to the heritage of the locality. High degree of integrity and/or authenticity.
& Municipal Heritage Inventory (non-statutory)	3: Some significance	Contributes to the heritage of the locality. May have some altered or modified elements, not necessarily from the overall significance of the item.
	4: Limited significance	Contributes to the history of the locality through its social and history rather than its built form. Does not fulfil the criteria for entry in the local Heritage List.
Municipal Heritage Inventory (non-statutory)	5: Historic Site	The site has historic significance for its previous use and its role in the historical development of the locality.

Based on a review of the above federal, state and local registers, three non-indigenous heritage places occur within or directly adjacent to the sites, as detailed in **Table 4** and shown in **Figure 10**. All three heritage places are listed at a local level, with one heritage place also listed at a state level.

Table 4: Non-indigenous heritage places within and adjacent to the site

ID	Place name	CoC Category	Statement of significance (CoC 2017)
4579*	Castledare Boys Home (fmr)	1: Exceptional significance	It is significant for its development and use as a residential school for intellectually handicapped boys at a time of great debate about appropriate treatment of the intellectually handicapped and mentally ill.
26082	Canning River Regional Park	1: Exceptional significance	The place is associated with early European navigation in the area, as well as a place used by Aboriginal families for camping, hunting, fishing and as a place for gathering.
17701	Castledare Boys Home (fmr) – Miniature Golf Course	4: Limited significance	The mini golf course has cultural significance because it is the first known mini golf course developed in Canning, and it relates to the work and recreation of the (Christian) Brothers and the boys and lay people.

\* ID 4579 is also listed on the State Register of Heritage Places pursuant to the *Heritage Act 2018*.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



The heritage values associated with the *Castledare Boys Home (fmr)* heritage place (ID 4579) are associated with a former boys home which historically extended across Lot 101. The majority of the buildings and structures were removed at the start of the 21<sup>st</sup> century as part of establishing the current retirement village land use. The remaining heritage values are limited to Niana Homestead, in the eastern extent of the mapped heritage place. The mapped extent of ID 4579 and the Niana Homestead are situated outside the site, and will not be impacted by future implementation of the structure plan.

The *Canning River Regional Park* heritage place (ID 26082) is located within the adjacent MRS 'Parks and Recreation' reserve and does not intersect the site. The extent of the heritage place was amended by the City of Canning in 2018 to specifically exclude the site.

The *Castledare Boys Home (fmr) – Miniature Golf Course* heritage place (ID 17701) is located within the northern portion of the site. As shown in **Plate 3**, it comprises a concrete-base six hole golf course containing mosaic tiles identical to those used within the adjacent Catholic Church. The proposed structure plan layout provides for the future retention and enhancement of this heritage place within a future public open space area, discussed further in **Section 4.7**.



Plate 3: Heritage place ID 17701 Castledare Boys Home (fmr) – Miniature Golf Course



# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 2.5 Bushfire

The Office of Bushfire Risk Management *State Wide Map of Bush Fire Prone Areas* identifies the majority of the site within a 'bushfire prone area' (**Plate 4**). Strategic planning proposals, including structure plans, require bushfire hazard level assessment under the *Guidelines for Planning in Bushfire Prone Areas Version 1.3*.

Emerge Associates prepared a Bushfire Management Plan (BMP) (Emerge Associates 2021) to support the structure plan, which includes an assessment of the existing vegetation and associated bushfire hazard levels within the site and surrounds (within 150 m). A Bushfire Attack Level assessment has been completed in accordance with *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas* (Standards Australia 2018) to inform the siting and design of residential areas identified within the structure plan.

The BMP determined that future development of the site can be located in an area that will, on completion, be subject to a low or moderate bushfire hazard. The anticipated environmental impacts of the structure plan, as outlined in **Section 4**, have specifically considered any bushfire management requirements. No further environmental impacts (such as additional clearing of vegetation) beyond that outlined in **Section 4** will be required in order to implement residential development across the site consistent with the proposed structure plan and in accordance with the requirements of the BMP. This is discussed further in the BMP (Emerge Associates 2021).

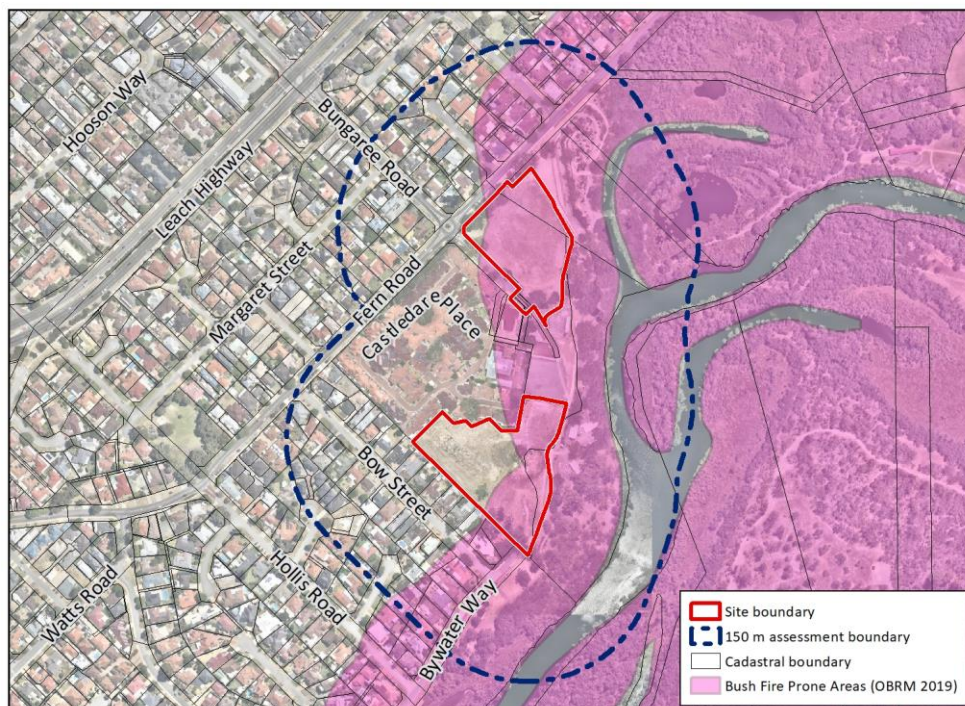


Plate 4: OBRM (2019) 'Bushfire prone areas' within and surrounding the site

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 2.6 Other land use considerations

### 2.6.1 Historic and existing land uses

Based on a review of available historic aerial photography (Landgate 2021), the site was historically cleared of remnant vegetation prior to 1953 to support agricultural land uses, with the exception of scattered trees along the site perimeter. The Castledare Railway infrastructure to the east of the site was constructed circa 1965 with additional structures erected between 1965 and 2002. Clearing associated with the construction of the miniature golf course within the central portion of the site and vehicle tracks surrounding the perimeter occurred circa 1989. Scattered trees remain within the site and the majority were likely planted in the 1980s.

### 2.6.2 Potential site contamination

The (former) Department of Environment Regulation classified the site as 'possibly contaminated – investigation required' under the *Contaminated Sites Act (2003)* in December 2009. Numerous contaminated sites investigations have been undertaken to date, in order to identify, characterise and delineate the extent of contaminated soils within and adjacent to the site, resulting from uncontrolled filling practices in the 1970s. These investigations include:

- *Preliminary Contamination Assessment* (Golder Associates 1999)
- *Preliminary Contamination Investigation at Castledare* (ATA 2001)
- *Preliminary Site Investigation Castledare Miniature Railway* (Coffey Environments 2013)
- *Immediate Human Health Risk Assessment and Environmental Site Assessment Report* (Coffey Environments 2014)
- *Preliminary and Detailed Site Investigation Castledare Miniature Railway* (Coffey Environments 2015)
- *Remediation Action Plan* (Aurora Environmental 2015)
- *Asbestos Investigation, Western Embankment of Stormwater Drain, Lot 4 Fern Road* (Aurora Environmental 2016)
- *Asbestos in Soil Investigation Report* (Aurora Environmental 2016)
- *Summary of Soil and Groundwater Investigations* (Aurora Environmental 2017)
- *Long Term Asbestos Management Plan* (Aurora Environmental 2017).

These investigations identified areas of fill material which contained asbestos, identified as the primary contaminant of potential concern. The presence of asbestos impacted material was attributed to historical fill being sourced from an asbestos manufacturing plant.

Extensive remediation works were completed across the site between 2016 and 2017 to address asbestos contaminated fill material. This involved the removal of all fill material from the site and subsequent validation of the underlying natural surface to achieve the classification of 'Decontaminated' in accordance with the *Contaminated Sites Act 2003*.

The excavated fill was enclosed in a purposefully constructed containment cell which forms part of a car park for the Castledare Miniature Railway, situated outside of and adjacent to the site. This containment cell and the balance of Lot 102 and Lot 4 reserved for 'Parks and Recreation' were

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



remediated using a cap and contain strategy to achieve the classification of 'Remediated for Restricted Use' in accordance with the *Contaminated Sites Act 2003*. The restrictions include:

- The land is restricted to non-sensitive uses and should not be developed for a more sensitive use such as residential use or childcare centre without further contamination assessment and/or remediation.
- The land is required to be managed in accordance with the *Long Term Asbestos Management Plan* (Aurora Environmental 2017) prepared specifically for the site.
- All activities which have the potential to disturb the surface are required to be undertaken in accordance with the *Long Term Asbestos Management Plan* prepared specifically for the site.

The remediation strategies adopted were consistent with Department of Health (2009) guidelines. Further detail is provided in the *Long Term Asbestos Management Plan*.

## 2.6.3 Surrounding land uses

The site is bound by Fern Road and existing urban development to the north, the Castledare Miniature Railway site to the east, remnant native vegetation associated with the Canning River foreshore area to the north and south, Castledare Place and Castledare Village, a gated community and Our Lady of Perpetual Help Catholic Church to the west.

The foreshore area adjacent to the site is largely occupied by the Castledare Miniature Railway which consists of 5 km of track, railway station, signal box, turn table, storage sheds, toilet block, picnic facilities and workshops. The Miniature Railway is open to visitors who often also partake in barbecues/picnics and utilise the turf area for recreational pursuits.

No land uses have been identified within at least 1000 m of the site that are likely to impact on future residential land uses or require separation distances to be accommodated in order to mitigate potential impacts on health and/or amenity. There are no major roads within or in immediate proximity to the site that will require further consideration in relation to the potential for noise impacts on adjacent future residential dwellings or other sensitive land uses.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 3 The Proposal

### 3.1 Historical planning context

The current 'Urban' MRS zoning of the site was established in 2020 following MRS Amendment 1365/57. The purpose of the amendment was to reclassify portions of Lot 4 Fern Road and Lot 102 Castledare Place, Wilson from the 'Urban' zone to 'Parks and Recreation' (0.50 ha) and reclassify other land from the 'Parks and Recreation' reservation to the 'Urban' zone (1.02 ha). As part of the negotiations for the rezoning of the 1.02 ha to the Urban zone, the proponent agreed that the portion of the MRS 'Parks and Recreation' reserve within their ownership would be ceded to the State free of cost, as part of the future subdivision process, equating to approximately 12.5 hectares.

The extent of the realigned MRS 'Parks and Recreation' reserve was informed by the *Wetland and Waterway Assessment* (Emerge Associates 2019) and accommodates the 100 Year ARI floodway, native riparian vegetation and a 50 m buffer from the outer extent of native riparian vegetation. As such, all floodplain, wetland and waterway values, as well as appropriate buffers are wholly accommodated in the MRS 'Parks and Recreation' reserve and do not encroach into the 'Urban' zoned area comprising the site.

MRS amendment 1365/57 was referred to the Environmental Protection Authority (EPA), in November 2019. The EPA determined that the proposed scheme should not be assessed under Part IV Division 3 of the *Environmental Protection Act 1986* (EP Act) and that it was not necessary to provide any advice or recommendations.

Pursuant to Section 126(3) of the *Planning and Development Act 2005*, the WAPC has the option of concurrently rezoning land that is being zoned 'Urban' under the MRS, to a 'Development' zone (or similar) in the corresponding LPS. In this respect, the northern portion of the site was rezoned to 'Urban Development' under the City of Canning LPS No. 42 concurrently with MRS Amendment 1365/57. The southern portion of the site is currently zoned 'Private Community Purposes' under the City of Canning LPS No. 42 and was not concurrently amended with MRS Amendment 1365/57.

### 3.2 Local Structure Plan

Burgess Design Group has prepared the *Castledare Local Structure Plan (Appendix A)* for the site on behalf of the Trustees of the Christian Brothers in WA. The structure plan proposes the following land uses:

- Residential (R25) areas within northern and southern cells within the site.
- Two public open space areas within the site.
- An integrated local road network within the site, including an emergency access way between the northern and southern residential cells for bushfire purposes.
- A dual-use path within the adjacent MRS 'Parks and Recreation' reserve.
- Retention of the existing Castledare Miniature Railway infrastructure within the adjacent MRS 'Parks and Recreation' reserve.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



- A carpark for the Castledare Miniature Railway between the two residential cells, which will also provide for the emergency access way.

Whilst the site contains limited environmental values, the Structure Plan layout incorporates spatial considerations to respond to identified environmental and heritage values, including:

- Strategic location and provision of road reserves and public open space areas to align with existing mature trees, to enable their future retention as part of the subdivision and development process.
- Strategic location and provision of a public open space area to provide for the retention of the Castledare miniature golf course, which has local heritage value.
- Alignment of public open space areas with proposed stormwater management infrastructure to provide for the management of surface water runoff generated from future residential land uses.

These spatial design responses are discussed in **Section 4**.

Concurrent with the local structure planning process, an associated amendment to LPS No. 42 will be progressed with the City of Canning to rezone the southern portion of the site to enable future residential development.

### 3.3 Future planning approvals process

Subject to approval and endorsement of the structure plan by the City of Canning and the WAPC, residential development of the site will be progressed through subdivision.

The subdivision application process will need to address the requirements of the approved structure plan. Once issued, subdivision approval/s would include a range of conditions, some of which may relate to environmental matters, which will need to be implemented as part of the subdivision and development process, before titles for subdivided lots are issued. Other components of development may be progressed through development approval, for example forward bulk earthworks or other non-subdivisional works.

Subdivision of the site will involve creation of the adjacent foreshore reserve, aligning with the extent of the MRS 'Parks and Recreation' reserve, which will be ceded free of cost to the State of Western Australia. The existing Castledare Miniature Railway infrastructure will be retained within the reserve and the operations are proposed to continue into the future.



## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



# 4 Environmental Assessment and Management Strategies

This section outlines the spatial response of the structure plan to the environmental attributes and values associated with the site and the environmental management considerations that will be required as part of future planning stages. Only those environmental values and attributes that require specific consideration based on their presence within the site, and/or applicable legislation and policy requirements are assessed.

## 4.1 Acid sulfate soils

### 4.1.1 Policy framework, site context and management objectives

DWER, through the WAPC, ensures ASS are adequately managed during the land use planning and development process. The objective of the DWER's ASS policy framework is to manage ASS appropriately to prevent the release of metals, nutrients and acidity into the soil and groundwater system that may adversely affect the natural and built environment and human health. The principal management objective for acid sulfate soils within the site is to ensure that any future development that may disturb acid sulfate soils is appropriately managed to avoid impacts on the environment.

A review of the regional mapping produced by DWER indicates that entirety of the site is classified as having a 'moderate to low' risk of ASS occurring within 3 m of the natural soil surface as shown in **Figure 4**. This is typical of intermittent waterlogged areas.

### 4.1.2 Structure plan layout considerations for acid sulfate soils

ASS management does not require any spatial consideration within the structure plan layout, as ASS risks are managed through future planning stages.

### 4.1.3 Future acid sulfate soils management requirements

Future residential land uses within the site will be serviced by deep sewerage, through a reticulated wastewater network managed by the Water Corporation. Installation of the deep sewerage network and other underground services may require deep excavation within the site, which has the potential to disturb ASS.

As such, DWER may recommend that a condition relating to the management of ASS be applied to any future subdivision approvals or development approvals issued by the WAPC or the City of Canning. Typically, the WAPC includes a standard condition on subdivision approvals where ASS risks apply (model subdivision condition EN8), which states:

*An acid sulphate soils self-assessment form and, if required as a result of the self-assessment an acid sulphate soils report and an acid sulphate soils management plan shall be submitted to and approved by the Department of Water and Environmental Regulation (DWER) before any subdivision works or development are commenced.*



# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



*Where an acid sulphate soils management plan is required to be submitted, all subdivision works shall be carried out in accordance with the approved management plan (Department of Water and Environmental Regulation).*

As such, ASS investigations and management considerations for the site may be required at subdivision, which may require the preparation of an Acid Sulfate Soil and Dewatering Management Plan (or similar).

## 4.2 Flora and vegetation

### 4.2.1 Policy framework, site context and management objectives

In the context of environmental impact assessments, the EPA's objective for flora and vegetation is 'to protect flora and vegetation so that biological diversity and ecological integrity are maintained'. Where a proposal may potentially impact upon flora and vegetation values, the following mitigation hierarchy should be applied to minimise potential impacts:

1. **Avoid** impacts
2. **Minimise** impacts
3. **Offset** impacts

The vegetation across the entirety of the site is in a 'completely degraded' condition, dominated by non-native grasses and weeds, with occasional overstoreys of remnant native or planted non-native trees. On this basis, vegetation within the site is not considered to represent intact vegetation communities, and there is a reduced level of biological diversity compared to surrounding areas where there are greater areas of remnant vegetation.

Given this, the impact of future development within the site is likely to be minimal on flora and vegetation values. Therefore, the objective for future management of flora and vegetation within the site will be principally focussed around opportunistically retaining areas of vegetation and/or individual trees within future public open space where this is practical and possible.

### 4.2.2 Structure plan considerations for flora and vegetation

The two POS areas and the widened Fern Road reserve shown in the structure plan have been specifically provided and situated to align with the location of existing mature native and non-native trees, such that they can be retained as part of future residential subdivision and development.

### 4.2.3 Future management requirements

Where native vegetation is required to be cleared within the site, this will likely be undertaken in accordance with a subdivision approval and associated authorised subdivision works, which will provide an exemption from the requirements for a clearing permit. Should bulk earthworks or any other works be commenced within the site that requires clearing of native vegetation before subdivision approvals are gained, a clearing permit pursuant to Part V of the EP Act will be required.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



In addition, and as part of subdivision, the WAPC may include a standard condition (model subdivision condition EN2) which requires:

*Prior to the commencement of subdivisional works, measures being undertaken to identify any vegetation on the site worthy of retention, including any potential habitat or foraging trees for threatened fauna species, and protection measures implemented to ensure such vegetation is not impacted by subdivisional works. (Local Government)*

This can be used to ensure that vegetation retention opportunities (likely to be limited to mature trees) are considered through the subdivisional works process.

### 4.3 Terrestrial Fauna

#### 4.3.1 Policy framework, site context and management objectives

In the context of environmental impact assessment, the EPA's objective for terrestrial fauna is 'to protect fauna so that biological diversity and ecological integrity are maintained'. The application of the mitigation hierarchy should be applied to avoid or minimise impacts to terrestrial fauna where possible.

Based on the degraded condition of vegetation within the site, there are limited fauna habitat values remaining. Opportunities to facilitate the retention of fauna habitat within the site are generally limited to the retention of mature native and non-native trees.

#### 4.3.2 Structure plan considerations for fauna

The two POS areas and the widened Fern Road reserve shown in the structure plan have been specifically provided and situated to align with the location of existing mature native and non-native trees (which provide some limited habitat to terrestrial fauna), such that they can be retained as part of future residential subdivision and development.

#### 4.3.3 Future management requirements

As part of the future subdivision approval process, the WAPC may include a condition requiring the preparation and implementation of a Fauna Relocation Management Plan (or similar), which would aim to minimise the risk of fauna interactions during construction is minimised (noting that the risk of such interactions is already low due to the general absence of fauna habitat within the site).

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 4.4 Hydrology

#### 4.4.1 Management objectives

In the context of environmental impact assessment, the EPA's objective for inland waters is 'to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected'.

In addition, the *State Water Strategy for Western Australia* (Government of WA 2003) and *Better Urban Water Management* (WAPC 2008) promotes integrated water cycle management and application of water sensitive urban design (WSUD) principles.

*Better Urban Water Management Guidance Note 2* outlines the water management reporting requirements to support each stage of the land use planning process:

- District Water Management Strategy – district structure plan or region scheme amendment
- Local Water Management Strategy – local structure plan or local scheme amendment
- Urban Water Management Plan – subdivision approval.

Hyd2o Hydrology (2021) prepared a LWMS for the site to support the proposed structure plan, in accordance with the requirements of *Better Urban Water Management*. The purpose of the LWMS is to identify how the proposed urban land use will address water use, the protection of water dependent environments and to identify existing and required stormwater management infrastructure. The LWMS provides a framework for the future implementation of integrated water cycle management utilising WSUD principles.

The LWMS proposes the following stormwater management strategy:

- Onsite retention of the first 15 mm of rainfall in biofiltration areas (within public open space areas) and soakwells (within lots) to provide water quality treatment.
- Use of a pipe road drainage system to convey the 5 year event.
- Events exceeding the first 15 mm are to travel towards the Canning River as diffuse overland flow to mimic the pre-development hydrology. The basins within the sites have been sized to detain flows to pre-development discharge rates in the 1% AEP event.
- Establish minimum habitable floor levels at least 0.5 m above the 1% AEP flood level of the Canning River.

Further detail is provided in the LWMS (Hyd2o Hydrology 2021), including specification of catchment areas, flows paths, and key infrastructure details based on detailed modelling.

#### 4.4.2 Structure plan layout considerations for hydrology

The POS areas shown in the structure plan have been located and sized such that they can adequately accommodate the required stormwater management infrastructure, specifically biofiltration areas and basins.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 4.4.3 Future management requirements

In accordance with *Better Urban Water Management*, an Urban Water Management Plan will be required to support the future subdivision process. As such, it is anticipated that WAPC will impose model subdivision condition D2 on any future subdivision approvals for the site, which requires:

*Prior to the commencement of subdivisional works, an urban water management plan is to be prepared and approved, in consultation with the Department of Water, consistent with any approved Local Water Management Strategy. (Local Government).*

Generally, an UWMP will provide for the implementation of the water management strategies approved through the LWMS, specifically addressing the following considerations:

- The detailed drainage design
- Imported fill specifications and requirements
- Implementation of water conservation strategies
- Water quality improvement measures
- Management and maintenance requirements
- Monitoring and evaluation program
- Status of groundwater abstraction licenses.

### 4.5 Wetlands

#### 4.5.1 Policy framework, site context and management objectives

The site does not contain any wetland features. However, a number of CCWs are situated adjacent to the site, associated with Canning River and its foreshore and floodplains areas.

The *Environmental Guidance for Planning and Development, Guidance Statement No.33* (EPA 2008) recommends a generic 50 m separation distance from CCWs, subject to consideration of site-specific information. The WAPC guidance states that the achievement of the management objective for a wetland may require more than the separation distance proposed or may be achieved with less. Variation from the guideline's suggested distances needs to be considered on the merits of each case.

As part of MRS Amendment 1365/57, the extent of the Canning River foreshore reserve adjacent to the site was determined. The determined foreshore reserve accommodates the 100 Year ARI floodway, native riparian vegetation and a 50 m buffer from the outer extent of native riparian vegetation, and was considered appropriate by DBCA and DPLH. As such, all floodplain, wetland and waterway values, as well as appropriate buffers are wholly accommodated in the existing MRS 'Parks and Recreation' reserve and do not encroach into the site.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 4.5.2 Structure plan considerations for wetlands

The structure plan accommodates the existing MRS 'Parks and Recreation' reserve, by excluding all future residential development from these areas. As such, no structure plan layout considerations in relation to wetlands are necessary within the site, as all wetland areas and associated buffers are wholly accommodated in the adjacent foreshore reserve.

### 4.5.3 Future management requirements

An UWMP will be prepared as a condition of subdivision approval, which will outline the water management framework to be implemented as part of subdivision and development, such that wetlands within the adjacent foreshore reserve are not adversely impacted.

## 4.6 Aboriginal heritage

### 4.6.1 Policy framework, site context and management objectives

The *Aboriginal Heritage Act 1972* provides for the protection and preservation of Aboriginal heritage and culture throughout Western Australia, including places and objects that are of significance to Aboriginal people. Aboriginal sites and materials are protected whether or not they have been previously recorded or reported. Under the *Aboriginal Heritage Act 1972* it is an offense to disturb an indigenous heritage site. Where the impact to a site is unavoidable, the consent of the Minister must be sought under Section 18 of the Act.

The State's *Aboriginal Heritage Due Diligence Guidelines* (DAA 2013) also provide a risk-based assessment for proponents to identify risk to Aboriginal heritage and mitigate risk where heritage sites may be present.

The site contains one Other Heritage Place (DPLH ID 15910 'Castledare artefacts'). Based on the result of an archaeological and ethnographic survey completed by McDonald Hales and Associates (1997), in addition to the site being significantly filled and excavated historically and then again between 2016 and 2017, there is a low likelihood of unrecorded Aboriginal heritage values occurring within the site which could be disturbed as part of future subdivision and development works.

### 4.6.2 Structure plan layout considerations for Aboriginal heritage

The site does not contain any known Aboriginal heritage values that require a spatial response in the structure plan layout.

### 4.6.3 Future management requirements

Given some potential remains for unrecorded Aboriginal heritage values to occur within the site, suitable Aboriginal heritage management protocols should be adhered to as part of future ground disturbing works. This should include a process to immediately cease works if potential Aboriginal artefacts or heritage values are identified or uncovered, which should then be assessed by a suitably qualified expert. If this process identifies the occurrence of Aboriginal heritage values protected under the *Aboriginal Heritage Act 1972*, then consent under Section 18 of the Act may be required.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 4.7 Non-Indigenous Heritage

#### 4.7.1 Policy framework, site context and management objectives

At a state level, the *Heritage Act 2018* provides statutory protection to heritage places listed on the State Register of Heritage Places, which is administered by the Heritage Council of WA. Part 5 of the Act requires all development applications which would or are likely to affect registered heritage places to be referred to the Heritage Council of WA for its advice, which is then considered by the relevant decision making authority. Whilst one heritage place listed on the State Register of Heritage Places occurs adjacent to the site (26082 *Canning River Regional Park*), no impacts to this heritage place are proposed or considered likely to occur as part of the future implementation of the structure plan, and as such these statutory requirements will not apply.

At a local level, the *Planning and Development Act 2005* and the City of Canning TPS no. 42 provide statutory protection to heritage places listed under the City of Canning TPS no. 42 Heritage List (Category 1, 2 or 3 heritage places). Specifically, a development application must be submitted to the City prior to a building permit application or demolition application which propose any works to the heritage place. Whilst two Category 1 heritage places occur adjacent to the site (4579 *Castledare Boys Home (fmr)* and 26082 *Canning River Regional Park*), no impacts or works involving either heritage place are proposed or considered likely to occur as part of the future implementation of the structure plan, and as such these statutory requirements will not apply.

The City of Canning Municipal Heritage Inventory is a non-statutory heritage list which includes all categories of heritage places (Category 1, 2, 3, 4 and 5). The Municipal Heritage Inventory does not afford any statutory protection for heritage places, and as such has no effect on the use and development of land and buildings. As such, whilst the site contains one Category 4 heritage place (17701 *Castledare Boys Home (fmr) – Miniature Golf Course*), it is not afforded any statutory protection.

#### 4.7.2 Structure plan layout considerations for non-indigenous heritage

Whilst not afforded statutory protection, heritage place 17701 *Castledare Boys Home (fmr) – Miniature Golf Course* is proposed to be retained as part of future development of the site, to provide heritage, amenity and social benefits to the local area. As such, the structure plan layout provides a POS area which includes the full extent of the heritage place, to enable its future retention in a parkland setting.

Whilst situated outside of the site, the structure plan also notes that the Niana Homestead (associated with Heritage place 4579 *Castledare Boys Home (fmr)*) will be retained and is not proposed to be impacted through future implementation of the structure plan. Similarly, the adjacent MRS 'Parks and Recreation' reserve is also shown on the structure plan, which will provide for the future retention of Heritage place 26082 *Canning River Regional Park*, where it occurs adjacent to the site.

As such, the structure plan identifies all non-indigenous heritage places (within and adjacent to the site) for future retention.



## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



### 4.7.3 Future management requirements

No statutory approvals under local and state government heritage legislation will be required, as outlined in **Section 4.7.3**.

Notwithstanding, heritage place 17701 *Castledare Boys Home (fmr) – Miniature Golf Course* is proposed to be retained in a future POS area and therefore will need to be incorporated into the future landscape design process, such that is appropriately retained and enhanced to enable future public use of the area.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 5 Implementation Framework

A summary of how the structure plan responds to the environmental values and attributes within the site is provided in **Table 5**. The table also outlines the proposed and potential future management measures required as part of the subdivision and development process.

Table 5: Environmental management framework implementation table

Factor	Structure plan phase (completed)	Subdivision phase	Part of development works
Acid sulfate soils	<ul style="list-style-type: none"> <li>Consider ASS Risk mapping as prepared by DWER. No spatial response in structure plan required.</li> </ul>	<ul style="list-style-type: none"> <li>Completion of ASS self-assessment and preparation of an Acid Sulfate Soil and Dewatering Management Plan, if required.</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of an Acid Sulfate Soil and Dewatering Management Plan, as required.</li> </ul>
Flora and vegetation	<ul style="list-style-type: none"> <li>Assessment of flora and vegetation values and preliminary consideration of potential retention opportunities. Structure plan layout response to accommodate future tree retention.</li> </ul>	<ul style="list-style-type: none"> <li>Detailed analysis of final subdivision layout to determine tree retention opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>Where tree retention is proposed, accommodate these as part of construction and landscaping works.</li> </ul>
Terrestrial fauna	<ul style="list-style-type: none"> <li>Assessment of fauna habitat values and preliminary consideration of potential retention opportunities. Structure plan layout response to accommodate future tree retention.</li> </ul>	<ul style="list-style-type: none"> <li>Detailed analysis of final subdivision layout to determine tree retention opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>Where tree retention is proposed, accommodate these as part of construction and landscaping works.</li> </ul>
Hydrology and Wetlands	<ul style="list-style-type: none"> <li>Preparation of a Local Water Management Strategy.</li> <li>Structure plan layout response to accommodate required stormwater management infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>Preparation of an Urban Water Management Plan.</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of the UWMP.</li> </ul>
Aboriginal and non-indigenous Heritage	<ul style="list-style-type: none"> <li>Preliminary desktop investigations into heritage sites.</li> <li>Structure plan layout response to accommodate future retention of <i>Castledare Boys Home (fmr) – Miniature Golf Course</i> (ID 17701) within future POS areas.</li> </ul>	<ul style="list-style-type: none"> <li>Accommodate retention of <i>Castledare Boys Home (fmr) – Miniature Golf Course</i> (ID 17701) within POS areas shown in final subdivision layout and incorporate into landscape design process.</li> </ul>	<ul style="list-style-type: none"> <li>Retain <i>Castledare Boys Home (fmr) – Miniature Golf Course</i> (ID 17701) within POS and implement landscape works.</li> <li>Implement appropriate construction management protocols to manage the any unexpected finds of Aboriginal artefacts or other heritage values.</li> </ul>

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 6 Conclusion

This EAMS has been prepared to support the *Castledare Local Structure Plan (Appendix A)* for Lot 4 Fern Road and Lot 102 Castledare Place, Wilson. This EAMS provides a synthesis of information regarding the environmental values and attributes of the site (**Section 2**) and discusses how the proposed structure plan layout responds to the existing environment and outlines the future environmental management requirements (**Section 4**).

Whilst the site was determined to contain limited environmental values, the structure plan layout incorporates the following spatial considerations in response to environmental and heritage values:

- Strategic location and provision of road reserves and POS areas to align with existing mature trees, to enable their future retention as part of the subdivision and development process.
- Strategic location and provision of a POS area to provide for the retention of the Castledare miniature golf course, which has local heritage value.
- Alignment of POS areas with proposed stormwater management infrastructure to provide for the management of surface water runoff generated from future residential land uses.

The environmental management strategy for future planning and development stages includes:

- Acid Sulfate Soils: completion of ASS investigations and preparation and implementation of an Acid Sulfate Soil and Dewatering Management Plan, if required. Likely to be triggered if deep excavation for the installation of services is required within the site.
- Flora and vegetation: retention of isolated mature trees within public open space areas and road reserves, subject to confirmation through detailed landscape and engineering design. Secure a clearing permit pursuant to Part V of the *Environmental Protection Act 1986* for any required clearing of native vegetation that precedes subdivision approval.
- Terrestrial fauna: prepare and implement a Fauna Relocation Management Plan, if required, to minimise the potential risk of fauna interactions during construction.
- Hydrology and wetlands: prepare and implement an Urban Water Management Plan, based on the Local Water Management Strategy prepared to support the structure plan.
- Aboriginal heritage: As part of future ground disturbing activities, implement suitable Aboriginal heritage management protocols to manage unexpected finds. If Aboriginal heritage values protected under the *Aboriginal Heritage Act 1972* are identified during works, then consent under Section 18 of the Act may be required.
- Non-indigenous heritage: incorporate heritage place 17701 *Castledare Boys Home (fmr) – Miniature Golf Course* into the landscape design process, such that is appropriately retained within POS and enhanced to enable future public use of the area.

Overall, the environmental attributes and values of the site can be accommodated within the structure plan design, or can be managed appropriately through the future planning and development stages in line with the relevant state and local government legislation, policies, guidelines and best management practices.

# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



## 7 References

### 7.1 General references

Aurora Environmental 2017, Long Term Asbestos Management Plan - Lot 4 and Lot 102 Fern Road, Wilson, AP2016-118, 1.

CMW Geosciences Pty Ltd 2015, Geotechnical Investigation Report - Proposed Residential Subdivision Castledare, Lots 4 and 202 Fern Road, Wilson, Rev 0.

Department of Aboriginal Affairs (DAA) 2013, Aboriginal Heritage Due Diligence Guidelines (Version 3.0), Department of Aboriginal Affairs, Perth.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017, A methodology for the evaluation of wetlands on the Swan Coastal Plain, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.

Emerge Associates 2019, Wetland and Waterway Assessment - Lot 4 and 102 Fern Road, Wilson, EP18-019(02)--004 TAA, B.

Emerge Associates 2021, Bushfire Management Plan - Lot 4 Fern Road and Lot 102 Castledare Place, Wilson, EP21-006(03)--001, 1.

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

Government of WA 2000, Bush Forever - Volume 1: Policies, principles and processes, Perth.

Government of WA 2003, A State Water Strategy for Western Australia, Perth.

Hyd2o Hydrology 2021, Local Water Management Strategy - Lots 4 & 102 Fern Rd, Wilson, H19067Bv1, 1.

Standards Australia 2018, AS 3959:2018 Construction of buildings in bushfire-prone areas, Sydney.

Western Australian Planning Commission (WAPC) 2008, Better Urban Water Management, Perth.

Western Australian Planning Commission (WAPC) 2015, Structure Plan Framework, Planning and Development (Local Planning Schemes) Regulations 2015.

### 7.2 Online references

Department of Aboriginal Affairs (DAA) 2021, *Aboriginal Heritage Enquiry System*, viewed 24 March 2021, <<http://maps.dia.wa.gov.au/AHIS2/>>.

## Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



Department of the Environment and Energy (DoEE) 2016, *EPBC Act Protected Matters Report*, generated from the EPBC Act Protected Matters Database, report generated 24 March 2021, <<https://www.environment.gov.au/epbc/protected-matters-search-tool>>.

Department of Parks and Wildlife (DPaW) 2013, *A visual guide to the Interim Biogeographic Regionalisation for Australia (IBRA) in WA*, viewed 24 March 2021, <<http://florabase.dec.wa.gov.au/help/ibra/#map>>.

Department of Parks and Wildlife (DPaW) 2015a, *Threatened Priority Flora Database*, viewed 24 March 2021 <[http:// https://www2.landgate.wa.gov.au/bmvf/app/waatlas/](http://https://www2.landgate.wa.gov.au/bmvf/app/waatlas/)>.

Department of Water (DoW) 2001, *Perth Groundwater Atlas (groundwater contours)*, viewed 24 March 2021, <<http://atlases.water.wa.gov.au/idelve/gwa/>>.

Department of Water and Environmental Regulation (DWER) 2016a, *Acid Sulfate Soil – Swan Coastal Plain Database*, viewed 24 March 2021, <[http:// https://www2.landgate.wa.gov.au/bmvf/app/waatlas/](http://https://www2.landgate.wa.gov.au/bmvf/app/waatlas/)>.

Department of Water and Environmental Regulation (DWER) 2016b, *Contaminated Sites Database*, viewed 1 24 March 2021, <<https://secure.dec.wa.gov.au/idelve/css/>>.



# Environmental Assessment and Management Strategy

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson Local Structure Plan



This page has been left blank intentionally.

# Figures



*Figure 1: Site Location*

*Figure 2: MRS Zones and Reserves*

*Figure 3: Soils and Topography*

*Figure 4: Acid Sulfate Soil Mapping*

*Figure 5: Plant Communities*

*Figure 6: Vegetation Condition*

*Figure 7: Environmental Features*

*Figure 8: Hydrological Features*

*Figure 9: Wetland Features*

*Figure 10: Heritage Places*





**Figure 1: Site Location**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(02)-F13a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021

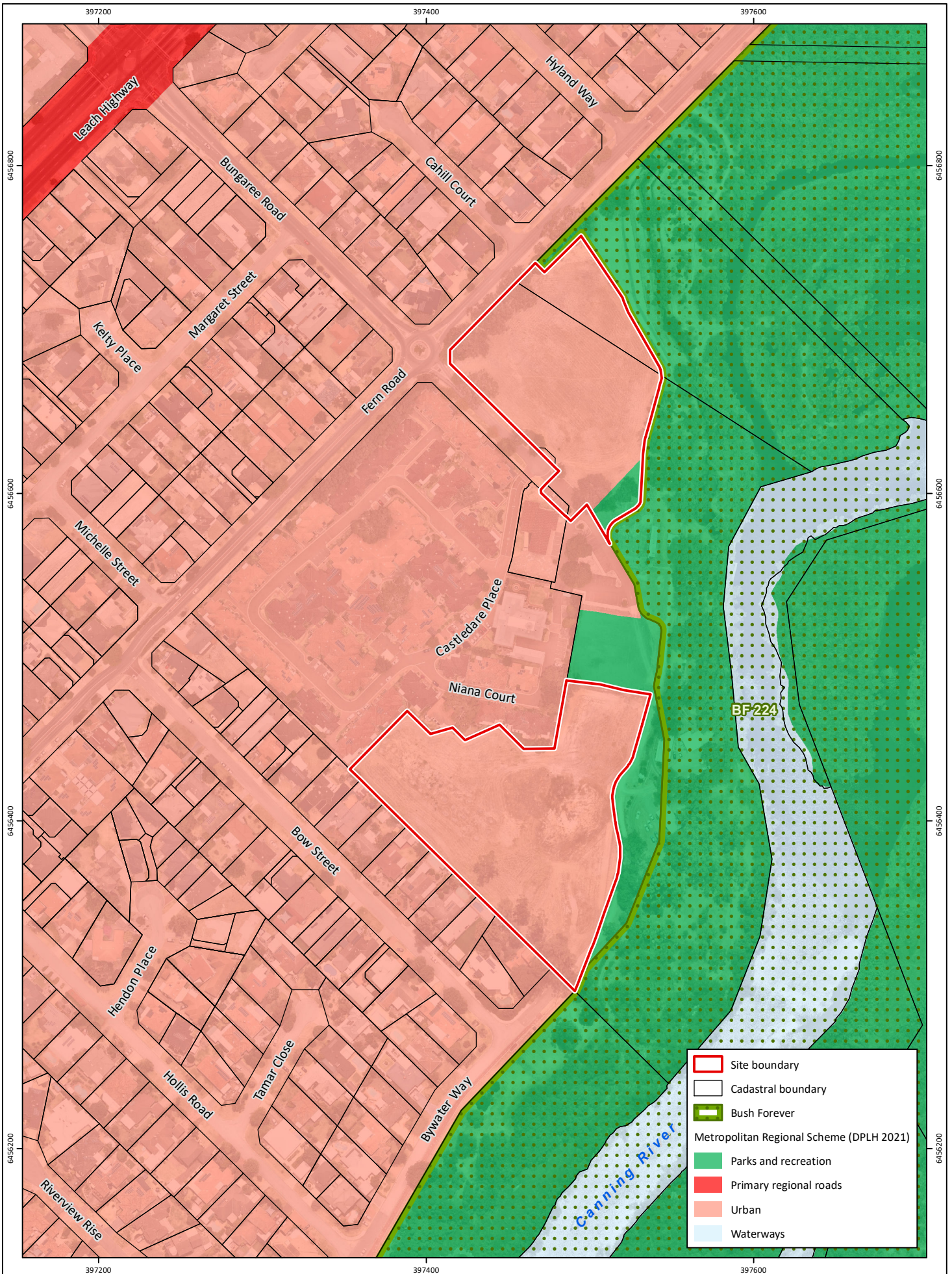


0 20 40 60  
 Metres  
 Scale: 1:3,000@A4  
 GDA 1994 MGA Zone 50



While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used.  
 © Landgate (2021). Nearmap Imagery date: 3/01/2021





**Figure 2: MRS Zones and Reserves**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

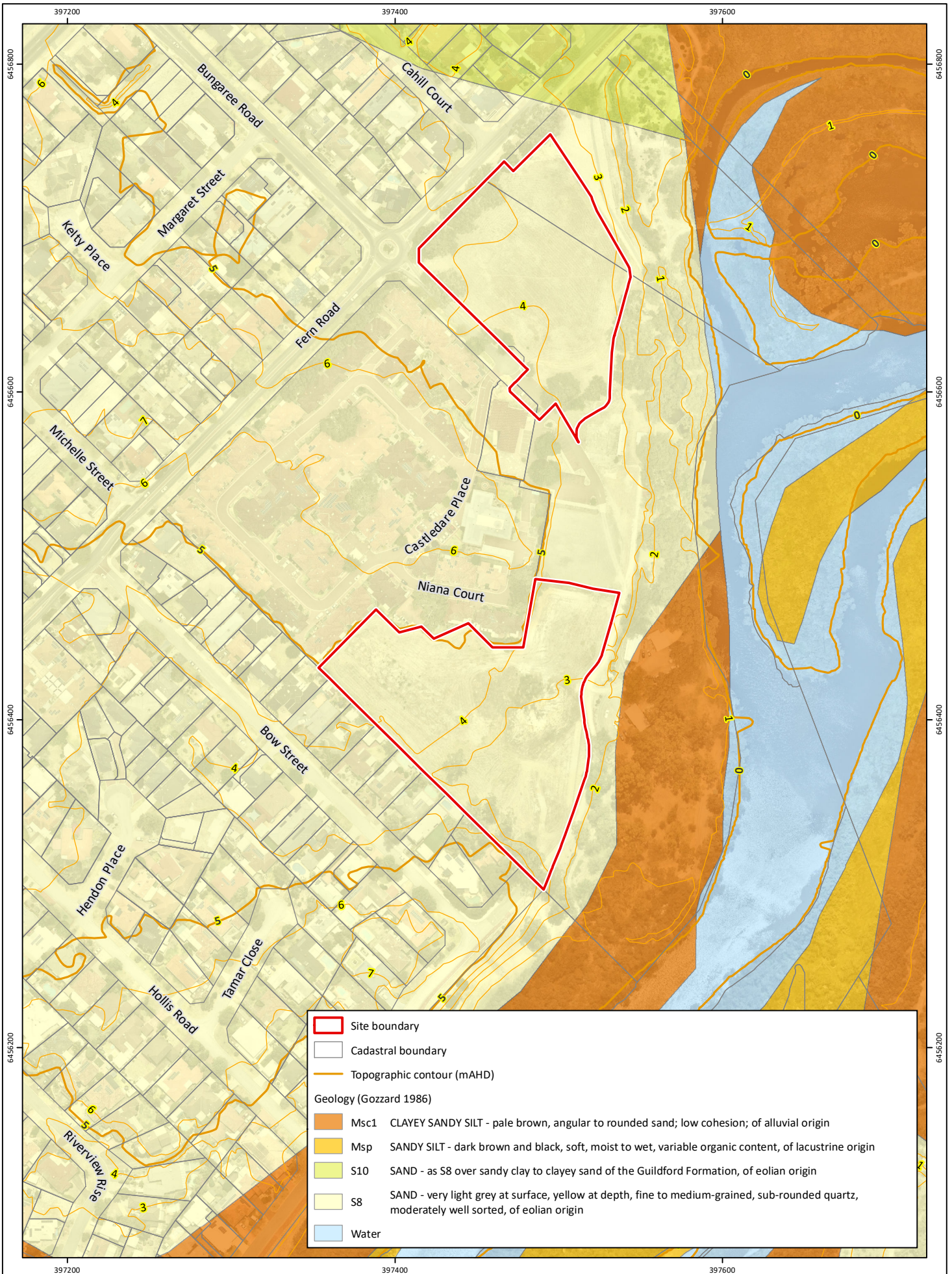
**Plan Number:** EP21-006(02)--F14b  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021



0 20 40 60 80  
 Metres  
 Scale: 1:3,000@A4  
 GDA 1994 MGA Zone 50







**Figure 3: Soils and Topography**

Plan Number:  
EP21-006(02)--F15a  
Drawn: GAR  
Date: 15/04/2021  
Checked: BRB  
Approved: ADB  
Date: 15/04/2021

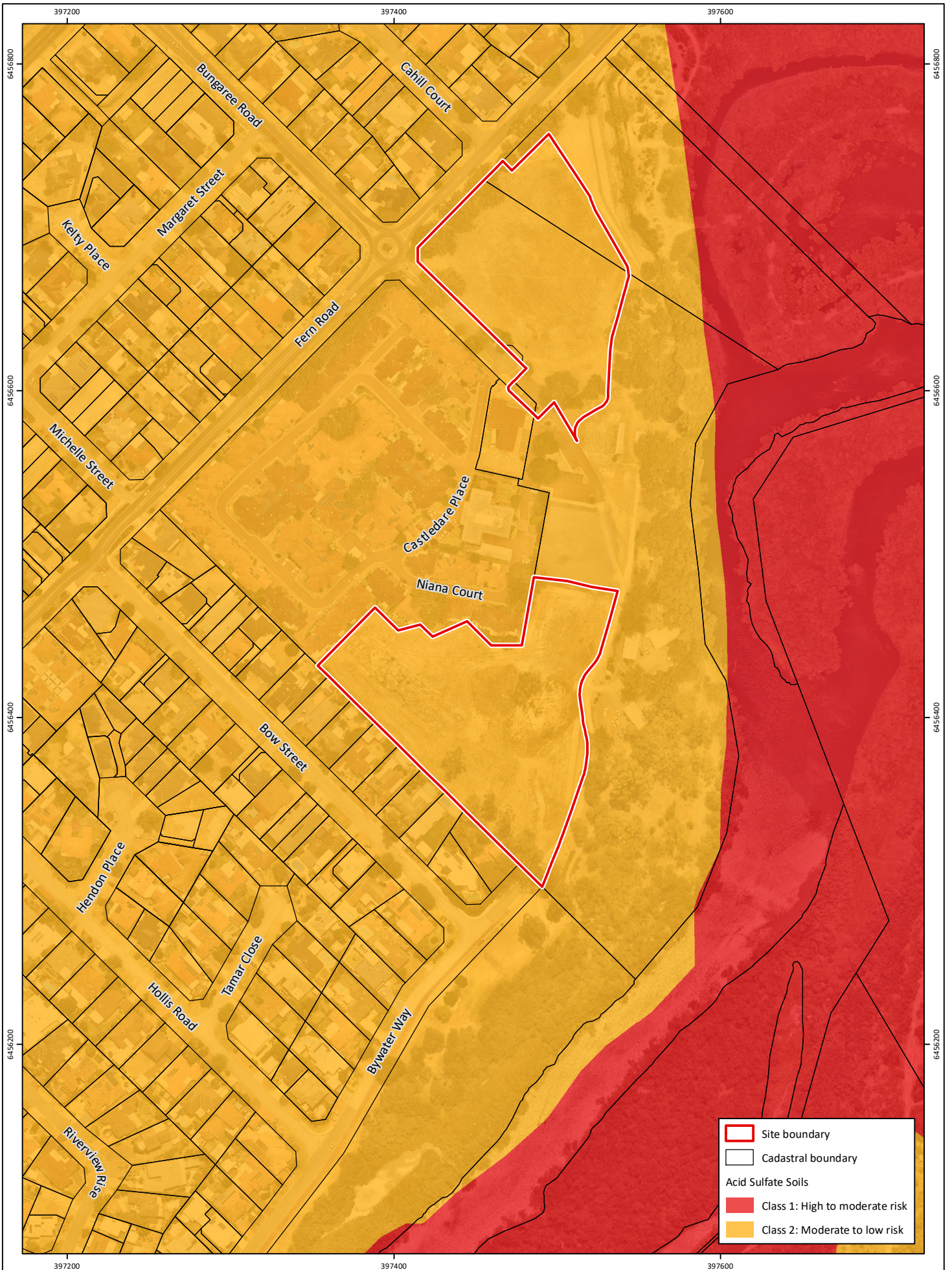


0 20 40 60 80  
Metres  
Scale: 1:3,000@A4  
GDA 1994 MGA Zone 50



**Project:** Environmental Assessment and Management Strategy  
Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

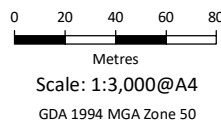




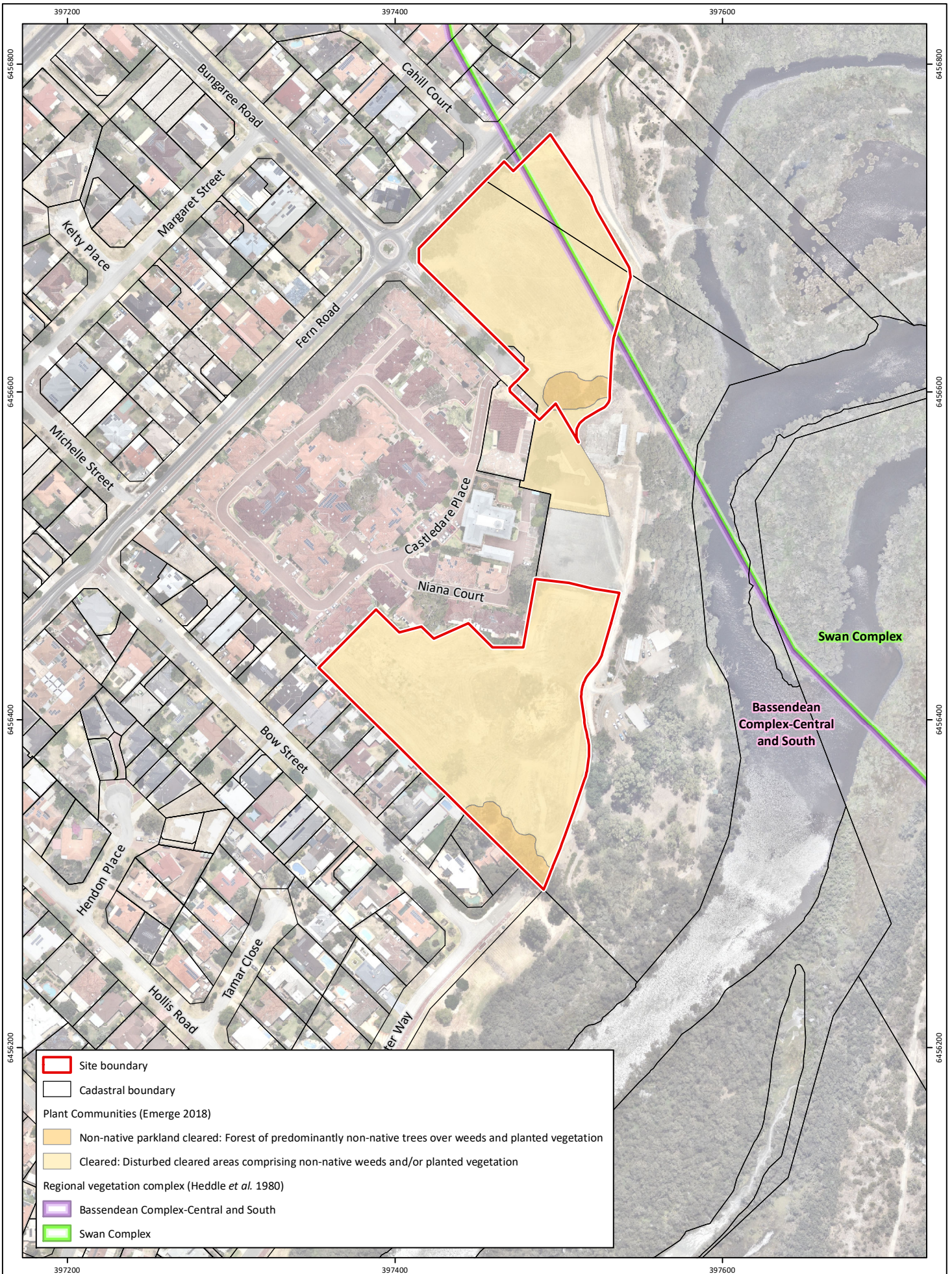
**Figure 4: Acid Sulfate Soil Mapping**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(02)--F16a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021



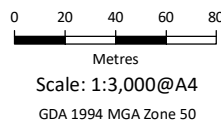




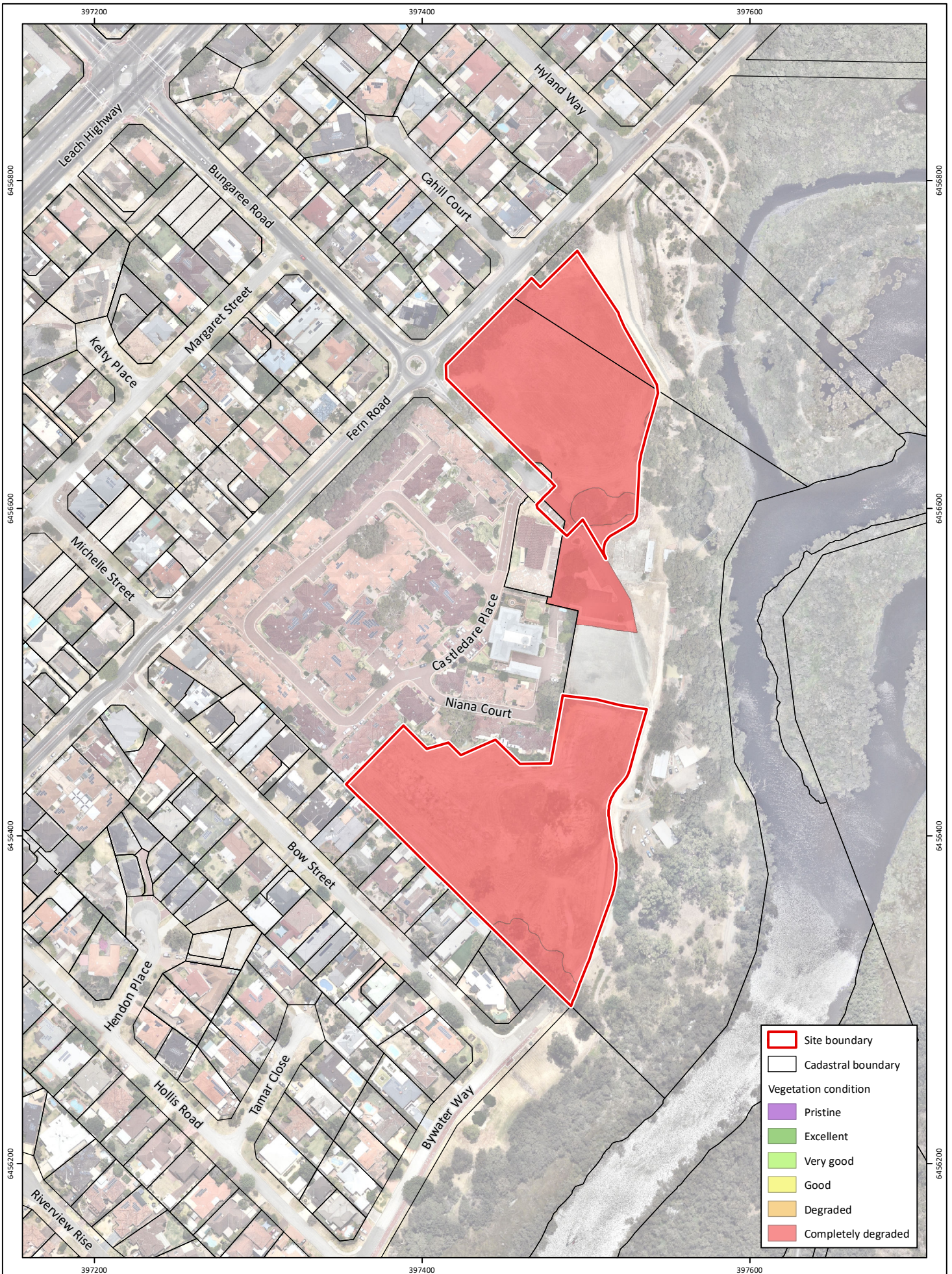
**Figure 5: Plant Communities**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:**  
 EP21-006(02)--F17a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021







**Figure 6: Vegetation Condition**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

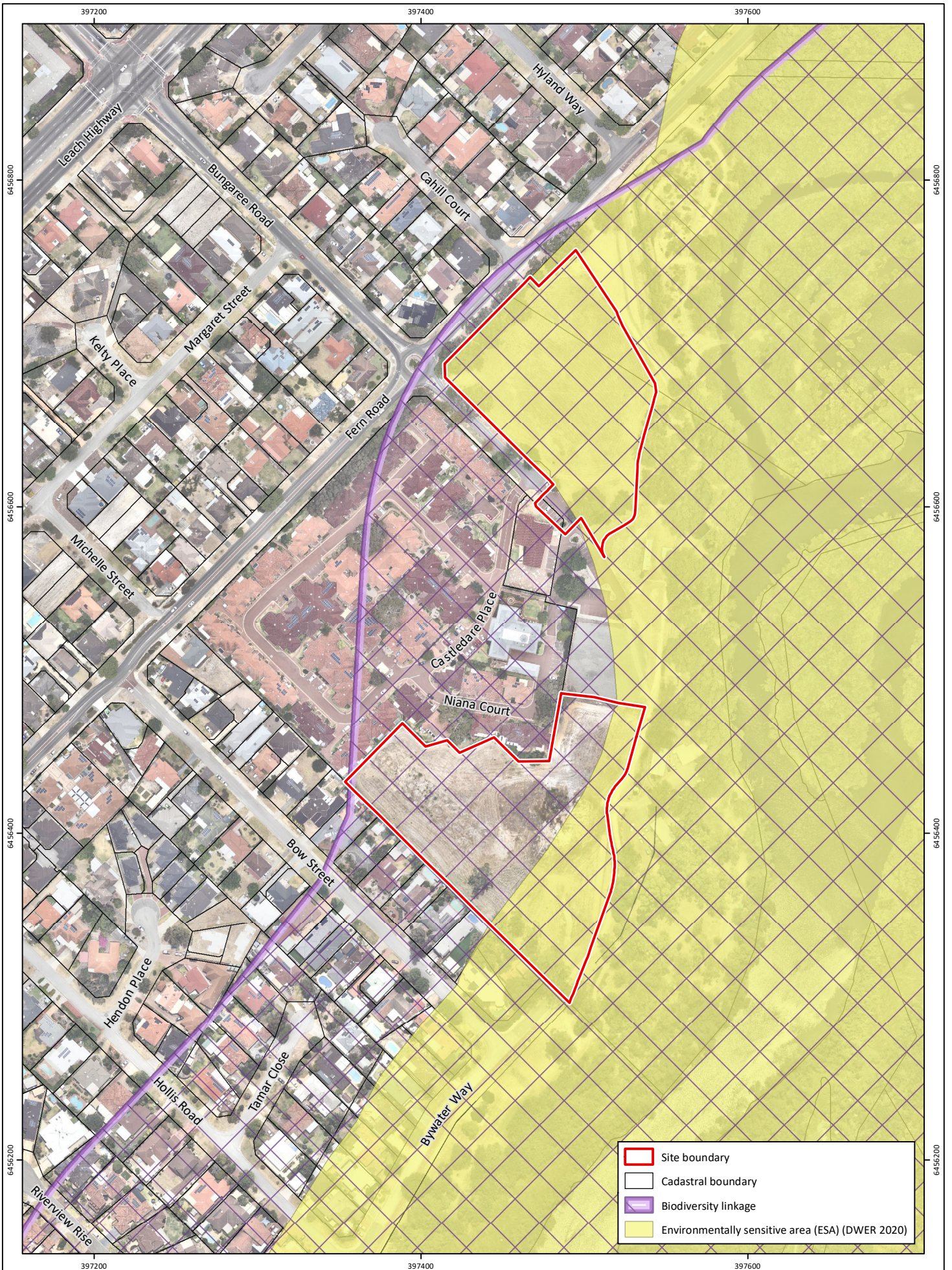
**Plan Number:** EP21-006(02)-F18a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021



0 20 40 60 80  
 Metres  
 Scale: 1:3,000@A4  
 GDA 1994 MGA Zone 50



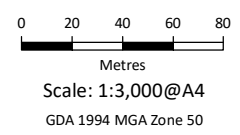




**Figure 7: Environmental Features**

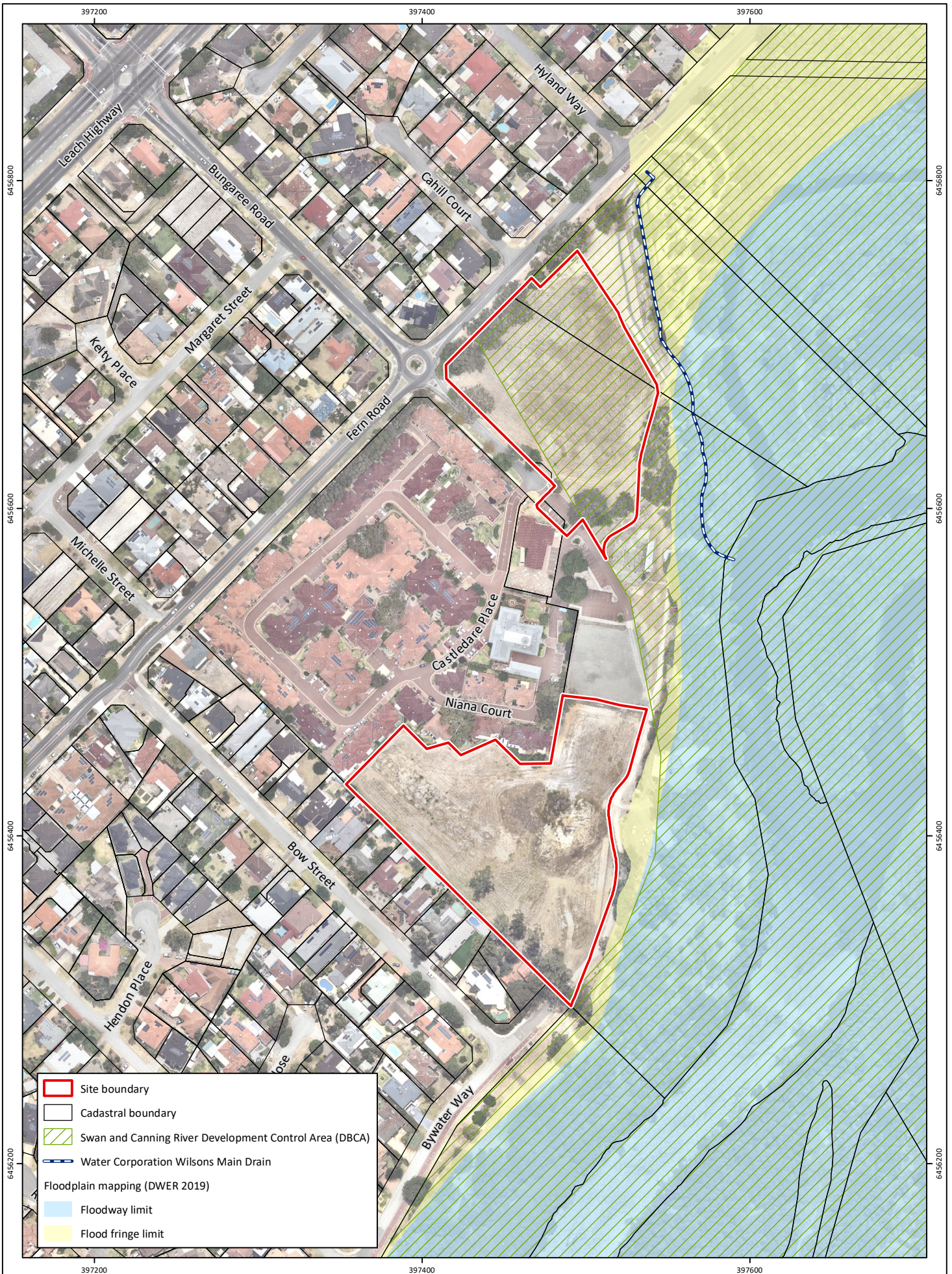
**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(02)-F19a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021



While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used.  
 © Landgate (2021). Nearmap Imagery date: 3/01/2021





	Site boundary
	Cadastral boundary
	Swan and Canning River Development Control Area (DBCA)
	Water Corporation Wilsons Main Drain
Floodplain mapping (DWER 2019)	
	Floodway limit
	Flood fringe limit

**Figure 8: Hydrological Features**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

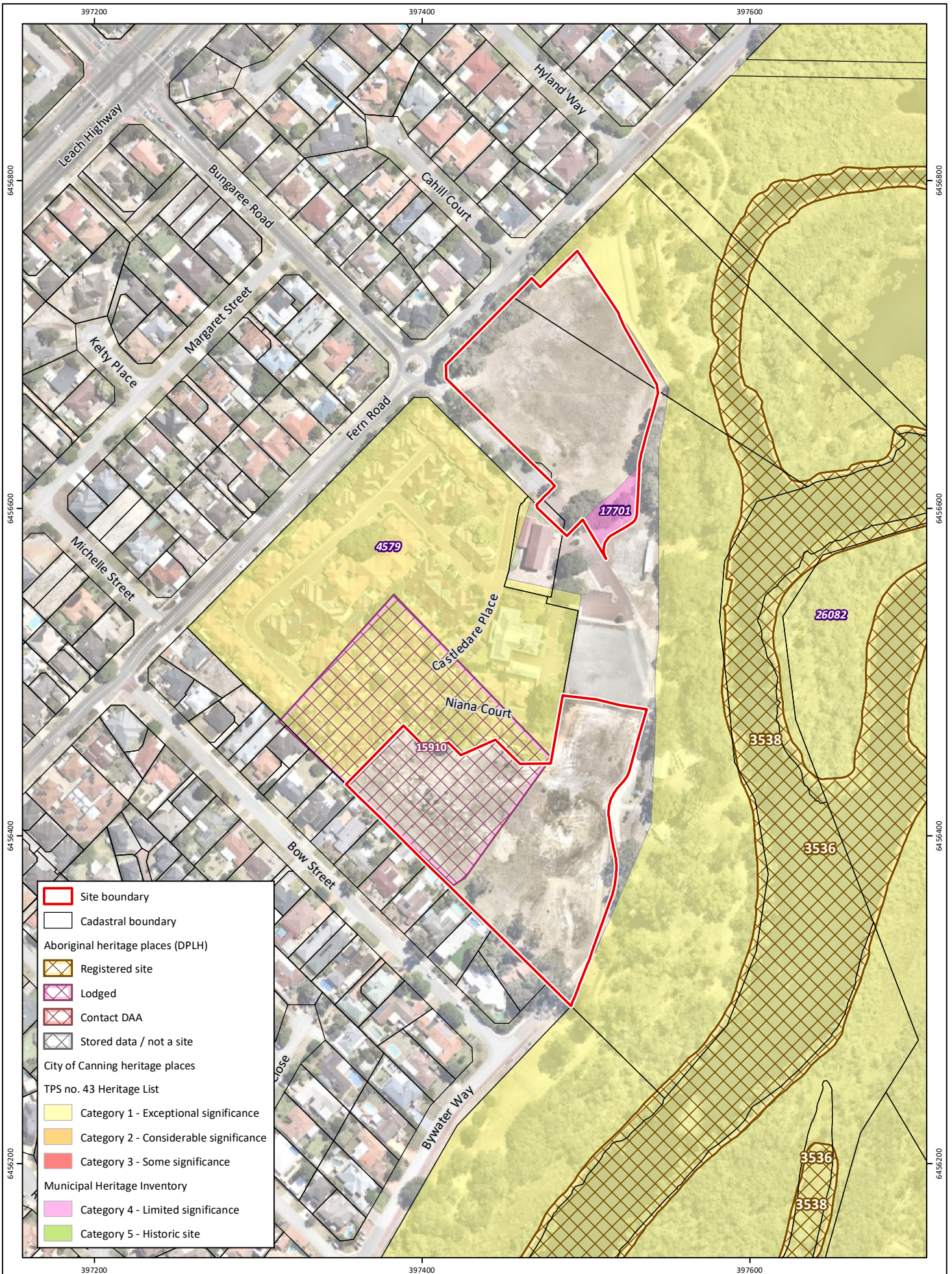
**Plan Number:** EP21-006(02)--F20a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021

0 20 40 60 80  
 Metres  
 Scale: 1:3,000@A4  
 GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.  
 ©Landgate (2021). Nearmap Imagery date: 3/01/2021





**Figure 10: Heritage Places**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

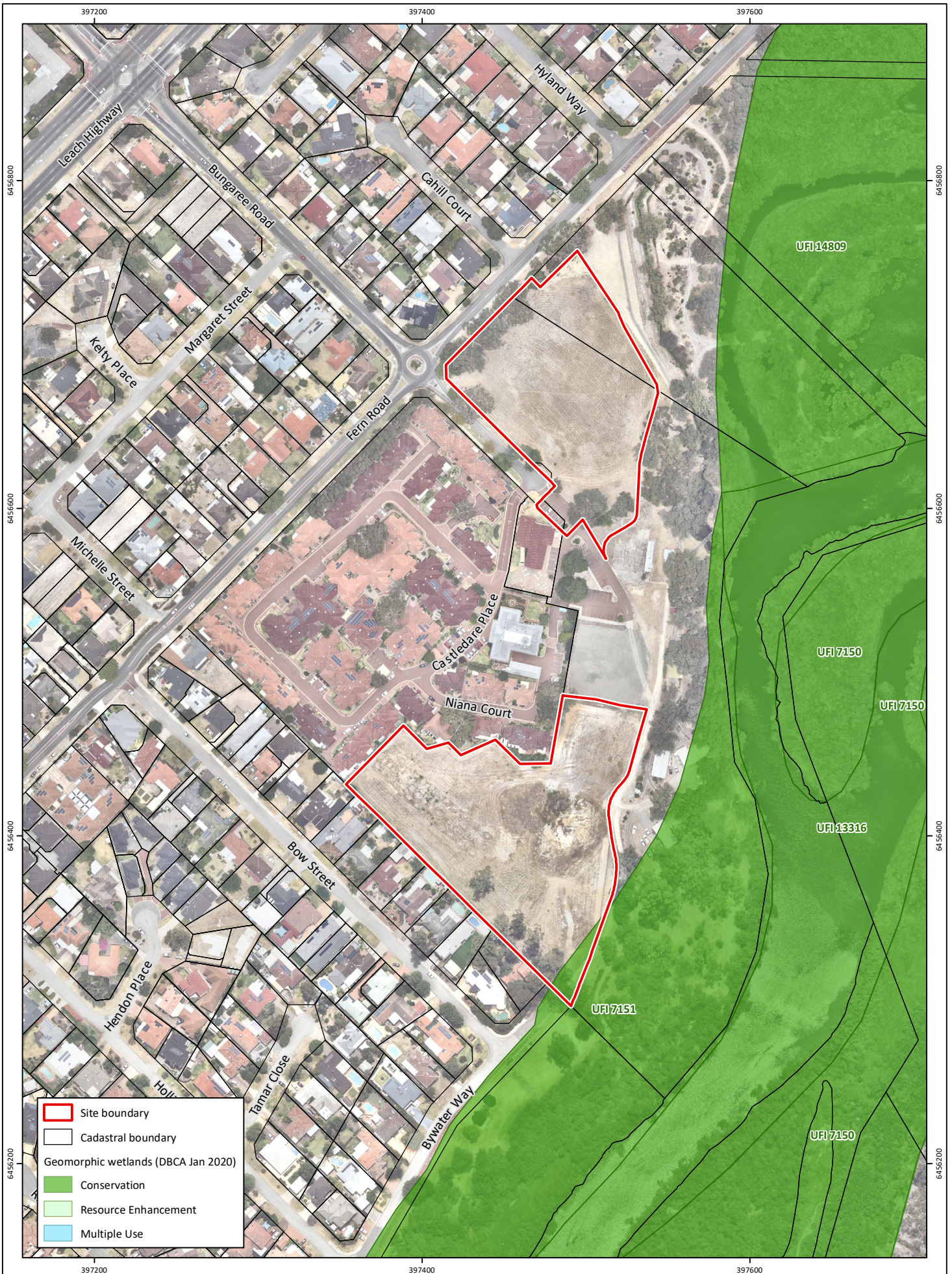
**Plan Number:** EP21-006(02)-F21a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021



0 20 40 60 80  
 Metres  
**Scale: 1:3,000@A4**  
 GDA 1994 MGA Zone 50



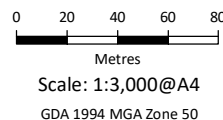




**Figure 9: Wetland Features**

**Project:** Environmental Assessment and Management Strategy  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(02)-F22a  
**Drawn:** GAR  
**Date:** 15/04/2021  
**Checked:** BRB  
**Approved:** ADB  
**Date:** 15/04/2021



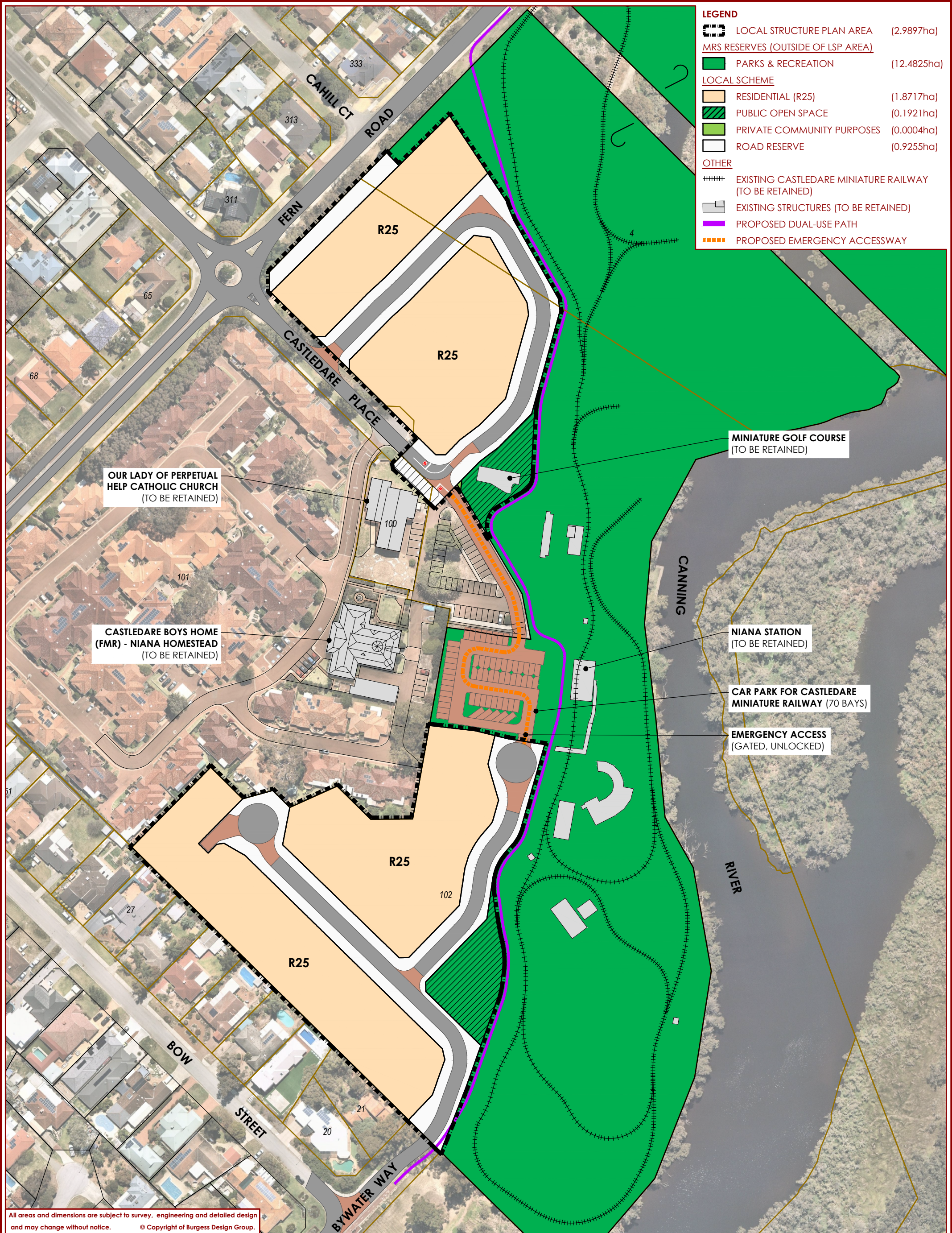


# Appendix A

Castledare Local Structure Plan (Burgess Design Group 2021)



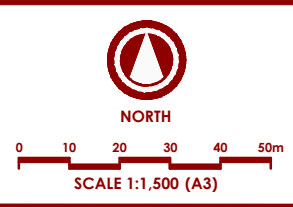




**LEGEND**

	LOCAL STRUCTURE PLAN AREA	(2.9897ha)
	MRS RESERVES (OUTSIDE OF LSP AREA)	
	PARKS & RECREATION	(12.4825ha)
<b>LOCAL SCHEME</b>		
	RESIDENTIAL (R25)	(1.8717ha)
	PUBLIC OPEN SPACE	(0.1921ha)
	PRIVATE COMMUNITY PURPOSES	(0.0004ha)
	ROAD RESERVE	(0.9255ha)
<b>OTHER</b>		
	EXISTING CASTLEDARE MINIATURE RAILWAY (TO BE RETAINED)	
	EXISTING STRUCTURES (TO BE RETAINED)	
	PROPOSED DUAL-USE PATH	
	PROPOSED EMERGENCY ACCESSWAY	

All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.



**PLAN 1: STRUCTURE PLAN MAP  
CASTLEDARE LOCAL STRUCTURE PLAN  
LOT 4 FERN RD & LOTS 100 & 102  
CASTLEDARE PL, WILSON**



# Appendix B

Wetland and Waterway Assessment (Emerge Associates  
2019)



Document Reference: EP18-019(02)--004B TAA

Emerge contact: Tom Atkinson

7 May 2019

PERTH OFFICE  
Suite 4, 26 Railway Road  
Subiaco  
Western Australia 6008

P +61 8 9380 4988  
F +61 8 9380 9636  
emergeassociates.com.au

Emerge Environmental Services Pty Ltd ABN  
57144772510 trading as Emmerge Associates

Attention: Catherine Prideaux  
Department of Biodiversity, Conservation and Attractions  
17 Dick Perry Avenue, Technology Park, Western Precinct  
Kensington WA 6151

*Delivered by email to: [Catherine.Prideaux@dbca.wa.gov.au](mailto:Catherine.Prideaux@dbca.wa.gov.au); [pdockett@rnoble.com.au](mailto:pdockett@rnoble.com.au);  
[jacey.mills@dbca.wa.gov.au](mailto:jacey.mills@dbca.wa.gov.au); [rivers.planning@dbca.wa.gov.au](mailto:rivers.planning@dbca.wa.gov.au)*

Dear Catherine

## **WETLAND AND WATERWAY ASSESSMENT – LOT 4 AND 102 FERN ROAD, WILSON**

### **1 INTRODUCTION**

The Trustees of the Christian Brothers in Western Australia Inc (Christian Brothers) intend to develop Lot 4 Fern Road and Lot 102 Castledare Place in Wilson for residential purposes. These lots (referred to herein as ‘the site’) are located approximately seven kilometres (km) south-east of the Perth Central Business District within the City of Canning, as shown in **Figure 1**.

The site extends over approximately 7.97 hectares and includes land that is currently zoned ‘urban’ and ‘parks and recreation’ in the *Metropolitan Region Scheme* (MRS). An amendment to the MRS was previously proposed within the site that reallocated land to urban and parks and recreation uses (*Burgess Design Group 2017*).

Preliminary comments on the proposed scheme amendment provided by the Department of Biodiversity Conservation and Attractions (DBCA) indicated that specific additional areas of land could be retained as ‘parks and recreation’ to provide an improved buffer to conservation category wetland features within the site (Benson Todd (DBCA) letter to the Western Australian Planning Commission (WAPC) dated 12 October 2018).

#### **1.1 Purpose and scope of work**

Emerge Associates (Emerge) were engaged by Richard Noble & Company to undertake a wetland and waterway assessment within and adjacent to the site to characterise wetland and waterway values such that the implications of the proposed amendment to parks and recreation reserve within the site can be better understood.

As part of this scope of work the following tasks were undertaken:

- A desktop review of relevant information pertaining to the site and surrounds.

- A field survey of the site and adjoining land along the Canning River<sup>1</sup>.
- Mapping of wetland landforms and assessment of wetland values.
- Review of the parks and recreation reserve identified in the *Metropolitan Region Scheme* to protect values of Canning River adjacent to the site.
- Provision of recommendations to ensure appropriate wetland and waterway management outcomes can be accommodated in the development proposal.
- Documentation of the assessment methodology, results and recommendations into a report.

## 2 METHODS

### 2.1 Desktop review

Sources used in the review of relevant information included the following:

- *Determining foreshore reserves* (WRC 2001)
- *FloraBase—the Western Australian Flora* (Western Australian Herbarium 2018)
- *Geology and Landforms of the Perth Region* (Gozzard 2007)
- *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2018)
- *Hydrography Features* dataset (DWER 2018)
- *Protected Matters Search Tool* (DoEE 2018a)
- *Metropolitan Region Scheme* (WAPC 2017)
- *NatureMap* (DPaW 2018a)
- *Swan Canning Riverpark Development Control Area* (Government of WA 2006)
- *Operational Policy 4.3: Identifying and establishing waterways foreshore areas* (DoW 2012)
- *Proposed MRS Zoning Summary Lots 4 Fern Road & 102 Castledare Place Wilson* (Burgess Design Group 2017).

### 2.2 Field survey

An ecologist from Emerge Associates undertook a field survey on 14 February and 11 March 2019. During the survey the site was traversed by foot and changes in landform, soils, vegetation composition and vegetation condition were noted. The locations of significant features was recorded using a hand-held GPS receiver and digital camera. An inventory of flora species observed was recorded and the condition of the vegetation was assessed using methods from Keighery (1994).

Identification of flora species was completed in the field and through comparison with taxonomic guides and databases. Flora species not native to Western Australia were denoted by an asterisk (\*) in text and raw data.

### 2.3 Mapping and data analysis

The local plant communities within the site were identified from the species data collected during the field survey, as well as, information about landforms and soils (Gozzard 2007).

Once a group was defined, the vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (ESCAVI 2003). The identified plant communities were then mapped on aerial photography (1:4,000) from survey data and boundaries interpreted from aerial photography. Vegetation condition was

---

<sup>1</sup>To standard required of a reconnaissance survey under Environmental Protection Authority (EPA) 2016, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth.



mapped on aerial photography (1:4,000) based on notes and images recorded during the field survey.

Wetland features in the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2018) that are mapped within the site were assessed against vegetation and landform information obtained during the survey. A wetland assessment was then completed for each wetland feature based on updated boundaries using the Department of Biodiversity and Conservation and Attractions' (DBCA's) *A methodology for the evaluation of wetlands on the Swan Coastal Plain, Western Australia* (DBCA 2017).

The biophysical assessment recommended in DWER's *Operational Policy 4.3: Identifying and establishing waterways foreshore areas* (DoW 2012) and the Water and Rivers Commission's *Determining foreshore reserves* (WRC 2001) provides a basis for definition of foreshore area. A foreshore area was defined using floodplain mapping (DWER 2019) and a nominal 50 metre distance from the outer edge of wetland associated native vegetation. The adequacy of the 'parks and recreation' reserve proposed in the MRS amendment for the site (*Burgess Design Group 2017*), was then compared to the boundaries of Swan Canning Riverpark 'development control area' (DCA), *Metropolitan Region Scheme* (MRS) 'parks and recreation' reserve; and to environmental features such as the boundary of Bush Forever Site 224, ecological sensitive areas, the extent of riparian vegetation and 100 year annual recurrence interval floodplain extent.

## 2.4 Survey limitations

The survey was undertaken by senior environmental consultant with knowledge of the local area and 17 years' of experience conducting wetland and waterway vegetation surveys. Technical review was undertaken by a principal environmental consultant with 20 years' experience in environmental science in Western Australia.

The survey was conducted within the summer low flow period for the Canning River and outside of the main flowering period for vegetation in the southwest of Western Australia. Nonetheless, given that the hydrological characteristics of the Canning River and adjacent wetlands are well-established and the condition of vegetation within the site was relatively easy to determine (i.e. 'completely degraded' or 'good or better'), the survey was considered sufficient to provide a representative summary of wetland and waterway values.

## 3 RESULTS

### 3.1 General site conditions

The site encompasses a relatively flat area of floodplain and wetland that abuts the Canning River. Parts of the site have been filled and re-contoured. Soils are sandy within the site (inclusive of fill sand) and tend to native alluvial loams and clays closer to the Canning River.

A relatively thin strip of remnant native vegetation occurs along much of the western bank of the Canning River within the site. To the east of the site extensive native vegetation occurs in association with the Canning River, its floodplain and associated fringing wetlands. The remaining vegetation within the site largely comprises planted non-native trees, landscaping and weed species.

An artificial drain managed by the Water Corporation has been constructed through the north west of the site. The central portion of this drain has been revegetated with native wetland plant species by the Wilson Wetland Action Group. Immediately to the east of the drain an upland/terrestrial area has also been revegetated using native species.

Buildings and infrastructure associated within the Castledare Miniature Railway occur in the south west of the site and tracks for the miniature railway extend from the south west corner around to eastern portion of the site.

### 3.2 Environmental features

The site intersects Bush Forever Site 224, a mapped environmentally sensitive area (ESA), a biodiversity linkage and DBCA managed land as shown in **Figure 2**.

### 3.3 Parks and recreation reserve

The parks and recreation reserve in the *Metropolitan Region Scheme* and proposed parks and recreation reserve from the proposed MRS amendment (Burgess Design Group 2017) are shown in **Figure 3**.

### 3.4 Mapped wetlands

The *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2018) shows four floodplain wetland features within the site including:

- conservation category wetland UFI 7151
- conservation category wetland UFI 14809
- conservation category wetland UFI 13316
- multiple use category wetland UFI 14810.

The location of the mapped wetland features is shown in **Figure 4**.

### 3.5 Flora

A total of 30 native, 35 planted native, 40 non-native and 11 planted non-native flora species were recorded within the site. None of the flora species recorded are threaten or priority species or declared pests.

A list of flora species recorded is provided as **Attachment 1**.

### 3.6 Vegetation

Vegetation within the site was determined to represent two native plant communities 'ErMr' and 'Jk' with the remainder comprising 'revegetation', 'non-native parkland cleared' and 'cleared', as described in **Table 1** and shown in **Figure 5**.

**Table 1: Plant communities present within the site**

Plant community	Description	Area (ha)
ErMr	Forest of <i>Eucalyptus rudis</i> over <i>Melaleuca raphiophylla</i> , <i>Casuarina obesa</i> over <i>Juncus kraussii</i> , non-native grasses and native and non-native herbs.	7.48
Jk	Sedgeland of <i>Juncus kraussii</i>	0.39
Revegetation	Shrubland of mixed planted native species.	0.69
Non-native parkland cleared	Forest of predominantly non-native trees over weeds and planted vegetation ( <b>Plate 4</b> ).	2.14
Cleared	Disturbed cleared areas comprising non-native weeds and/or planted vegetation ( <b>Plate 4</b> ).	4.49



***Plate 1: Plant community ErMr in 'very good' condition***



***Plate 2: Plant community Jk in 'very good' condition***





***Plate 3: Plant community revegetation.***



***Plate 4: Plant community 'non-native parkland cleared' in 'completely degraded' condition.***





**Plate 5: Plant community ‘cleared’ in ‘completely degraded’ condition.**

### 3.7 Vegetation condition

The vegetation within the site was determined to range from ‘very good’ to ‘completely degraded’ condition. The majority of the site was classified as being in ‘very good - good condition’. This compound condition category was applied as the interior of much of the wetland area in the east of the site was not traversed during the survey. It was nonetheless assumed that these areas comprised a combination of relatively intact and sometimes degraded vegetation which, when viewed collectively at larger scale, may be considered to be present in good or better condition. The extent of vegetation by condition category is detailed in **Table 2** and shown in **Figure 6**.

**Table 2: Vegetation condition categories within the site**

Condition category (Keighery (1994))	Size (ha)
Very good	0.47
Very good - good	7.33
Completely degraded	6.63
Revegetation	0.69

### 3.8 Wetland and waterways

#### 3.8.1 UFI 7151

Wetland feature UFI 7151 is associated with a section of the Canning River. It is classified as an estuary-peripheral basin (which implies potential for tidal influence). The extent of the UFI 7151 in relation to the site is shown on **Figure 4**. A representative image of UFI 7151 is provided in **Plate 5**.



**Plate 6: Example area within wetland feature UFI 7151**

Based on the mapped extent of the Canning River floodplain and the extent of wetland associated vegetation the boundary of wetland feature UFI 7151 is inaccurate<sup>2</sup>. The wetland assessment for the portion of UFI 7151 adjacent to the site indicated that it comprises values representative of the ‘conservation’ management category that is currently assigned (refer to evaluation output provided in **Attachment 2**).

### 3.8.2 UFI 14809

Wetland feature UFI 14809 is associated with a section of the Canning River. It is classified as a floodplain (which implies seasonal inundation). Based on the current extent of wetland associated (or riparian) vegetation the boundary of wetland feature UFI 14809 is also inaccurate<sup>2</sup>. The wetland assessment for UFI 14809 indicated that it comprises values representative of the ‘conservation’ management category that is currently assigned (refer to evaluation output provided in **Attachment 2**). A representative image of UFI 14809 is provided in **Plate 6**.

---

<sup>2</sup> It is not unusual for the boundaries of wetland features to be inconsistent with physical wetlands as the *Geomorphic Wetlands of the Swan Coastal Plain* dataset was drawn at a relatively coarse, regional scale.





**Plate 7: Example area within wetland feature UFI 14809**

### 3.8.3 UFI 13316

Wetland feature UFI 13316 is associated with a section of the Canning River. It is classified as estuary-waterbody basin (which implies marine and/or tidal influence). The extent of UFI 13316 within the site is minimal and lies outside of the proposed MRS amendment area and was therefore not further assessed.

### 3.8.4 UFI 14810

Wetland feature UFI 14810 is associated with a section of the Canning River. It is classified as a floodplain (which implies seasonal inundation). The extent of UFI 13316 within the site is relatively small and lies outside of the proposed MRS amendment area and was therefore not further assessed.

### 3.8.5 Waterways

The Canning River waterway channel adjacent to the site is well defined. The vegetation associated with the Canning River comprises plant community **ErMr** (refer **Figure 5**) which is present in 'good to very good' and 'very good' condition (refer **Figure 6**).

The 100 year ARI floodplain intersects portions of the site adjacent to the Canning River.

## **4 REVIEW OF THE ADEQUACY OF THE PARKS AND RECREATION RESERVE PROPOSED IN THE MRS AMENDMENT**

According to biophysical assessment recommended in DWER's *Operational Policy 4.3: Identifying and establishing waterways foreshore areas* (DoW 2012) and the Water and Rivers Commission's *Determining foreshore reserves* (WRC 2001) when delineating a foreshore area reference should be made to both hydrology and riparian vegetation. For this assessment the 100 Year ARI floodway, native riparian vegetation and a 50 m buffer from the outer extent of native riparian vegetation were used as basis for defining a foreshore area for the Canning River and associated wetlands within the site. The 50 m buffer was applied as this nominal distance is typically requested by the DBCA in relation to management of conservation category wetland.

The land that would be required to provide a reserve that encompasses this foreshore area falls almost entirely within the parks and recreation reserve proposed in the MRS amendment as shown in **Figure 7**.

The parks and recreation reserve proposed in *MRS Amendment* does not contain the identified foreshore area in two locations:

1. In the southern end of the site the road network connection precludes extending a parks and recreation reserve to the full extent of 50 m buffer from native vegetation.
2. In the north western side of the site urban land use is proposed to be located within the nominal 50m buffer on the basis that asbestos remediation has been completed in this area and the proposed layout achieves desirable urban design outcome.

These two exceptions to the 50 m buffer approach would result in a smaller buffer distance between the outer edge of native riparian vegetation and proposed urban landuses. However, a buffer would remain of approximately 30 m in these locations, which is likely to provide a similar if not equivalent benefit as a 50 m buffer. Therefore the two exceptions are not considered to pose any significant risk to the values of the Canning River or associated wetlands within the site.

Richard Noble has indicated considerable effort has been applied to remediate asbestos contamination within the site and the remediate forms the basis for the proposed urban zoning boundary. Due to benefit provided by asbestos remediation and the low risk that reducing buffer distance in two localised areas would pose, the parks and recreation reserve proposed in the MRS amendment (Burgess Design Group 2017), is therefore considered adequate to protect the waterway values of the Canning River within and adjacent to the site.

## 5 CONCLUSIONS AND RECOMMENDATIONS

Based on our assessment we found the following:

- The site contains relatively flat, low-lying landforms that include floodplain, estuary and near estuary wetland features, as well as, upland/terrestrial land. Parts of the site have been filled including areas that have been remediated for historical asbestos contamination.
- The vegetation within and adjacent to the site is present in 'very good' to 'completely degraded' condition. The vegetation is not considered to represent any listed TEC or PEC.
- The areas of native vegetation in very good to good condition are associated with wetland feature UFI 14809 and UFI 7151. These features are mapped as a conservation category wetlands. When assessed at the scale that each feature is drawn both have values that are representative of a conservation category wetland. However, only the portion of UFI 14809 within the site has values representative of conservation category wetland. UFI 7151 has lower values as vegetation within the portion of this feature within the site has a modified landform and largely contains vegetation in completely degraded condition.
- The parks and recreation reserve proposed in the MRS amendment for the site is considered adequate to protect the waterway values of the Canning River adjacent to the site.

### Summary and closing

We trust that this letter provides a comprehensive summary of the wetland and waterway values relevant to the site and adequacy of the parks and recreation reserve proposed in the MRS amendment to protect values associated with the section of Canning River and associated wetlands within the site.

Should you have any questions regarding the content of this letter, please do not hesitate to contact the undersigned.

Yours sincerely  
Emerge Associates



**Tom Atkinson**

SENIOR ENVIRONMENTAL CONSULTANT, TEAM LEADER - ECOLOGY

cc: Peter Dockett, Senior Development Manager, Richard Noble & Company  
Jacey Mills, A/Manager, Statutory Assessments, Rivers and Estuaries Branch, DBCA  
[rivers.planning@dbca.wa.gov.au](mailto:rivers.planning@dbca.wa.gov.au)

Encl: Figure 1: Site Location  
Figure 2: Environmental Features  
Figure 3: Existing MRS Parks and Recreation Reserve and Proposed MRS Amendment  
Figure 4: Hydrological Features  
Figure 5 Plant Communities  
Figure 6: Vegetation Condition  
Figure 7: Proposed MRS Amendment Review Inputs

Attachment 1 – Flora Species List

Attachment 2 – Completed Wetland Assessment Forms



## General References

- Department of Biodiversity, Conservation and Attractions (DBCA) 2017, *A methodology for the evaluation of wetlands on the Swan Coastal Plain*, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.
- Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.
- Department of Water (DoW) 2012, *Operational policy 4.3: Identifying and establishing waterways foreshore areas*, Perth.
- Department of Water and Environmental Regulation (DWER) 2018, *Hydrography Linear (Heirarchy) (DWER-031)*, Perth.
- Environmental Protection Authority (EPA) 2016, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth.
- ESCAVI 2003, *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0*, Department of the Environment and Heritage, Canberra.
- Government of WA 2006, *Swan and Canning Rivers Management Act 2006*, Perth.
- Gozzard, J. R. 2007, *Geology and Landforms of the Perth Region*, Geological Survey of Western Australia, Perth.
- Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.
- Western Australian Planning Commission (WAPC) 2017, *Metropolitan Region Scheme*, Perth.
- Water and Rivers Commission (WRC) 2001, *Water Note 23: Determining Foreshore Reserves*, East Perth.

## Online References

- Western Australian Herbarium (2018). *FloraBase—the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. <<https://florabase.dpaw.wa.gov.au>>

# Figures



*Figure 1: Site Location*

*Figure 2: Environmental Features*

*Figure 3: Hydrological Features*

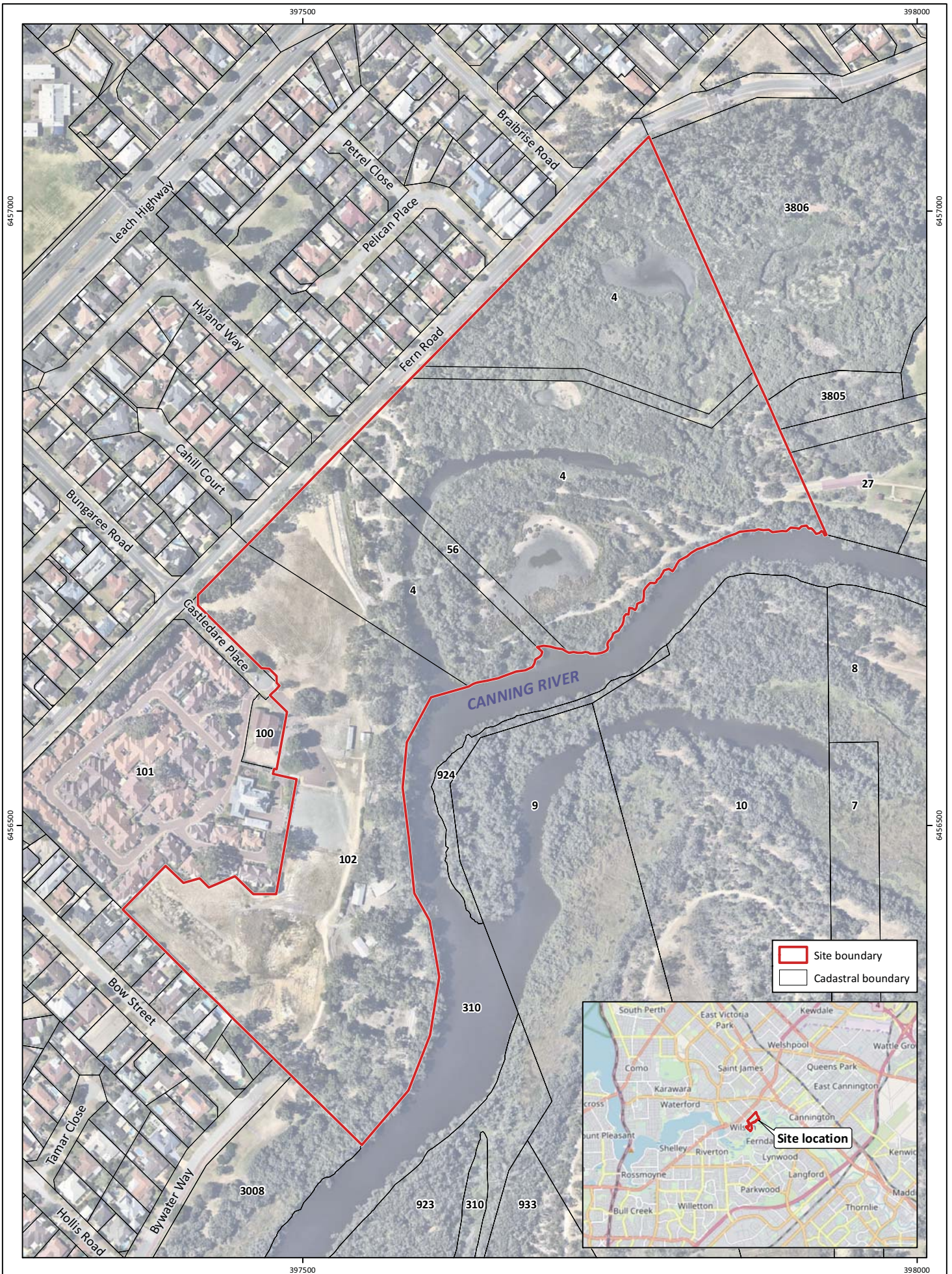
*Figure 4: Plant Communities*

*Figure 5: Vegetation Condition*

*Figure 6: Proposed Wetlands, Waterways and Buffers*







**Figure 1: Site Location**

**Project:** Wetland and Waterway Assessment  
 Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

**Plan Number:** EP18-019(02)--F13  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019

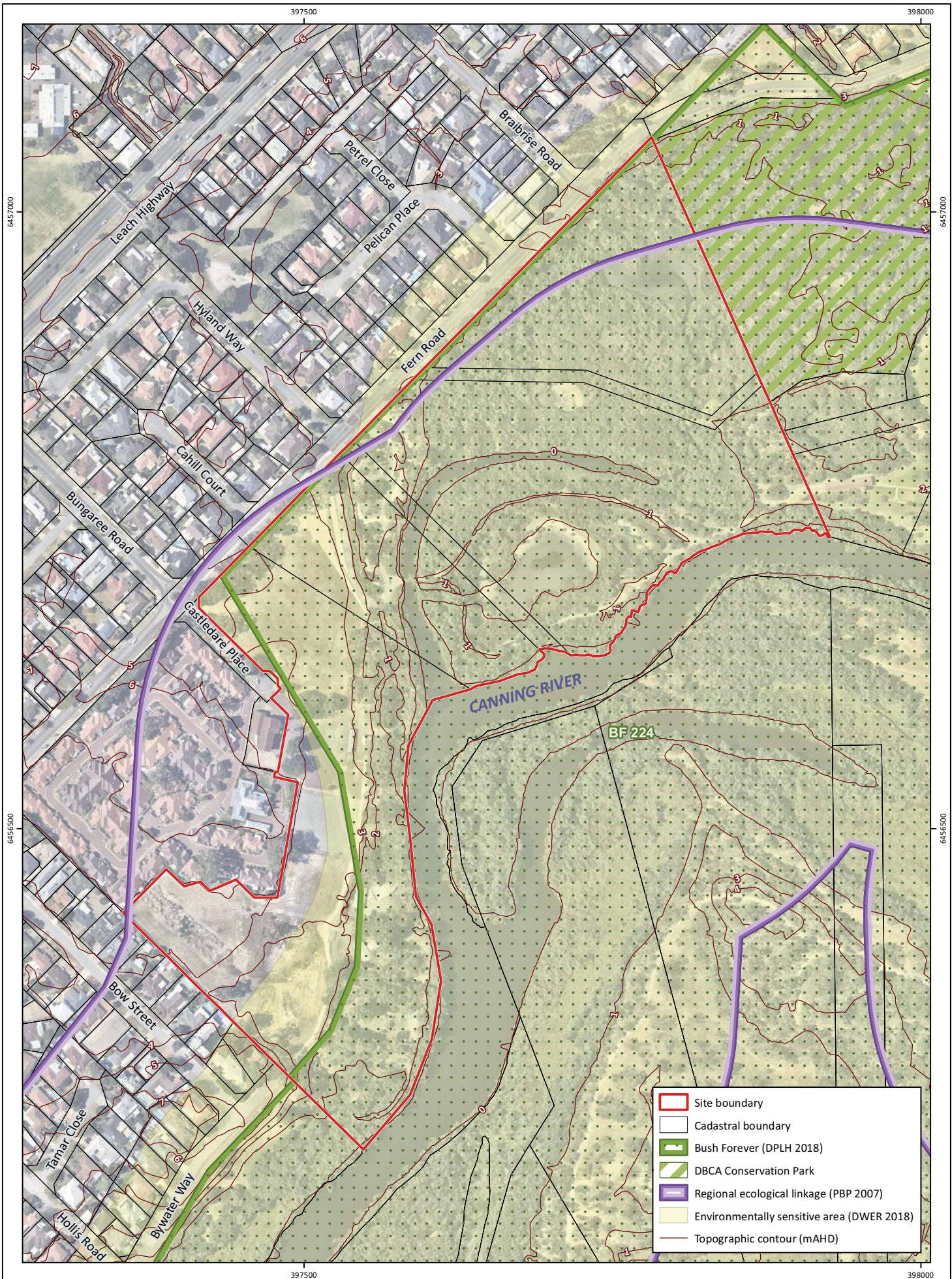


0 50 100  
 Metres  
 Scale: 1:4,000@A4  
 GDA 1994 MGA Zone 50



While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used





**Figure 2: Environmental Features**

**Project:** Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

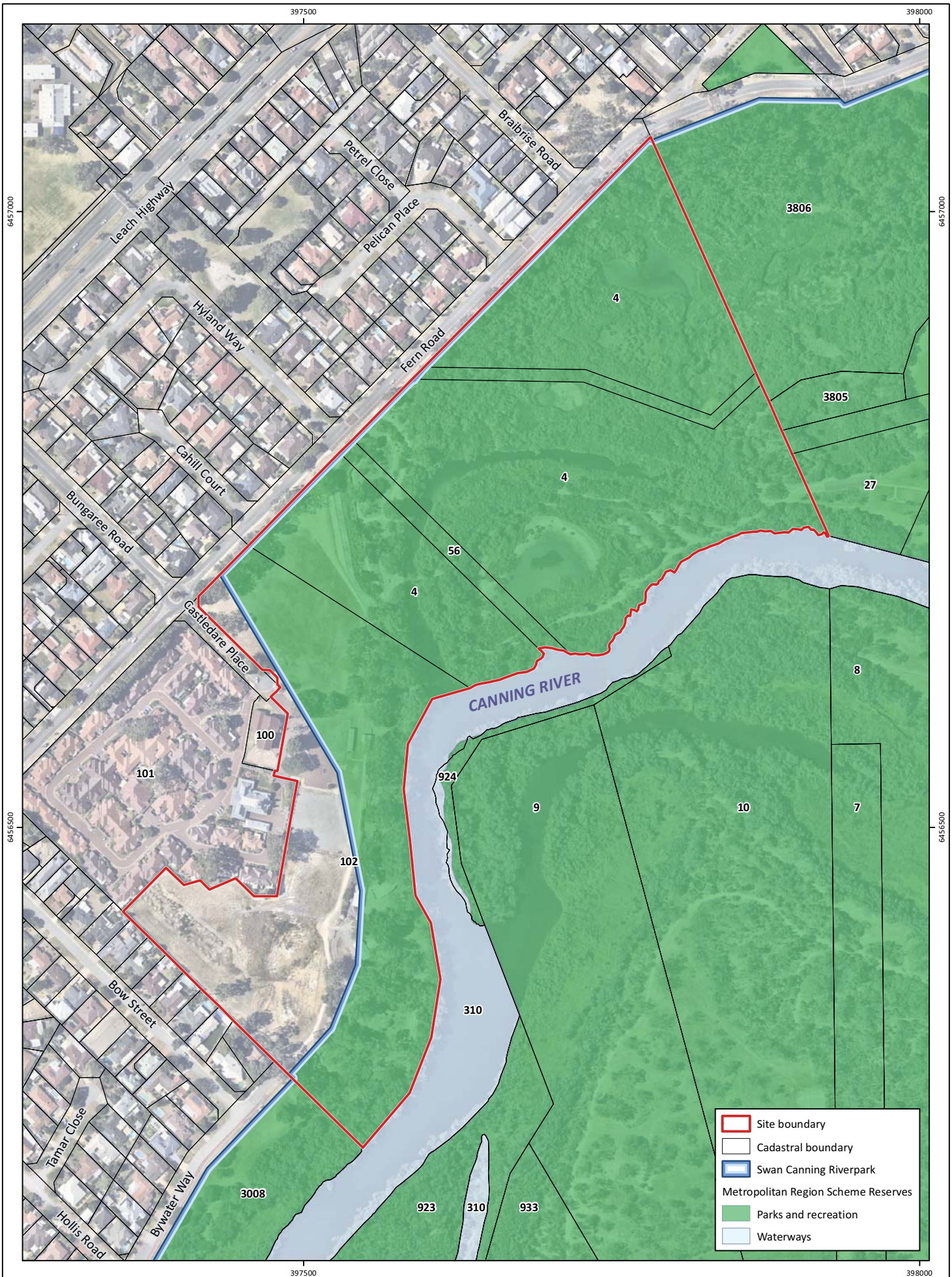
**Plan Number:** EP18-019(02)-F14  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019



0 50 100  
Metres  
Scale: 1:4,000@A4  
GDA 1994 MGA Zone 50







**Figure 3: Existing Parks and Recreation Reserve**

**Project:** Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment

**Client:** Trustees of the Christian Brothers in WA

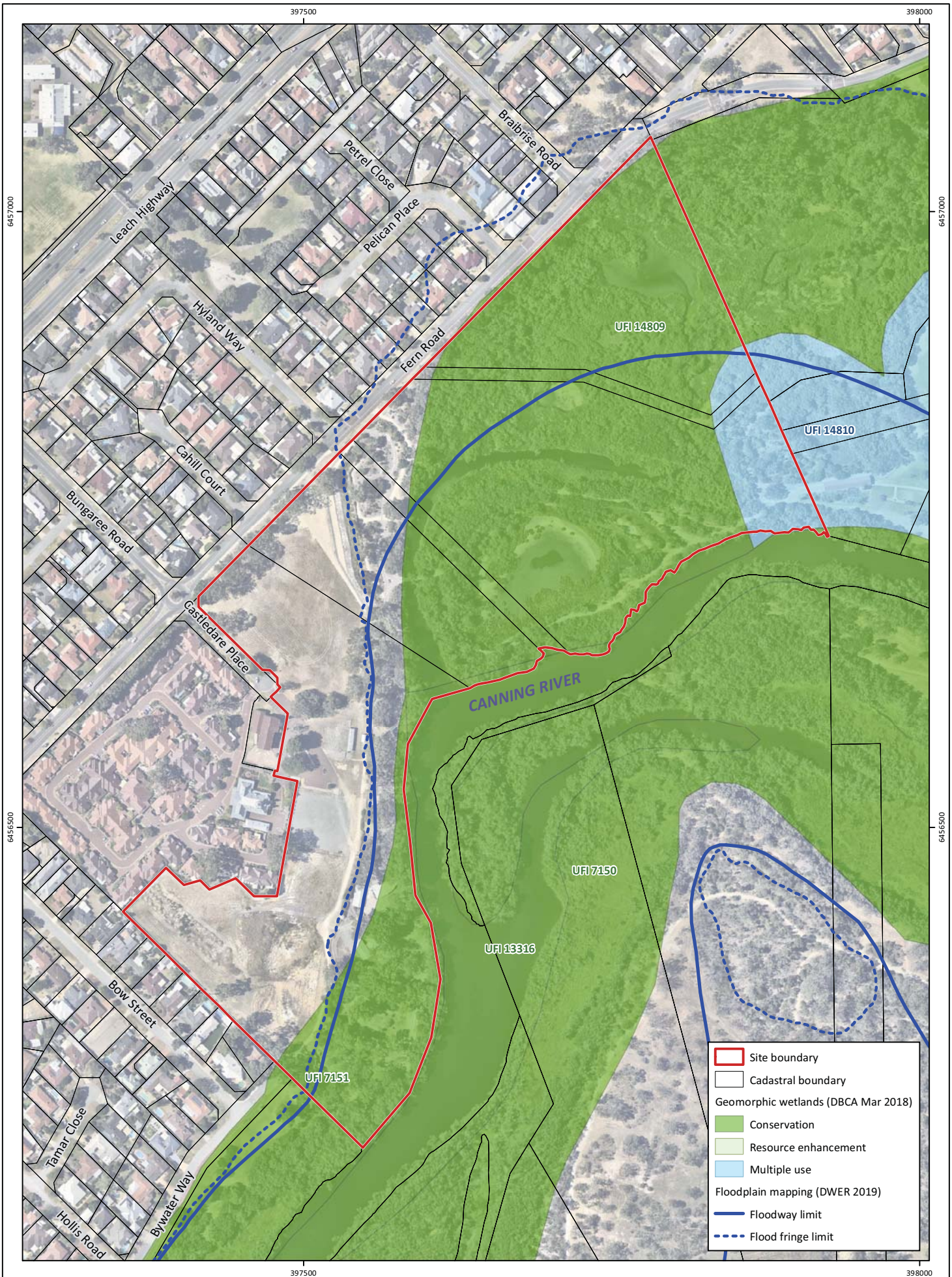
**Plan Number:** EP18-019(02)--F15  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019



0 50 100  
Metres  
Scale: 1:4,000@A4  
GDA 1994 MGA Zone 50







**Figure 4: Hydrological Features**

**Project:** Wetland and Waterway Assessment  
 Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

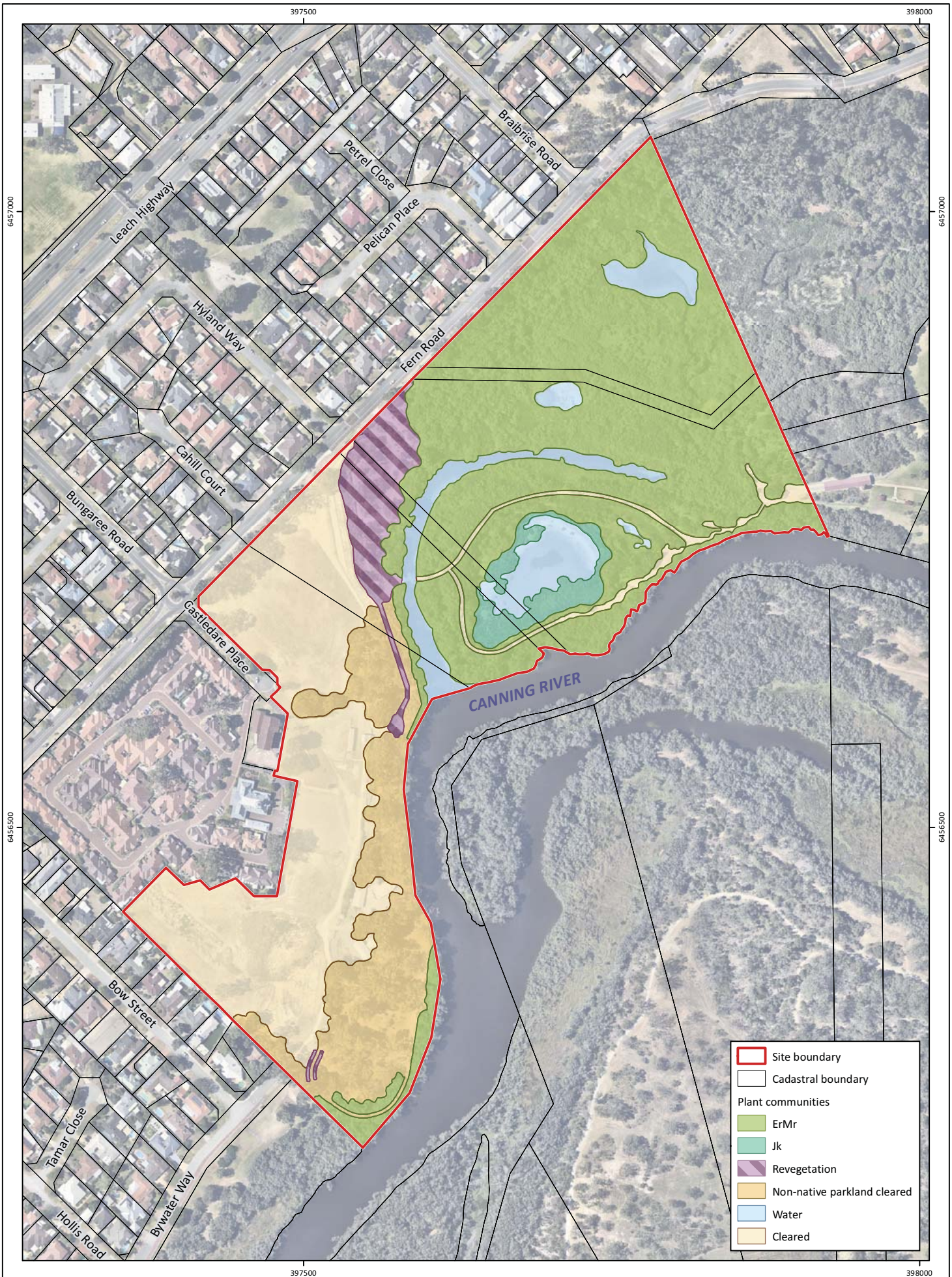
**Plan Number:** EP18-019(02)--F16  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019



0 50 100  
 Metres  
**Scale: 1:4,000@A4**  
 GDA 1994 MGA Zone 50







**Figure 5: Plant Communities**

**Project:** Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

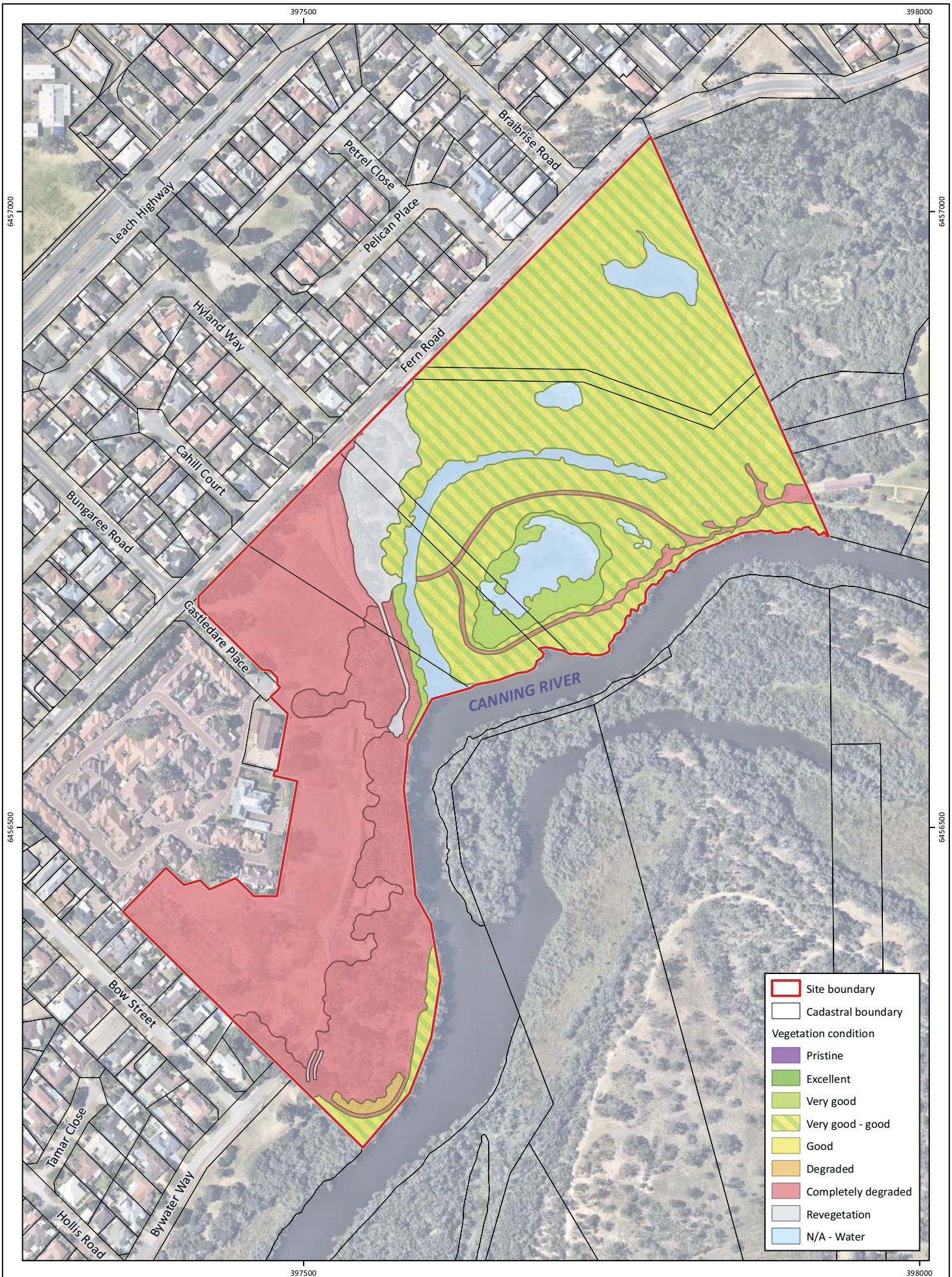
**Plan Number:** EP18-019(02)--F17  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019



0 50 100  
Metres  
Scale: 1:4,000@A4  
GDA 1994 MGA Zone 50







**Figure 6: Vegetation Condition**

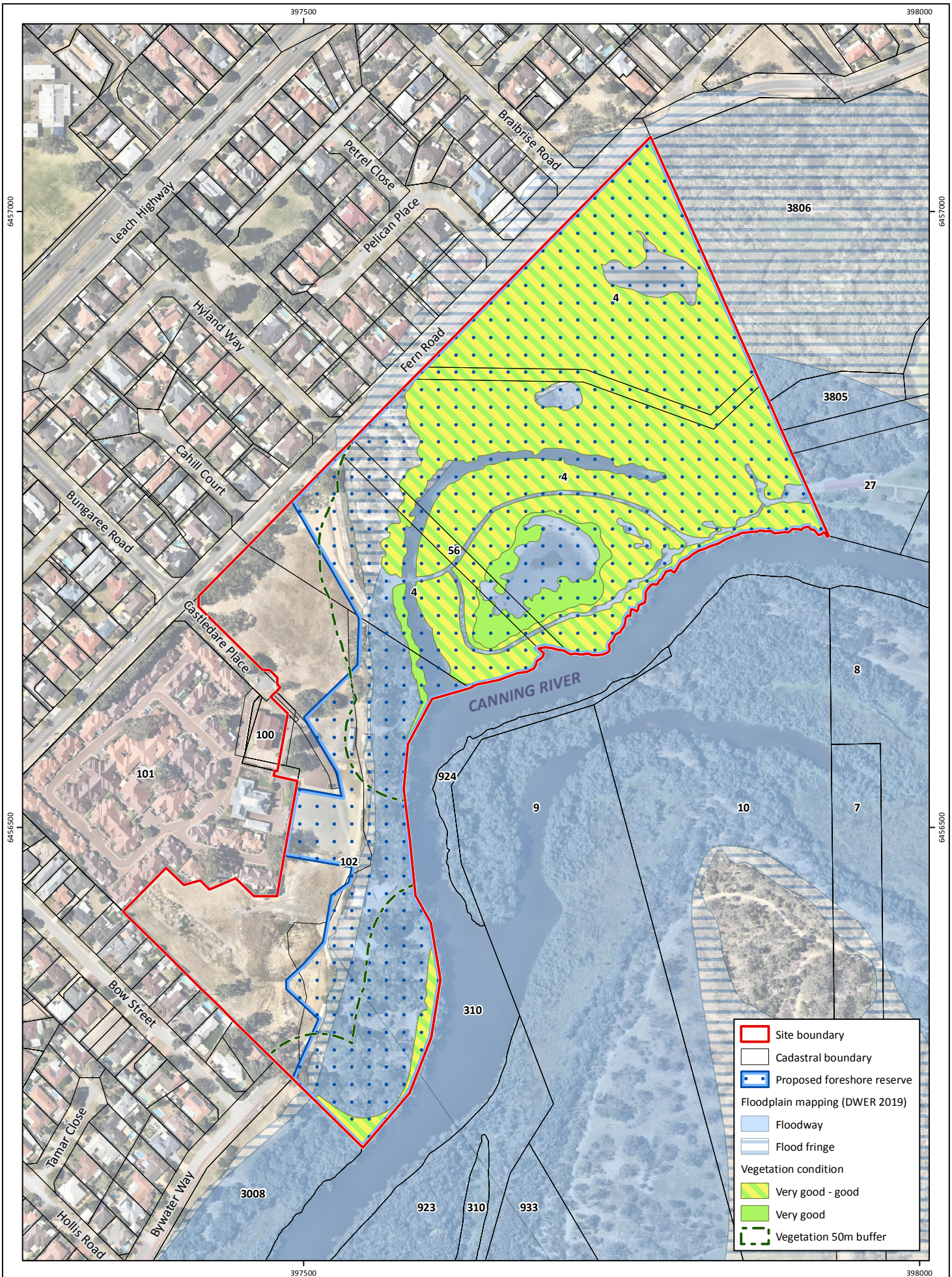
**Project:** Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment

**Client:** Trustees of the Christian Brothers in WA

**Plan Number:** EP18-019(02)--F18  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019







**Figure 7: Proposed MRS Amendment Review Inputs**

**Project:** Wetland and Waterway Assessment  
 Fern Road Wilson Scheme Amendment

**Client:** Trustees of the Christian Brothers in WA

**Plan Number:** EP18-019(02)-F22  
**Drawn:** RAO  
**Date:** 01/05/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 01/05/2019

0 50 100  
 Metres  
 Scale: 1:4,000@A4  
 GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used





# Attachment 1

Flora Species List







## Flora Species List - Fern Road Wilson

Note: \*=introduced weed species, Pl=planted

Family	Species
<b>Aizoaceae</b>	* <i>Carpobrotus edulis</i>
<b>Anacardiaceae</b>	* <i>Schinus terebinthifolia</i>
<b>Apiaceae</b>	<i>Centella asiatica</i>
<b>Arecaceae</b>	* <i>Washingtonia filifera</i>
<b>Asteraceae</b>	* <i>Conyza bonariensis</i> * <i>Hypochaeris ?glabra</i> * <i>Lactuca serriola</i> * <i>Sonchus oleraceus</i> * <i>Symphotrichum squamatum</i>
<b>Brassicaceae</b>	* <i>Lobularia maritima</i>
<b>Campanulaceae</b>	<i>Lobelia alata</i>
<b>Casurinaceae</b>	<i>Allocasuarina humilis</i> <i>Casuarina obesa</i>
<b>Chenopodiaceae</b>	* <i>Atriplex prostrata</i> <i>Salicornia quinqueflora</i> <i>?Tecticornia halocnemoides</i>
<b>Cyperaceae</b>	<i>Baumea articulata</i> <i>Baumea juncea</i> <i>Baumea preissii</i> <i>Bolboschoenus caldwellii</i> * <i>Carex divisa</i> <i>Carex fascicularis</i> * <i>Cyperus congestus</i> * <i>Cyperus papyrus</i> <i>Ficinia nodosa</i> <i>Gahnia trifida</i> <i>Lepidosperma longitudinale</i> <i>Schoenoplectus tabernaemontani</i>

**Fabaceae**

- Acacia pulchella*
- Acacia saligna*
- \* *Erythrina X sykesii*
- Gastrolobium capitatum*
- Hardenbergia comptoniana*
- Jacksonia furcellata*
- Jacksonia sternbergiana*
- Kennedia prostrata*
- \* *Lupinus* sp.
- Pl *Paraserianthes lophantha*
- \* *Trifolium ?glomeratum*
- \* *Trifolium arvense*
- \* *Trifolium campestre*
- \* *Vicia* sp.
- Viminaria juncea*

**Haemodoraceae**

- \* *Anigozanthos* sp.
- Conostylis ?aculeata*

**Hemerocallidaceae**

*Dianella revoluta* var. *divaricata*

**Iridaceae**

*Patersonia occidentalis*

**Juncaceae**

*Juncus kraussii*  
*Juncus pallidus*

**Lamiaceae**

- Pl *Hemiandra pungens*

**Lauraceae**

*Cassytha glabella*

**Malvaceae**

- \* *Hibiscus* sp.

**Meliaceae**

- \* *Melia azedarach*

**Myrtaceae**

- Adenanthos cygnorum*
- \* *Agonis flexuosa*
- Astartea scoparia*
- Pl *Callistemon* sp.
- Corymbia calophylla*



- \* *Corymbia citriodora*
- \* *Corymbia maculata*
- \* *Eucalyptus camaldulensis*
- \* *Eucalyptus cladocalyx*
- \* *Eucalyptus gomphocephala* var. *gomphocephala*
- \* *Eucalyptus grandis*
- \* *Eucalyptus robustum*
- Eucalyptus rudis*
- \* *Eucalyptus salmonophloia*
- \* *Eucalyptus* sp.
- \* *Eucalyptus todtiana*
- Hypocalymma angustifolium*
- Kunzea glabrescens*
- Melaleuca cuticularis*
- Melaleuca lateritia*
- Melaleuca raphiophylla*
- Melaleuca teretifolia*
- Melaleuca viminea*

#### **Onagraceae**

*Epilobium hirtigerum*

#### **Plantaginaceae**

- \* *Bacopa monnieri*

#### **Poaceae**

- Pl *Austrodanthonia ?caespitosa*
- \* *Avena* sp.
- \* *Briza maxima*
- \* *Briza minor*
- \* *Bromus diandrus*
- \* *Cynodon dactylon*
- \* *Ehrharta calycina*
- \* *Ehrharta longiflora*
- \* *Eragrostis curvula*
- \* *Lolium* sp.
- \* *Paspalum dilatatum*
- \* *Paspalum urvillei*
- \* *Pennisetum clandestinum*
- \* *Stenotaphrum secundatum*
- Pl *Themeda australis*
- \* *Vulpia* sp.

#### **Polygonaceae**

*Persicaria decipiens*

- \* *Rumex* sp.

#### **Proteaceae**

- Pl *Banksia dallaneyi*
- Pl *Banksia littoralis*

Pl *Grevillea* sp. (red flowers)  
Pl *Grevillea* sp. (tall yellow flowers)  
*Hakea lissocarpha*  
*Hakea prostrata*

**Rosaceae**

\* *Rubus anglocandicans*

**Scrophulariaceae**

Pl *Eremophila glabra*  
Pl *Myoporum caprarioides*

**Solanaceae**

\* *Solanum nigrum*

**Typhaceae**

*Typha domingensis*  
*Typha orientalis*

**Xanthorrhoeaceae**

Pl *Xanthorrhoea preissii*

**Zamiaceae**

Pl *Macrozamia fraseri*

# Attachment 2

Completed Wetland Assessment Forms







**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 14810

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)

**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 14809

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)



**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 13316

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)

**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 7151

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)

Appendix Two

**Local Water Management Strategy  
+ Letter from Hrd2o**







## **Lot 4 Fern Road & Lot 102 Castledare Place, Wilson**

Local Water Management Strategy

March 2021

**Client: Richard Noble**

## Contents

<b>Executive Summary</b>	<b>3</b>
<b>1. Introduction</b>	<b>4</b>
1.1 PLANNING CONTEXT	4
1.2 KEY DOCUMENTS	5
<b>2. Proposed Development</b>	<b>6</b>
<b>3. Design Criteria</b>	<b>7</b>
<b>4. Pre-Development Environment</b>	<b>8</b>
4.1 SITE CONDITIONS	8
4.2 GEOTECHNICAL	8
4.3 ACID SULPHATE SOILS	8
4.4 CONTAMINATED SITES	9
4.5 WETLANDS AND WATERWAY ASSESSMENT	11
4.6 SURFACE WATER	11
4.6.1 Surface Water Quality	12
4.7 GROUNDWATER	12
4.7.1 Groundwater Levels	12
4.7.2 Groundwater Quality	14
<b>5. Water Use Sustainability Initiatives</b>	<b>16</b>
5.1 WATER EFFICIENCY MEASURES	16
5.2 WATER SUPPLY	16
5.3 WASTEWATER MANAGEMENT	16
<b>6. Stormwater Management Strategy</b>	<b>17</b>
6.1 PRE-DEVELOPMENT STORMWATER MODELLING	17
6.2 ECOLOGICAL PROTECTION (15 MM)	18
<b>7. Groundwater Management Strategy</b>	<b>21</b>
7.1 FILL AND SUBSOIL DRAINAGE	21
7.2 ACID SULPHATE SOILS	21
<b>8. Urban Water Management Plans</b>	<b>22</b>
<b>9. Monitoring</b>	<b>23</b>
9.1 PRE DEVELOPMENT	23
9.2 POST DEVELOPMENT	23
<b>10. Implementation</b>	<b>24</b>

## 11. References

25

### Appendices

- A. LWMS Checklist for Developers
- B. Geotechnical Report (CMW Geosciences, 2015)
- C. Wetland and Waterway Assessment (Emerge, 2019)
- D. Hydrological Monitoring Results
- E. Monitoring Programme Correspondence
- F. DWER Bore Hydrographs
- G. Landscape Plans (Emerge Associates)
- H. Preliminary Engineering Drawings (TABEC Engineers)
- I. Stormwater Modelling Results

### Figures

1. Location Plan
2. Concept Plan
3. Site Conditions
4. Geotechnical Plan
5. Foreshore Plan
6. Surface Water Plan
7. Groundwater Plan
8. Stormwater Management Plan
9. Post Development Monitoring Plan

### Tables

1. Urban Water Management Process
2. Design Criteria
3. AAMGL DWER Bores
4. AAMGL Site Bores
5. Pre Development Groundwater Quality
6. Pre-Development Modelling Results
7. Stormwater Management
8. BMP Water Quality Performance in Relation to Design Criteria
9. Post Development Monitoring Programme
10. Implementation Responsibilities

### Disclaimer

This document is published in accordance with and subject to an agreement between Hyd2o and the Client for whom it has been prepared, and is restricted to those issues that have been raised by the Client in its engagement of Hyd2o. It has been prepared using the skill and care ordinarily exercised by hydrologists in the preparation of such documents. Hyd2o recognise site conditions change and contain varying degrees of non-uniformity that cannot be fully defined by field investigation. Measurements and values obtained from sampling and testing in this document are indicative within a limited timeframe, and unless otherwise specified, should not be accepted as conditions on site beyond that timeframe. Any person or organisation that relies on or uses the document for purposes or reasons other than those agreed by Hyd2o and the Client does so entirely at their own risk. Hyd2o denies all liability in tort, contract or otherwise for any loss, damage or injury of any kind whatsoever (whether in negligence or otherwise) that may be suffered as a consequence of relying on this document for any purpose other than that agreed with the Client.



## Executive Summary

Hyd2o was commissioned by Richard Noble to prepare this local water management strategy (LWMS) to support the Local Structure Plan for Lot 4 Fern Road and Lot 102 Castledare Place within the suburb of Wilson.

The site is approximately 4 ha in size and located approximately 13 km southeast of the Perth central business district within the City of Canning (Figure 1).

The concept plan for the site has been prepared by Burgess Design Group. The proposed residential development consists of residential lots, roads, car parking areas and public amenity near the Canning River Foreshore.

The site is predominantly cleared and vacant. Topography across the site varies between 2mAHD - 5mAHD and is adjacent to the Canning River. The foreshore to the Canning River at this location is prioritised by recreational uses including the Castledare Miniature Railway.

The Site was identified as possibly contaminated by DWER and underwent numerous investigations between 1999 and 2017 to identify, characterise and delineate the extent of contaminated soils resulting from uncontrolled filling practices in the 1970s. The land was subsequently remediated.

The values of the Canning River are proposed to be maintained post-development through the establishment of a foreshore reserve area with the proposed metropolitan rezoning reflecting the agreed park and recreation reserve area.

Stormwater management within the site concentrates on water sensitive urban design and the retention of the first 15mm in biofiltration areas with peak flows being retained to predevelopment flow rates prior to discharging via overland flow towards the Canning River.

This document has been prepared in accordance with the principles and objectives of Better Urban Water Management (Western Australian Planning Commission, 2008).

Implementation of the strategy will be undertaken in accordance with Better Urban Water Management through the development and implementation of Urban Water Management Plans for individual stages of development within the site.

## 1. Introduction

Hyd2o was commissioned by Richard Noble to prepare this local water management strategy (LWMS) to support the proposed Local Structure Plan for Lot 4 Fern Road and Lot 102 Castledare Place within the suburb of Wilson.

The site is approximately 4 ha in size and located approximately 13 km southeast of the Perth central business district within the City of Canning (Figure 1).

The concept plan for the site has been prepared by Burgess Town Planning. The proposed residential development consists of residential lots, roads, car parking areas and public amenity near the Canning River Foreshore.

The proposed development of the site has considered the opportunities and constraints of the existing environment and uses this information to inform the development of this document.

This document provides an integrated total water cycle management approach to the development of the concept plan, with an assessment of the pre-development environment, development of water use sustainability initiatives, a stormwater management strategy, a groundwater management strategy and a plan for implementation.

A copy of the Better Urban Water Management (WAPC, 2008) LWMS Checklist for Developers is included as Appendix A to assist the Department of Water and Environmental Regulation (DWER), Department of Biodiversity, Conservation and Attractions (DBCA) and City of Canning (CoC) in review of this document.

The Lots 4 & 102 Fern Rd, Wilson District Water Management Plan/Local Water Management Strategy was prepared by Hyd2o in 2019 and approved by DWER. The document was circulated to DBCA and City of Canning during consultation phases. The outcomes of the consultation are included in this updated and revised LWMS.

### 1.1 Planning Context

This site is currently zoned 'Urban' under the Metropolitan Region Scheme (2020).

The site zoned as 'Urban Development' under the City of Canning's Town Planning Scheme No. 42 (City of Canning, 2020).

The urban water management planning process for the site is shown in Table 1. This LWMS supports the proposed development of the structure plan to an urban development with community purpose.

**Table 1: Urban Water Management Process**

Planning Phase	Planning Document	Urban Water Management Documents
MRS amendment	MRS Amendment	Lots 4 Fern Rd & 102 Castledare Pl Wilson DWMS/LWMS <b>APPROVED</b>
Local Structure Plan/ Local Scheme Amendment	Local Structure Plan	Lots 4 Fern Rd & 102 Castledare Pl LWMS <b>THIS DOCUMENT</b>
Subdivision	Subdivision Application	Urban Water Management Plan <b>FUTURE PREPARATION</b>

## 1.2 Key Documents

This LWMS uses the following key documents to define its principles, criteria, objectives, and implementation responsibilities:

- Better Urban Water Management (WAPC, 2008)
- Stormwater Management Manual for WA (Department of Water, 2007)
- Decision Process for Stormwater Management in WA (DWER, 2017)
- Guidelines for district water management strategies (Department of Water, 2013)
- City of Canning Water Management Strategy (City of Canning/Essential Environmental, 2014)
- Planning for Land Use, Development and Permitting Affecting the Swan Canning Development Control Area (Department of Parks and Wildlife/Swan River Trust, 2016a)
- Planning for Stormwater Management Affecting the Swan Canning Development Control Area (Department of Parks and Wildlife/Swan River Trust, 2016a)
- Swan Canning Water Quality Improvement Plan (Swan River Trust 2009)
- Local Water Quality Improvement Plan Canning Plain Catchment (Swan River Trust,



## 2. Proposed Development

The proposed concept plan is shown in Figure 2.

It consists of a mix of residential lots, roads, and public amenity areas.

This LWMS aims to assist in maintaining the predevelopment hydrological regime of the Canning River system.

This development aims to allow the area to maximise its potential for public amenity adjacent to the Canning River and for environmentally sensitive conservation areas to be maintained.

### 3. Design Criteria

Key design criteria for the site are shown in Table 2 and have been established consistent with criteria specified in the key reference documents previously detailed in Section 1.2.

These design criteria are used to formulate the water management strategy for the site to remain within the identified constraints and opportunities of the pre-development environment.

**Table 2: Design Criteria**

Strategy Elements	LWMS Method & Approach
<b>Water Use Sustainability</b>	
Water Efficiency	<ul style="list-style-type: none"> <li>Water efficiency requirements consistent with Building Codes of Australia</li> <li>Maximising infiltration of stormwater where possible</li> <li>"Waterwise" Public Open Space</li> <li>Aim for less than 100 kL/person/year</li> </ul>
Water Supply	<ul style="list-style-type: none"> <li>Water Corporation IWSS for lots, encourage the use of rainwater tanks.</li> <li>Minimise use of scheme water for non-drinking purposes</li> </ul>
Wastewater	<ul style="list-style-type: none"> <li>Water Corporation reticulated sewerage</li> </ul>
<b>Stormwater</b>	
Flood Protection	<ul style="list-style-type: none"> <li>Overland flow paths within road reserves identified for safe conveyance of flows exceeding pipe drainage system capacity</li> <li>1% average exceedance probability (AEP) events to be directed towards the Canning River via diffuse overland flow and maintained to pre-development discharge rates.</li> <li>Establish minimum habitable floor levels at 0.5m above the 1% AEP Flood Level of the Canning River.</li> <li>All development outside the Floodway of the Canning River.</li> </ul>
Serviceability	<ul style="list-style-type: none"> <li>Piped drainage system sized to convey 5 year event</li> <li>20% AEP event retained on site.</li> </ul>
Ecological Protection	<ul style="list-style-type: none"> <li>Use of soakwells at lot scale to infiltrate the first 15mm on site.</li> <li>Establishment of biofiltration area for treatment and infiltration of first 15mm road runoff within Park &amp; Recreation Reserve outside of Bush Forever area</li> </ul>
<b>Groundwater</b>	
Fill Requirement & Subsoil Drainage	<ul style="list-style-type: none"> <li>Habitable floor levels to have clearance to groundwater through the use of sand fill.</li> <li>No subsoil drainage proposed.</li> </ul>
Acid Sulphate Soils & Contamination	<ul style="list-style-type: none"> <li>If required, management of Acid Sulphate Soils to be handled as a separate process to LWMS consistent with DoE (2004) requirements and reported in future UWMP's.</li> </ul>

## 4. Pre-Development Environment

### 4.1 Site Conditions

The 4 ha site is located in the suburb of Wilson in the City of Canning.

The site is bound to the north by Fern Road and the Castledare Retirement Village, to the east by Parks and Recreation reserve, to the south by the Canning River and to the west by existing urban development (Figure 1).

The site is currently vacant and cleared with an existing bitumen carparking area. The adjacent stretch of the Canning River is generally parkland cleared with established trees and turfed below. The foreshore is used predominantly for recreational pursuits and is the site for the Castledare Miniature Railway

Figure 3 shows an aerial photograph with existing land use and topography.

The site is relatively flat, ranging from 5 mAHD to 2 mAHD generally falling towards the Canning River (Figure 3).

### 4.2 Geotechnical

According to the Geological Surveys of Western Australia (Gozzard, 1983), the site is characterised by Sand (S8).

A geotechnical investigation of the site was undertaken by CMW Geosciences on 3 July, 2015. A copy of the geotechnical report is provided in Appendix B. A total of 12 test pits were excavated to depths between 2.2 m and 2.6 m (Figure 4). A full set of location specific geological profiles can be found in Appendix B. Typical profiles for the test pits are as follows:

- TOPSOIL: 0.15m – 0.5m, consisting of fine to coarse grained, sub-angular to sub-rounded, dark brown. In some cases, possibly fill.
- SAND: 0.5m – 2.6m, fine to medium grained, sub angular to sub-rounded, pale grey to yellow brown

CMW Geosciences also undertook permeability testing which yielded an in-situ permeability rate of 2 m/day.

### 4.3 Acid Sulphate Soils

Acid Sulphate Soil (ASS) is the common name given to naturally occurring soil and sediment containing iron sulfides. These naturally occurring iron sulfides are generally found in a layer of waterlogged soil or sediment, and are benign in their natural state.

When disturbed and exposed to air, however, they oxidise and produce sulfuric acid, iron precipitates, and concentrations of dissolved heavy metals such as aluminium, iron and arsenic. Release of acid and metals as a result of the disturbance of ASS can cause significant harm to the environment and infrastructure.

The presence of ASS has been a recognised issue of concern in Western Australia since 2003. The Department of Environment and Conservation and the WAPC have released guidance notes on ASS, covering the requirement for assessing sites and the management of sites



where ASS are identified. ASS investigations are commonly required as part of the conditions of subdivision or as a requirement for a dewatering license application.

The WAPC's Bulletin 64 (WAPC, 2003) ASS risk mapping for the site indicates that the eastern side of the site is classified as having a moderate to high ASS disturbance risk less than 3 m from the surface.

WAPC (2003) mapping indicates that in some of the areas of the site mapped as wetland adjacent to the Canning River there is a high to moderate risk of acid sulphate soils within 3m of natural soil surface. This is typical of intermittent waterlogged areas.

If further ASS investigations are required they will be undertaken as a separate process to the urban water management planning process.

#### 4.4 Contaminated Sites

Lot 102 and Lot 4 were initially classified by the DWER as 'Possibly Contaminated – Investigation Required' under Section 13 of the *Contaminated Sites Act* (2003). Consequently, Lots 4 and 102 underwent numerous investigations between 1999 and 2017 to identify, characterise and delineate the extent of contaminated soils resulting from uncontrolled filling practices in the 1970's including the following:

- Preliminary Contamination Assessment, Castledare Site, Corner Bungaree and Fern Road, Wilson, WA. Prepared for Richard Noble and Associates (Golder Associates, 1999).
- A Review of Previous Investigations and Recommendations for Further Work Required. Prepared for Richard Noble and Associates (ATA, 2000).
- Preliminary Contamination Investigation at Castledare, Bungaree Road, Wilson. Prepared for Richard Noble and Associates (ATA, 2001).
- Preliminary Site Investigation Castledare Miniature Railway, Lot 4 and Part of Lot 102, Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers in WA (Inc.) c./ Richard Noble and Associates Pty Ltd. (Coffey Environments, 2013).
- Immediate Human Health Risk Assessment and Environmental Site Assessment Report, Castledare Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers and Water Corporation (Coffey Environments, 2014).
- Preliminary and Detailed Site Investigation Castledare Miniature Railway, Lot 4 and Part of Lot 102, Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers in WA (Inc.) c./ Richard Noble and Associates Pty Ltd. (Coffey Environments, 2015)
- Remediation Action Plan, Part Lot 4 and Part Lot 102, Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers in WA (Inc.) c./ Richard Noble and Associates Pty Ltd. (Aurora Environmental, 2015)
- Asbestos Investigation, Western Embankment of Stormwater Drain, Lot 4, Fern Road, Wilson, WA. Prepared for Water Corporation (Aurora Environmental, 2016).
- Asbestos in Soil Investigation Report, Part Lot 4, Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers in WA (Inc.) c./ Richard Noble and Associates Pty Ltd. (Aurora Environmental, 2016).

- Summary of Soil and Groundwater Investigations, Lot 4 and Lot 102, Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers in WA (Inc.) c./ Richard Noble and Associates Pty Ltd. (Aurora Environmental, 2017).
- Long Term Asbestos Management Plan, Lot 4 and Lot 102, Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers in WA (Inc.) c./ Richard Noble and Associates Pty Ltd. (Aurora Environmental, 2017).
- Environmental Statement (for proposed Scheme Amendment), Lot 4 and Lot 102, Fern Road, Wilson, WA. Prepared for Trustees of the Christian Brothers in WA (Inc.) c./ Richard Noble and Associates Pty Ltd. (Aurora Environmental, 2018).

The primary contaminant of potential concern (COPC) was asbestos, however it was noted to be present in various forms including asbestos containing material (ACM), asbestos fines (AF) and fibrous asbestos (FA) as a result of filling / land reclamation in low lying areas adjacent to the Canning River. The eastern portion of the site was reportedly filled with waste material containing asbestos, specifically fibrous material from extractor fans from the former James Hardie Industries plant at Burswood together with other fill materials including building rubble and bonded asbestos products. Anecdotal evidence suggested that some localised / small scale fly-tipping has occurred with some fragments of asbestos containing material (ACM) identified on the surface of the western portions of Lots 4 and 102. Historical investigations identified some fill material with localised impacts of zinc and organochlorine pesticides (OCPs).

Studies indicated that groundwater beneath the site contained low levels of metals and nutrients that were consistent with background groundwater quality attributed to a long established urban area. Groundwater was also indicated to be brackish, due to its proximity to the Canning River which is tidally influenced within the vicinity of the site. The Perth Groundwater Atlas indicated that groundwater is not suitable for use via garden bores. On the basis of the conceptual site model developed for the site and in the absence of any identified sources of groundwater contamination, groundwater remediation was not required.

On the basis of the findings of the investigations, extensive soil remedial works were completed between 2016 and 2017 and documented in a Remediation and Validation Report (Aurora Environmental, 2018). The remediation strategy (endorsed by DWER and DoH) comprised removal of all fill material from the proposed urban / residential area and subsequent validation of the underlying natural surface to achieve the classification of 'Decontaminated' in accordance with the *Contaminated Sites Act 2003*. The excavated fill was placed in a purposefully constructed containment cell which forms part of a car park for the Castledare Miniature Railway. This containment cell and the balance of Lot 102 and Lot 4 reserved for Parks and Recreation were remediated using a cap and contain strategy to achieve the classification of 'Remediated for Restricted Use' in accordance with the *Contaminated Sites Act 2003*. Restrictions comprise:

- The land is restricted to non-sensitive uses and should not be developed for a more sensitive use such as residential use or childcare centre without further contamination assessment and/or remediation;
- The land is required to be managed in accordance with the Long Term Asbestos Management Plan prepared specifically for the site; and

- All activities which have the potential to disturb the surface are required to undertaken in accordance with the Long Term Asbestos Management Plan prepared specifically for the site.

## 4.5 Wetlands and Waterway Assessment

The site is adjacent to the Canning River and associated Canning River Regional Park. The site is located downstream of the Kent Street Weir and as such the Canning River is influenced by tidal activity and characterised by brackish water. The foreshore is generally parkland cleared for recreational pursuits.

The foreshore area adjacent to the site is largely occupied by the Castledare Miniature Railway. The miniature railway consists of over 5km of track, railway station, signal box, turn table, storage sheds, toilet block, some picnic facilities and workshops (Department of Conservation and Land Management, 1997). The Miniature Railway is open to visitors who often also partake in barbeques/picnics and enjoy the turf area for recreational pursuits (Department of Conservation and Land Management, 1997).

The site is adjacent to a number of wetland features including some classified and mapped as conservation category wetlands (CCW).

An ecologist from Emerge Associates conducted an assessment of flora, vegetation and wetland values within and adjacent to the site on 14 February and 11 March 2019. This resulted in refinements to the broadly mapped CCW boundaries based on the actual biophysical conditions observed and present on the ground. An assessment was also undertaken of the foreshore area for the Canning River within the site which took into account the adjacent wetland features and buffer requirements. The refined wetland boundaries and a minimum recommended foreshore area was then presented to the DBCA within a formally documented Wetland and Waterway Assessment (Emerge 2019) (Appendix C). The proposed foreshore reserve is shown in Figure 5.

Representatives from Richard Noble, Emerge Associates, Department of Planning Lands and Heritage (DPLH) and DBCA met at the site on 7 May 2019 to discuss the extent of foreshore reserve and the proposed location of a Primary Shared Path (PSP) with respect to future land tenure and zoning arrangements. The PSP is shown in Figure 2.

## 4.6 Surface Water

There are no natural watercourses or drainage lines within the site. The site is adjacent to the Canning River and all flows generally travel as overland flow towards the Canning River. Figure 6 provides the topographic flow direction for the site indicating that overland flow is generally towards the Canning River to the south and the east.

Floodplain mapping and management is provided for the Canning River by DWER as part of the Canning River Flood Study which commenced in 1981 and was revised based on better topographic information in 2015. The DWER online floodplain mapping tool shows that the site is outside the floodplain of the Canning River (Figure 6). The 1% average exceedance probability (AEP) flood levels adjacent to the site range from 2.40 mAHD to 2.24 mAHD (Figure 6).



The site is downstream of the Kent St Weir and the Canning River at this location is subject to tidal fluctuations and has the hydrodynamic functions of an estuary.

#### 4.6.1 Surface Water Quality

Surface water quality samples were taken from the Canning River adjacent to the site on eight occasions between October 2016 and August 2018 to provide an indication of the current condition of the River at this location. The sampling location is shown on Figure 6.

A summary of the key measure parameters are provided below with complete results in Appendix D.

- Mean pH of the site was 7.2 indicating neutral conditions and falling within the ANZECC guideline range of 6.5-8.0.
- Electrical conductivity varied between 0.003 and 1.031. A variation is expected in samples due to the tidal nature of the river.
- Mean total nitrogen was recorded as 1.12 mg/L across all samples which is slightly higher than the Canning Plain Catchment Local Water Quality Improvement Plan water quality target of 1.0 mg/L but lower than the ANZECC Guideline of 1.2mg/L.
- Mean total phosphorus was recorded as 0.08 mg/L which is lower than the Canning Plain Catchment Local Water Quality Improvement Plan water quality target of 0.1mg/L but higher than the ANZECC Guideline of 0.065 mg/L.
- Average concentrations of zinc were recorded as 0.013 mg/L which is lower than the ANZECC 90% trigger value for the protection of freshwater species.
- Mean concentrations of copper were recorded as 0.002 mg/L which is lower than the ANZECC 80% trigger value for the protection of freshwater species.
- All other metals sampled (arsenic, cadmium, chromium, nickel, lead and mercury) were below the laboratory limit of detection.

## 4.7 Groundwater

### 4.7.1 Groundwater Levels

The second edition of the Perth Groundwater Atlas (Department of Environment, 2004) indicates the superficial aquifer base at the site is approximately -15 mAHD and indicates a saturated thickness of approximately 16 m. Groundwater levels in the Atlas are representative of typical end of summer groundwater levels and estimate groundwater levels of 1 mAHD within the site, with groundwater flow in a southerly direction towards the Canning River.

Hyd2o installed three groundwater monitoring bores within the site on 5 September 2016. Water levels in all bores were measured monthly from Sept-Dec 2016 with monitoring recommencing at two bores in March 2017, and at all bores from June 2017 until August 2018. Water quality sampling was undertaken on four occasions between September 2016 and January 2018. The continuity of the monitoring programme was interrupted due to the contaminated sites remediation that prohibited access to the site by Hyd2o personnel. Hyd2o sought clarification with DWER in March 2017 to confirm the proposed approach to monitoring was sufficient. This correspondence is provided in Appendix E.

The estimated average annual maximum groundwater levels (AAMGL) for the site are shown in Figure 7 based on this data. Hyd2o have calculated the AAMGL by adjusting levels at site bores based on the recorded level in DWER bores L&W1606 and L&W2436 on 30/8/2018 referenced to its long term historical data (Table 3). DWER bores L&W1606 and L&W2436 long-term hydrographs are provided in Appendix F. The data considered for the calculation is from 1975. Although the bores have a longer record a distinct shift in rainfall occurred in the 1970s in Perth which would be more commiserate with rainfall levels observed in more recent years.

The AAMGL for each groundwater bore is shown in Table 4. Depth to groundwater for the site is approximately 0.7 m-2 m below ground surface.

Table 3: AAMGL DWER Bores

Bore	Period of Record	Groundwater Level (mAHD) 30/08/2018	AAMGL (mAHD)	Correction Factor (m)	MGL (mAHD)	Correction Factor (m)
L&W1606	1975 - 2018	6.01	5.74	-0.27	6.56	+0.55
L&W2436	1975-2018	9.12	9.00	-0.12	9.50	+0.38
Correction Factors for Site Bores				-0.19		+0.47

Table 4: AAMGL Site Bores

Bore	Natural Surface (mAHD)	Groundwater Level (mAHD) 30/08/18	Applied Correction Factor (m)	AAMGL (mAHD)	Depth Below Natural Surface (m)
MB1	4.57	3.35	-0.19	3.16	1.41
MB2	3.53	1.71	-0.19	1.41	2.12
MB3	3.54	1.30	-0.19	2.84	0.70

#### 4.7.2 Groundwater Quality

Groundwater quality samples were taken from MB1 and MB2 on six occasions and MB3 on four occasions between September 2016 and January 2018. Detailed groundwater quality results are included in Appendix D and summarised in Table 5 and with comparison to ANZECC (2000) guidelines for lowland rivers in the southwest of Australia:

- Mean pH ranged from 6.04 to 6.96, mostly within the ANZECC guideline range of 6.5 to 8.0 pH.
- Mean EC ranged from 0.29 mS/cm to 0.84 mS/cm which is within to above the ANZECC guideline range of 0.12 mS/cm to 0.30 mS/cm. Groundwater is of medium salinity.
- Mean TN ranged from 2.05 mg/L to 5.68 mg/L which is above the ANZECC guideline concentration of 1.2 mg/L.
- Mean TP ranged from 0.07 mg/L to 1.36 mg/L. These values exceed the ANZECC guideline of 0.065 mg/L.



Whilst TN and TP concentrations are above the ANZECC guidelines, they represent typical groundwater nutrient values for the Swan Coastal Plain.

**Table 5: Predevelopment Groundwater Quality**

Parameter	Groundwater Bore			
	ANZECC	MB1	MB2	MB3
EC (mS/cm)	0.12 – 0.30	0.33	0.29	0.84
pH	6.5 – 8.0	6.04	6.37	6.96
TN (mg/L)	1.2	5.68	2.42	2.05
TP (mg/L)	0.065	1.36	0.35	0.07
TKN (mg/L)	-	2.65	1.80	2.05
Ammonia (mg/L)	0.08	0.17	0.22	0.09
Nitrite as N (mg/L)	-	0.009	0.005	0.005
Nitrate as N (mg/L)	-	2.93	0.64	0.005

## 5. Water Use Sustainability Initiatives

### 5.1 Water Efficiency Measures

Water conservation measures will be implemented within the development and will be consistent with Water Corporation's "Waterwise" land development criteria, and include:

- Promotion of use of waterwise practices including water efficient fixtures and fittings (taps, showerheads, toilets and appliances, rainwater tanks, waterwise landscaping).
- Water efficiency consistent with Building Codes of Australia.
- Use of groundwater bores for irrigation of public open space.
- Maximising on site retention of stormwater.

Agreed water conservation measures and locations will be detailed at the UWMP stage.

### 5.2 Water Supply

The Water Corporation's Integrated Water Supply System (IWSS) will supply potable water to the future homes on the site.

Landscape planning undertaken by Emerge is included as Appendix G. Landscaping has been designed with recognition of the of the best species to provide water quality treatment in stormwater areas and with local species incorporated to minimise water use.

The site is located within the Perth (Superficial-Swan) Groundwater Management Area (GMA), City of Canning groundwater sub area. DoW's online Water Register for Licence and Water Availability Information indicates that the superficial aquifer is not fully allocated within this sub area and therefore water is available should this be required for irrigation or construction purposes.

### 5.3 Wastewater Management

Wastewater will be deep sewerage (reticulated) with management by Water Corporation.

## 6. Stormwater Management Strategy

Stormwater management will be undertaken consistent with DWER water sensitive design practices. The system will consist of lot soakwells, piped road drainage system, and biofiltration areas.

Key elements of the system which are reflected in this LWMS include:

- Onsite retention of the first 15mm of rainfall in biofiltration areas and lot soakwells to provide water quality treatment.
- Events exceeding the first 15mm are to travel towards the Canning River as diffuse overland flow to mimic the pre-development hydrology.
- Time of concentration from the site during a 1% AEP storm are likely to be much quicker than any flood response from the Canning River and the flows would be so small they would not pose any downstream flood risk. The flood protection priority for the proposed development is to have flows moving away from residential areas and being positioned above the 1% AEP levels of the Canning River.
- The basins have been sized to retain flows to pre-development rates in the 1% AEP event.

The stormwater management concept and post development catchment mapping for the site is shown in Figure 8. Three main stormwater catchments have been identified in consultation with project engineers TABEC, all of which concentrate on infiltration of stormwater. Preliminary Engineering drawings for the site including lot levels are provided in Appendix H. Final locations and configurations of stormwater storage areas will be provided in UWMPs for the site.

### 6.1 Pre-Development Stormwater Modelling

Stormwater modelling for the predevelopment environment was performed using XP-Storm. The design rainfall storms modelled in XP-Storm were based on methodology in Australian Rainfall and Runoff (AR&R) (Ball et al, Australia, 2016). All design rainfall and temporal patterns were imported into the model using the ARR Data Hub. The rainfall temporal pattern was assumed to be spatially uniform across the catchment. Storm durations ranged from 1 hour to 72 hours and all ensembles run to determine the critical events.

Runoff coefficients adopted for pre-development modelling purposes were based existing land use characteristics of the site, with a runoff coefficient of 20% applied to grassed areas and 80% applied to existing carparking areas.

Modelling was conducted for the estimated topographic catchments within the site as shown in Figure 6 that has a total area of 3.11 ha catchment which falls towards the Canning River Foreshore.

Modelling outputs are shown in Appendix I and summarised in Table 6 below for various average exceedance probability events. Summarising the results:

- The median peak flow for 63% AEP events was found to be close to zero with the 15 mm event (approximately a 1 hour, 63% AEP event) producing runoff of 0.02 m<sup>3</sup>/s.
- In the 1% AEP event the median peak flow for the 1 hr critical duration storm event was 0.10 m<sup>3</sup>/s.



These results are consistent with field observations which indicate runoff during frequently occurring events does not appear to occur however overland diffuse flow during major events is considered likely.

These flow rates and volumes are used to guide the design of the system post development in Section 6.2.

**Table 6: Pre Development Modelling Results**

	63% AEP Event	20% AEP Event	1% AEP Event
Median Peak Flow (m <sup>3</sup> /s)	0.03	0.05	0.10
Range of Results	(0.03-0.04)	(0.05-0.06)	(0.08-0.13)
Critical Duration for Flow Rate	1 hr	1 hr	1 hr

## 6.2 Ecological Protection (15 mm)

Ecological protection is proposed by maintaining the first 15mm on site to treat water quality. Table 7 provides an indication of the volumes of water quality protection areas required to achieve best water sensitive design outcomes.

It is expected that bioretention volumes will be achieved through a mix of underground storage within road reserves, tree pits, and open swales in POS.

Where open bioretention areas are proposed they will be designed consistent with the ‘Vegetation guidelines for stormwater biofilters in the south-west of Western Australia’ (Monash Water for Liveability Centre, 2014). The biofiltration areas have been designed in accordance with the aforementioned document, as well DoW 2007a and DWER 2017.

The detailed design of the bioretention basin will be presented in a subsequent urban water management plan (UWMP) and will include a specification to reduce any erosion from the basin overtopping.

**Table 7: Stormwater Management**

Catchments	North	Car Park	South
Lots (ha)	0.78	0	1.10
Road Reserve (ha)	0.33	0	0.49
Car park (ha)	0	0.27	0
Total Contrib Area (ha)	1.11	0.27	1.59
15mm EIA(ha)	0.21	0.18	0.32
<b>Storage Parameters</b>			
Type	Basin	Swale	Basin
Base RL (mAHD)	2.05	3.0	2.5
MGL	1.5	1.5	2.0
Base Area (m <sup>2</sup> )	100	0	25
Side slopes (1:v)	6	6	6
Total Depth	1.0	0.5	
Spillway Height (mAHD)	3.0	3.5	3.5
Spillway width (m)	20	30	10
<b>15mm</b>			
Volume (m <sup>3</sup> )	30	41	48
<b>20% Results</b>			
TWL (mAHD)	2.85	3.50	3.17
Total Depth (m)	0.8	0.5	0.67
Volume (m <sup>3</sup> )	33	66	58
TWL area (m <sup>2</sup> )	112	276	170
<b>1% Results</b>			
TWL (mAHD)	3.05	3.51	3.52
Total Depth (m)	1.0	0.51	1.02
Volume (m <sup>3</sup> )	61	69	139
TWL area (m <sup>2</sup> )	169	282	300
<b>Outflow Rates</b>			
15mm (63% AEP) (m <sup>3</sup> /s)	0	0	0
20% AEP (m <sup>3</sup> /s)	0	0	0.01
1% AEP(m <sup>3</sup> /s)	0.03	0.04	0.04

Table 8 details a summary from the Stormwater Management Manual for Western Australia (DoW, 2007) of expected pollutant removal efficiencies for various water sensitive urban design measures in relation to water quality design criteria contained in WAPC (2008).

While DoW (2007) does not provide expected pollutant removal efficiencies for all best management practices (BMPs), application of a treatment train approach using a combination of the non-structural and structural measures will therefore clearly achieve the design objectives for water quality for the site.

Table 8: BMP Water Quality Performance in Relation to Design Criteria

Water Quality Parameter	WAPC (2008) Design Criteria (required removal as compared to a development with no WSUD)	Structural Controls Nutrient Output Reduction <sup>1</sup>	
		Bioretention Systems	Detention/ Retention Storages
Total Suspended Solids	80%	80%	65-99%
Total Phosphorus	60%	60%	40-80%
Total Nitrogen	45%	50%	50-70%
Gross Pollutants	70%	-	>90%

1. Typical Performance Efficiencies



## 7. Groundwater Management Strategy

### 7.1 Fill and Subsoil Drainage

Development levels in the site will be largely dominated by fill requirements to achieve adequate separation to groundwater, given the proximity of groundwater levels to natural surface. Current available engineering subdivision drawings undertaken by TABEC Engineering are included as Appendix H.

It is not envisaged that subsoil drainage will be required within the development.

Finished lot levels and fill requirements are a detailed design issue to be addressed during the preparation of detailed engineering design drawings and preparation of the UWMP and will be ultimately submitted for council approval at that stage.

### 7.2 Acid Sulphate Soils

Acid sulphate soil mapping has been previously discussed in Section 3.2.1 as ranging from a high to low risk.

Management of acid sulphate soils (ASS) will be addressed by a separate study to this LWMS if required depending on excavation depths for engineering services. Details regarding the outcomes of any ASS studies required will be included as part of the UWMP.

All assessment and management of ASS will be conducted in accordance with the Acid Sulphate Soil Guideline Series Identification and Investigation of Acid Sulphate Soils (DoE, 2004).

## 8. Urban Water Management Plans

Consistent with processes defined in WAPC (2008), an Urban Water Management Plan (UWMP) will be developed and submitted to support subdivision applications for various stages of development within the site. UWMP's will address:

- Demonstrated compliance with LWMS criteria and objectives to the satisfaction of City of Canning and DWER.
- Agreed/approved measures to achieve water conservation and efficiencies of water use.
- Detailed stormwater management design including refining stormwater modelling detailed in the LWMS.
- Management of groundwater levels including proposed fill levels.
- Specific structural and non-structural BMPs and treatment trains to be implemented including their function, location, maintenance requirements, expected performance and agreed on going management arrangements.
- Management of subdivisional works.
- Implementation plan including roles, responsibilities, funding and maintenance arrangements.
- Specific monitoring and reporting to be undertaken consistent with the monitoring program defined in the LWMS.
- Contingency plans (where necessary).

More detail of the POS and stormwater storage integration will be provided during the development of the UWMP, including refinement of stormwater modelling, preparation of landscape plans (species selection and treatments), and detailed design drawings.

Preparation of the UWMP will be the responsibility of the developer.

## 9. Monitoring

### 9.1 Pre Development

Additional predevelopment monitoring is not anticipated for the purpose of informing the UWMP and subdivision process.

### 9.2 Post Development

Post development groundwater monitoring locations and parameters are detailed in Figure 9 and Table 9.

Department of Water (2012) indicates a minimum of 3 years post development monitoring is required, and defines post development as *"from completion of first subdivision to five years after 80 per cent of the development (by land area) has been completed"*.

The program is therefore designed to operate over a three year post development period, with the timing for commencement of the program to be negotiated at UWMP stage with DWER and the City of Canning.

The program may need to be modified as data is collected to increase or decrease the monitoring effort in a particular area, or to alter the scope of the program itself. Any modification to the program would be identified through review of the collected data and would require the agreement of all parties (DWER, City of Canning, and developer).

All water quality testing will be conducted by a NATA approved laboratory.

**Table 9: Post Development Monitoring Program**

Monitoring	Parameter	Location	Method	Frequency and Timing
Groundwater	Water Level (m AHD)	1 site bore + DoW bore	Electrical depth probe or similar	Quarterly
	pH, EC, Total Nitrogen, Total Phosphorus	1 site bore	Pumped bore sample	Quarterly (Jan, Apr, Jul & Oct)
Stormwater	pH, EC, TSS Total Nitrogen Total Phosphorus	1 location in retention storage	Collected grab sample	Nominally 2 times per year in winter when/if water present.
Stormwater	Performance Assessment	3 location in infiltration storages	Visual Inspection	Nominally 2 times per year in winter.



## 10. Implementation

Table 10 details the roles, responsibilities and funding to implement the LWMS for this site.

Any modification required to the LWMS would be identified through the UWMP process and would require the agreement of all parties (DWER, City of Canning, and developer).

Specific maintenance responsibilities will be detailed at the UWMP stage. It is envisaged that the schedule for maintenance works will be consistent with typical requirements of the City of Canning.

**Table 10: Implementation Responsibility**

Implementation Action	Responsibility & Funding	
	Developer	City of Canning
Preparation of UWMP	<input checked="" type="checkbox"/>	
Review & Approval of UWMP		<input checked="" type="checkbox"/>
Construction of Stormwater System	<input checked="" type="checkbox"/>	
Post Development Monitoring Program	<input checked="" type="checkbox"/>	
Operation & Maintenance		
a) Prior to Handover	<input checked="" type="checkbox"/>	
b) Following Handover		<input checked="" type="checkbox"/>

## 11. References

Australian and New Zealand Environment and Conservation Council (ANZECC) (2000), National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, October 2000.

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), (2016), Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia

City of Canning. (2018) Local Biodiversity Strategy. June 2018

CMW Geosciences. (2015) Proposed Residential Subdivision Castledare, Lots 4 and 102 Fern Road Wilson, WA Geotechnical Investigation Report. Prepared for Trustees of the Christian Brothers in WA.

Department of Conservation and Land Management, City of Canning and the National Parks and Nature Conservation Authority. 1997, Canning River Regional Park Management Plan 1997-2007.

Department of Environment (2004a) Acid Sulphate Soil Guideline Series Identification and Investigation of Acid Sulphate Soils, Perth, Western Australia

Department of Environment (2004) Perth Groundwater Atlas, Second Edition

Department of Environment (2003). General Guidance on Managing Acid Sulphate Soils. Acid Sulphate Soils Guideline Series Department of Environment (DoE), August 2003.

Department of Parks and Wildlife & Swan River Trust (2016) Corporate Policy Statement No. 49 Planning for Stormwater management affecting the swan canning development control area. June 2016

Department of Water (2007), Stormwater Management Manual for Western Australia.

Department of Water (2012). Water Monitoring Guidelines for Better Urban Water Management Strategies and Plans.

Department of Water and Environmental Regulation (2017). Decision Process for Stormwater Management in WA.

Emerge Associates (2019) Wetland and Waterway Assessment- Lot 4 and 102 Fern Rd Wilson. May 2019

Essential Environmental (2014) Water Management Strategy. Prepared for the City of Canning by Essential Environmental.

Gozzard J.R. (1983) Armadale part Sheets 2033 I and 2033 IV, Perth Metropolitan Region, Environmental Geology Series, GSWA.

Institution of Engineers Australia (2006), Australian Rainfall Quality

Institution of Engineers Australia (2003), Australian Rainfall & Runoff

Swan River Trust (2009) Swan Canning Water Quality Improvement Plan. December 2009

Swan River Trust (2010) Canning Plain Catchment Local Water Quality Improvement Plan. June 2010

Western Australian Planning Commission, (2003). Planning Bulletin No. 64: Acid Sulphate Soils. Western Australian Planning Commission, November 2003.

Western Australian Planning Commission. (2008), Better Urban Water Management, October 2008



## FIGURES

---



 Site







Source: Burgess Design Group (2021)





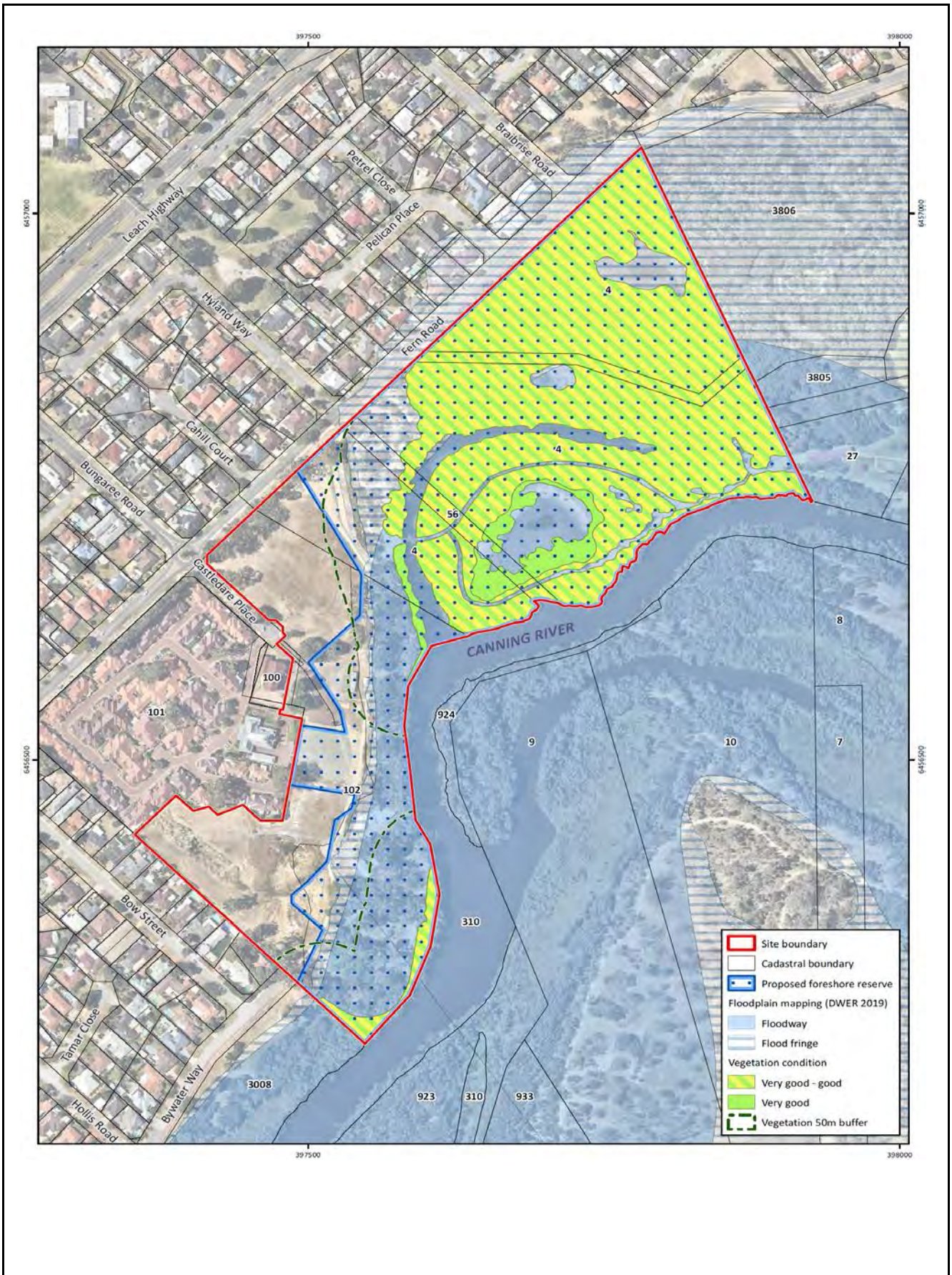
-  Site
-  Topography (mAHD)





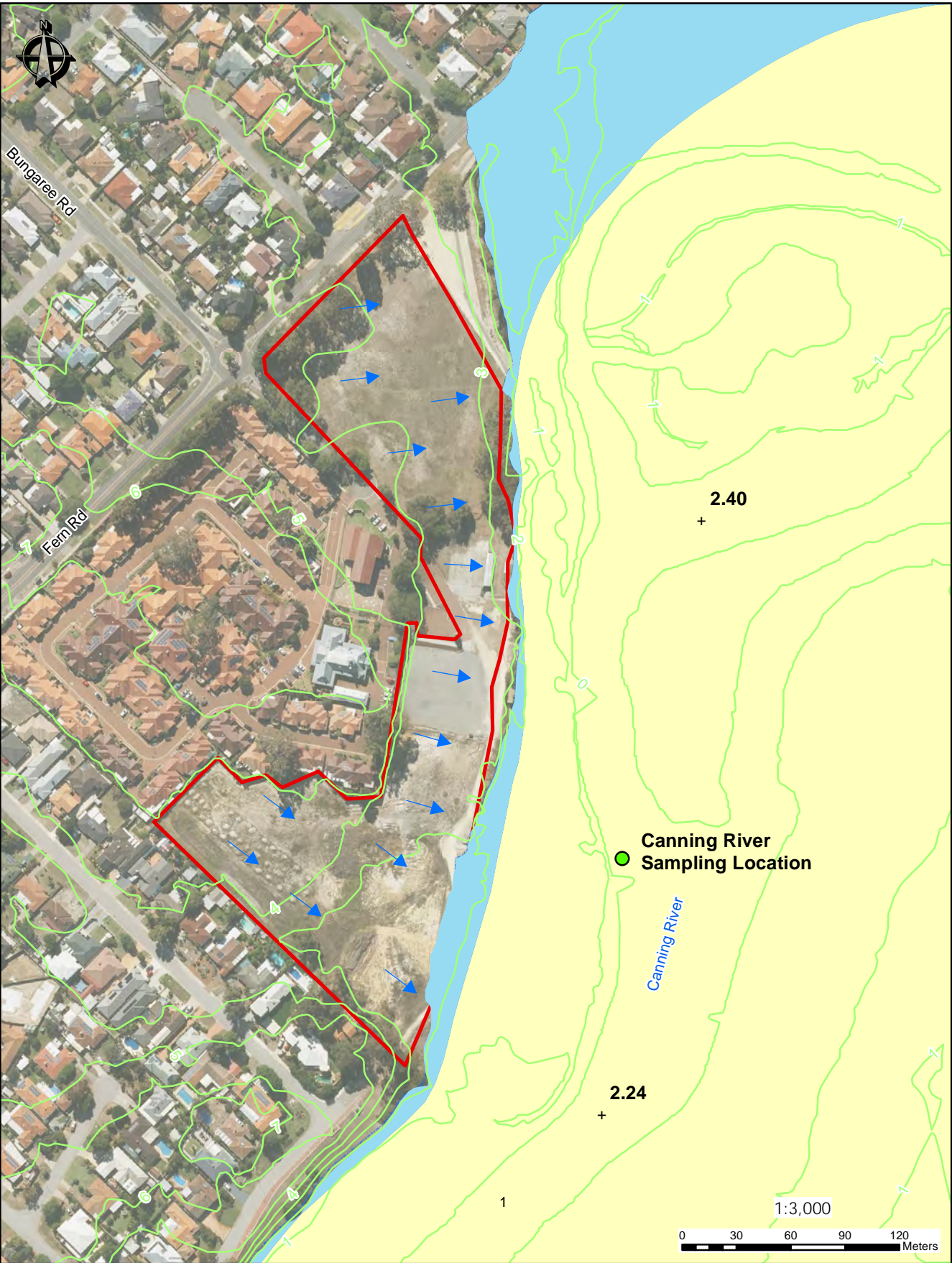
-  Site
-  Test Pit Location





Source: Emerge Associates (2019)








- Site
- Topography (mAHD)
- 1% AEP Floodway
- 1% AEP Flood Fringe
- + 1% AEP Flood Level (mAHD)
- Water Quality Sampling Location
- ➔ Catchment flow direction

hyd2o  
 Lot 4 Fern Rd & 102 Castledare Pl,  
 Wilson LWMS  
 Surface Water Plan  
 Figure 6





-  Site
-  Groundwater Bores
-  AAMGL (mAHD)

hyd<sub>2</sub>o  
Lot 4 Fern Rd & Lot 102 Castledare PI,  
Wilson LWMS  
Groundwater Plan  
Figure 7





North	20pct	1pct
TWL (mAHD)	2.85	3.05
Total Depth (m)	0.8	1.0
Volume (m3)	33	61
TWL Area (m2)	112	169
Outflow (m3/s)	0	0.03

First 15mm volume of 30m3 to be stored in underground cells within road reserve.

CarPark	20pct	1pct
TWL (mAHD)	3.50	3.51
Total Depth (m)	0.50	0.51
Volume (m3)	66	69
TWL Area (m2)	276	282
Note: 20pct TWL not shown as it is the same size as the 1pct.		
Outflow (m3/s)	0	0.04

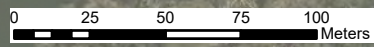
First 15mm shown as 41m3 in 0.5m deep biofiltration swale.

South	20pct	1pct
TWL (mAHD)	3.17	3.52
Total Depth (m)	0.67	1.02
Volume (m3)	58	139
TWL Area (m2)	170	300
Outflow (m3/s)	0	0.04

15mm: 48 m3 of volume as shown in a 0.5m deep biofiltration swale.

All basins sized to detain runoff to pre-development rates.

1:2,500



**Landuse**

- Pathway
- 15mmBasin
- 1pctBasin
- Catchment
- Lots
- POS
- Parking
- Road

hyd2o  
 Lot 4 Fern Rd & 102 Castledare Pl,  
 Wilson: LWMS  
**Stormwater Management Plan**  
**Figure 8**





- Lots
- Parking
- Road
- 15mmBasin

hyd2o  
Lot 4 Fern Rd & 102 Castledare Pl  
Wilson: LWMS  
**Post Development Monitoring Plan**  
**Figure 9**



**APPENDIX A**  
**LWMS Checklist for Developers**

---

## Better Urban Water Management LWMS Checklist

Local Water Management Strategy Item	Deliverable	✓	Comments
<b>Executive summary</b>			
Summary of the development design strategy, outlining how the design objectives are proposed to be met	Design elements and requirements for BMP's and critical control points	<input checked="" type="checkbox"/>	Executive Summary & Section 3
<b>Introduction</b>			
Total water cycle management - principles and objectives Planning background Previous studies		<input checked="" type="checkbox"/>	Introduction, Sections 1.1 & 1.2
<b>Proposed development</b>			
Structure plan, zoning and land use Key landscape features Previous land use	Site context plan Structure plan	<input checked="" type="checkbox"/>	Section 1, 2, & 3. Figure 1, Figure 2, Figure 3
Landscape - proposed POS areas, POS credits, water source, bore(s), lake details (if applicable), irrigation areas	Landscape plan	<input checked="" type="checkbox"/>	Stormwater Areas and Volumes to inform POS credits in Section 6 & Figures 9. Water availability identified in Section 5.2. Landscape Plan in Appendix H
<b>Design criteria</b>			
Agreed design objective and source of objective		<input checked="" type="checkbox"/>	Section 3
<b>Pre-development environment</b>			
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		<input checked="" type="checkbox"/>	Section 4 & Figures 4-8
Site conditions- existing topography/ contours, aerial photo underlay, major physical features	Site condition plan	<input checked="" type="checkbox"/>	Section 4.1, Figure 4
Geotechnical - topography, soils including acid sulfate soils and infiltration capacity, test pit locations	Geotechnical plan	<input checked="" type="checkbox"/>	Section 4.2-4.3, Figure 5
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"/>	Sections 4.4-4.6, Figure 6
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"/>	Section 4.7, Figure 7
Groundwater - topography, pre development groundwater levels and water quality, test bore locations	Groundwater plan plus details of groundwater monitoring and testing	<input checked="" type="checkbox"/>	Section 4.8, Figure 8, Appendix E
<b>Water use sustainability initiatives</b>			
Water efficiency measures- private and public open spaces including method of enforcement		<input checked="" type="checkbox"/>	Section 5.1
Water supply (fit- for-purpose strategy), agreed actions and implementation. If non-potable supply, support with water balance		<input checked="" type="checkbox"/>	Section 5.2
Wastewater management		<input checked="" type="checkbox"/>	Section 5.3
<b>Stormwater management strategy</b>			
Flood protection - peak flow rates, volumes and top water levels at control points, 100 year flow paths and 100 year detentions storage areas	100yr event plan Long section of critical points	<input checked="" type="checkbox"/>	Section 6 & 6.1-6.3, Figure 9,
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	5yr event plan	<input checked="" type="checkbox"/>	Section 6 & 6.1-6.3, Figure 9
Protect ecology - detention areas for the 1 yr 1 hr ARI event, areas for water quality treatment and types of (including indicative locations for) agreed structural and non-structural best management practices and treatment trains. Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1 yr event plan Typical cross sections	<input checked="" type="checkbox"/>	Section 6 & 6.1 & 6.4, Figure 9

Local Water Management Strategy Item	Deliverable	✓	Comments
<b>Groundwater management strategy</b>			
Post development groundwater levels, fill requirements (including existing and likely final surface levels), outlet controls, and subsoil areas/exclusion zones	Groundwater/subsoil plan	<input checked="" type="checkbox"/>	Section 7, 7.1-7.2
Actions to address acid sulphate soils or contamination		<input checked="" type="checkbox"/>	Section 7.3
<b>The next stage - subdivision and urban water management plans</b>			
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required prior to detailed design		<input checked="" type="checkbox"/>	Section 9
<b>Monitoring</b>			
Recommended future monitoring plan including timing, frequency, locations and parameters, together with arrangements for ongoing actions		<input checked="" type="checkbox"/>	Section 8, Figure 12
<b>Implementation</b>			
Developer commitments		<input checked="" type="checkbox"/>	Section 10
Roles, responsibilities, funding for implementation		<input checked="" type="checkbox"/>	Section 10
Review		<input checked="" type="checkbox"/>	Section 10



**APPENDIX B**  
**Geotechnical Report (CMW Geosciences, 2015)**

---

17 July 2015

**PROPOSED RESIDENTIAL SUBDIVISION  
CASTLEDARE, LOTS 4 AND 202 FERN ROAD,  
WILSON, WA  
GEOTECHNICAL INVESTIGATION REPORT**

Trustees of the Christian Brothers in WA (Inc)

Ref. 2015-0574AB, Rev0

# Table of Contents

- 1 INTRODUCTION ..... 1**
- 2 BACKGROUND INFORMATION AND RELATED REPORTS..... 1**
- 3 PROPOSED DEVELOPMENT..... 1**
- 4 SCOPE OF WORK..... 1**
- 5 SITE DESCRIPTION ..... 2**
- 6 GEOTECHNICAL FIELD INVESTIGATION ..... 2**
- 7 LABORATORY TESTING ..... 3**
- 8 GROUND MODEL..... 3**
  - 8.1 Previous Investigation Findings ..... 3
  - 8.2 Published Geological Conditions ..... 3
  - 8.3 Generalised Subsurface Conditions ..... 3
  - 8.4 Groundwater ..... 4
  - 8.5 Permeability ..... 4
- 9 LABORATORY TEST RESULTS..... 4**
- 10 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS ..... 5**
  - 10.1 Geohazards..... 5
    - 10.1.1 Fill ..... 5
    - 10.1.2 Flood Risk..... 5
  - 10.2 Bulk Earthworks Operations ..... 5
  - 10.3 Preliminary Site Classification..... 6
- 11 CLOSURE ..... 6**

## Figures

Figure 1 – Site Location Plan

Figure 2 – Site Plan

## Appendices

Appendix A – Test Pit Logs

Appendix B – Test Pit Photographs

Appendix C – In-situ Permeability Test Results

Appendix D – Laboratory Test Results



## 1 INTRODUCTION

CMW Geosciences Pty Ltd (CMW) was authorised by The Trustees of The Christian Brothers in WA (Inc) to carry out a geotechnical investigation of a site located at Lots 4 and 202 Fern Road, Wilson by way of a signed authorisation dated 30 June 2015. The scope of work and associated terms and conditions of our engagement were detailed in our services proposal letter referenced 2015-0574AA, Rev0 dated 27 May 2015.

## 2 BACKGROUND INFORMATION AND RELATED REPORTS

The site is currently partly zoned "Recreation" and partly zoned "Private Clubs and Institutions" under the City of Canning Metropolitan Region Scheme (MRS) and owned by the Christian Brothers, who are proposing to sell the land for residential development. The client is currently seeking to increase the area designated as "Private Clubs and Institutions" under the MRS, and as such the investigations have been focused on addressing planning conditions likely to be set by the Western Australian Planning Commission (WAPC) as part of the proposed change to a more sensitive land use.

Previous investigations at other portions of Lot 102 and Lot 4 have identified areas of fill material which contained asbestos. The presence of the impacted material was identified as being due to historical fill being sourced from an asbestos manufacturing plant (ATA Environmental, 2001). Based on historical investigations, evidence suggests that the use of the impact fill material did not occur on the areas of Lot 102 and Lot 4 that form the current investigation area. Anecdotal evidence suggests that uncontrolled fly-tipping may also have taken place in areas of the site, particularly in and adjacent to the Water Corporation Main Drain drainage channel in the north-east corner of Lot 102. However, it is noted that the anecdotal information clearly noted that only the original drainage corridor and the area to the east were subject to filling, and that the area to the west of the drainage corridor, including the subject site, was considered to be 'virgin land'.

The site was classified by the Department of Environment Regulation as '*possibly contaminated – investigation required*' under Section 13 of the *Contaminated Sites Act (2003)* on 8 December 2009 due to historical contamination of the site (as part of the larger area of Lot 102 and Lot 4) including the use of fill containing asbestos contamination. Parts of the site have historically experienced filling and/or stockpiling of building rubble and waste containing "flat sheet" asbestos and potentially filling with slurry containing asbestos fibres.

We have been provided with a copy of a Coffey Preliminary and Detailed Site Investigation Report, reference ENAUPERT03749AC\_R01a, dated 16 June 2015 which provides details of desktop reviews and previous environmental investigations at the site. It is understood that no geotechnical investigations have been completed at the site.

## 3 PROPOSED DEVELOPMENT

At the time of undertaking this investigation and of writing this report the project was in the early stages of planning. We understand that a number of residential lots are proposed with two storey houses. It is proposed to redevelop a portion of the site (mostly within the southern section) as a future residential development. The remainder of the site (the northern section) is proposed to remain as public open space use in the foreseeable future, but may potentially be considered for further expansion of the Castledare Retirement Village at some point. Currently, the subdivision master plan or structure plan has not been provided.

## 4 SCOPE OF WORK

The purpose of this report is to describe the investigation completed, the ground conditions encountered and to provide recommendations with respect to geotechnical aspects of the proposed

development including site preparation and earthworks, excavatability and site classification, as detailed in our proposal letter.

The scope of work carried out by CMW excludes any work related to the contamination aspects.

## 5 SITE DESCRIPTION

The proposed development site comprises an area of approximately 4.6ha and is located at Lots 4 and 202 Fern Road, Wilson, WA as shown on the attached Site Location Plan – Figure No. 1.

The site has been accessed as public open space and appears to be used by the public to access the parkland areas adjacent to the Canning River. The Castledare Miniature Railway is present on the eastern portion of Lot 102 and Lot 4, adjacent to the site.

The site rises from less than 1.0m above Australian Height Datum (AHD) at the edge of the Water Corporation Wilson Main Drain, to a maximum of 5.0m AHD in the west (Department of Environment (DoE) 2004a). The site slopes down to the Canning River to the east and suggests a degree of filling given the relatively steep gradient present.

The site is fenced along the southern perimeter, with fencing belonging to individual residential properties. Other boundaries of the site are unfenced and the area, including the site, is open to public access.

The surrounding area comprises of the Castledare Retirement Village and church located to the west with residential properties located to the south. To the north the Water Corporation Main drain is present with the Castledare Miniature Railway and associated recreation open space located along the eastern boundary of the site.

For the purposes of this investigation, the site has been separated into two areas (Area 1 in the northern part and Area 2 in the southern part) and this is shown on the Site Investigation Plan (Figure 02).

## 6 GEOTECHNICAL FIELD INVESTIGATION

Following a dial before you dig search, the field investigation was carried out on 03 July 2015. All fieldwork was carried out under the direction of CMW Geosciences Pty Ltd in general accordance with AS1726 (1993), Geotechnical Site Investigations. The scope of fieldwork completed was as follows:

- Undertake a walkover survey of the site to assess the general landform, site conditions and adjacent structures / infrastructure;
- Twelve test pits, denoted TP01 to TP12, were excavated using a backhoe fitted with a 600mm wide blade bucket to depths of between 2.2m and 2.6m below existing ground levels. All test pits were terminated due to repeated collapse. Representative bulk samples were collected to provide samples for subsequent laboratory testing. Engineering logs and photographs of the test pits are presented in Appendix A and B respectively;
- Two hand auger boreholes, denoted HA01 and HA02, were drilled using a 100mm diameter auger to target depths of up to 1.4m below existing ground levels to facilitate in-situ permeability testing. The results of the in-situ falling head permeability tests are presented in Appendix C;
- Perth Sand Penetrometer (PSP) tests were carried out adjacent to each test pit, in general accordance with AS1289.6.3.3, to depths of up to 4.2m to provide soil density profiles. Graphical results of the PSP testing are presented on the test pit logs in Appendix A;

The approximate locations of the respective investigation sites referred to above are shown on the attached Site Plan (Figure No. 02).

## 7 LABORATORY TESTING

Laboratory testing was carried out generally in accordance with the requirements of the current edition of AS 1289 (where applicable).

All testing was scheduled by CMW and carried out by Cardno Geotech, a NATA registered Testing Authority.

The extent of testing carried out to provide the geotechnical parameters required for this study are presented in Table 1.

<b>Table 1: Laboratory Test Schedule Summary</b>		
<b>Type of Test</b>	<b>Test Method</b>	<b>Quantity</b>
Particle size distribution	AS1289.3.6.1	3
Atterberg limits	AS1289.3.1.1, 3.2.1, 3.3.1	3
Linear shrinkage	AS1289.3.4.1	3

Certificates for the test results outlined above are presented in Appendix D.

## 8 GROUND MODEL

### 8.1 Previous Investigation Findings

Previous environmental investigation at the site have identified fill materials to be present to depths of up to 1.8m. This fill material typically comprised sand fill with some construction rubble present.

### 8.2 Published Geological Conditions

A review of the geological references (Ref. Perth, Sheet 2034 II and Part of 2034 III and 2134 III) for the area suggests the site is underlain by Bassendean Sand. Immediately adjacent to the Canning River (to the east) alluvial deposits comprising clayey sandy silt may be encountered.

### 8.3 Generalised Subsurface Conditions

The ground conditions encountered and inferred from the investigation were considered to be generally consistent with the published geology and the previous investigations and can be generalised according to the following subsurface sequence:

FILL/TOPSOIL/SILTY SAND	silty sand, dark brown, grass cover and 200 mm root zone;
(POSSIBLE) FILL/SAND	typically medium dense to dense, dark grey, grey and brown, fine to medium grained;
SAND (SP)	typically medium dense, pale grey to orange brown, fine to medium grained;
Sandy CLAY/CLAYEY SAND (CH/SC)	firm to stiff orange brown mottled grey, low to high plasticity.

The distribution of these units is summarised in Table 2 below:



Description	Depth to top of layer (m)		
	Minimum	Maximum	Average
FILL/POSSIBLE FILL & TOPSOIL/ SILTY SAND	0	0	0
FILL/SAND*	0.2	0.7	0.3
SAND (SP)	0.2	1.5	0.6
Sandy CLAY/CLAYEY SAND (CH/SC)**	1.5	1.5	1.5

Notes: \* Strata only encountered in TP03, TP06, TP07, TP08 and TP09. \*\* Strata only encountered in TP09 and TP10. TP06 encountered loose sands at between 0.7m and 1.3m and between 2.9m and >4.2m depth.

## 8.4 Groundwater

The Perth Groundwater Atlas which indicates that likely maximum groundwater levels may be at approximately RL 2.5m AHD in the east and RL 5m in the west. These elevations are approximately at or near to existing ground levels.

Groundwater was encountered as a seepage in TP10 at a depth of 1.5m during our investigation. In addition, soils were noted as wet below 1.9m in TP12 and below 2.0m TP07. These depths equate to approximately RL 2.5m AHD.

## 8.5 Permeability

The results of the constant and rising head permeability tests carried out were used to estimate the soil coefficient of permeability in accordance with the methods described in CIRIA Report No. 113. The results indicate in-situ permeability of between  $1.9 \times 10^{-5}$  m/sec and  $2.7 \times 10^{-5}$  m/sec (2m/day).

## 9 LABORATORY TEST RESULTS

Results of the laboratory tests provided in Appendix D are summarised in Table 3 below:

Test Location	Depth (mbgl)	Gravel (%)	Sand (%)	Fines (%)	LL (%)	PL (%)	PI (%)	LS (%)
TP09	1.5	4	32	64	67	23	44	17.5
TP10	2.0	1	81	18	21	10	11	3.0
TP10	2.1	8	71	21	25	11	14	5.5

Notes: particle percentages by weight, LL = liquid limit, PL = plastic limit, PI = plasticity index, LS = linear shrinkage

The results of the laboratory testing generally concur with the field descriptions and indicate layers of sandy clay and clayey sand. The sandy clay was high plasticity and the clay portion of the clayey sand was low plasticity.

## 10 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

### 10.1 Geohazards

#### 10.1.1 Fill

Fill material was encountered during our investigation across the site to depths of up to 1.5m below ground level. In addition, fill material was also encountered during the previous environmental investigations across the site to depths of up to 1.8m.

The fill material was typically medium dense sand, however, isolated PSP tests indicated zones of loose sand. In addition, in some locations isolated areas of construction rubble, plastic and metal were encountered up to 1.5m deep. Given the presence of this material, the history of the site and the variable quality and density, it is considered that this fill is uncontrolled and has not undergone any placement or compaction under engineering supervision in order to deem it engineered fill. This material may cause intolerable total and differential settlements of structures.

#### 10.1.2 Flood Risk

Given the maximum elevations published in the Perth Groundwater Atlas and the proximity of the Canning River, it may be possible that maximum groundwater levels may be at existing ground levels during a flood event. The site is within a 100 Year Average Recurrence Interval (ARI) Floodplain Area as defined by the Department of Water.

### 10.2 Bulk Earthworks Operations

#### 10.2.1 Topsoil Stripping

All topsoil or otherwise shallow unsuitable organic material should be removed and cut to waste. Alternatively, it may be blended and re-worked, as described below, or used in Public Open Spaces. This material is not consistent across the site and may vary in thickness between 200mm and 700mm thick.

#### 10.2.2 Remediation of Uncontrolled Fill Material

Depending on bulk earthworks proposed, unsuitable uncontrolled fill material may require excavation and replacement to its full depth to reduce the likelihood of total and differential settlements. All organic and deleterious fill material must be excavated and replaced with clean granular fill, moisture conditioned and compacted as outlined in Section 10.2.3.

These unsuitable deposits must be disposed of off-site or may be blended with clean sand material (depending on the quality) and re-worked as per the recommendations in Section 10.2.3. In areas where uncontrolled fill is clean granular material and does not contain any deleterious material, it may be possible to remediate any loose areas with high energy deep compaction to ensure consistent densities. In addition, if considerable engineered fill depths (~1m) are anticipated as part of this development, remediation of loose material may not be required. Once bulk earthworks plans are finalised, remediation strategies can be more accurately assessed and it is recommended that CMW be contacted to provide further advice.

#### 10.2.3 General Earthworks

Earthworks construction recommendations are as follows:

- Cut/fill earthwork operations can be undertaken as required using standard mechanic plant. Imported fill should be clean granular fill with less than 10% fines (<75 µm diameter) and free of cobbles and boulders (>150 mm diameter);
- The upper 300mm of the exposed subgrade within proposed cut areas and beneath proposed fill areas should then be moisture conditioned to within  $\pm 3\%$  of the optimum moisture content

and compacted to achieve a dry density ratio of at least 95% based on Modified compaction (AS1289 5.2.1). This is normally considered to have been achieved with a minimum blow count of 7 for each 150mm depth penetration of the PSP test. Any weak, cohesive or organic materials observed during this proof roll shall be removed and replaced with compacted clean fill;

- All fill materials must be moisture conditioned to within  $\pm 3\%$  of the optimum moisture content, placed and compacted, in layers no greater than 300mm, to achieve a dry density ratio of at least 95% based on Modified compaction (AS1289 5.2.1). This is normally considered to have been achieved with a minimum blow count of 7 for each 150mm depth penetration of the PSP test;
- Temporary cut batters in natural sand above the water table may be excavated to a gradient of up to 1v:1.5h (33.5 degrees) to maximum heights of 3m, provided no load bearing structures are located within 2m of the batter crest. Cut batters exceeding this 3m height must be benched (minimum 1.5m wide level benches). All permanent slopes in sand that are not supported by a retaining wall, battered back to 1V:2H (26 degrees). All permanent slopes should be densely vegetated to minimise the risk of soil erosion.

#### 10.2.4 Trafficability

The sandy nature of the site soils means that they will dry quickly where exposed which will lead to significant rutting under construction vehicle loads. Therefore across the building platform, consideration to the placement of a 150 mm thick blinding layer of crushed limestone gravel or similar should be made following sand subgrade compaction.

#### 10.2.5 Earthworks Monitoring

Variations in ground conditions may occur between test locations. If conditions other than those described are encountered, further advice should be sought without delay. During the formation of building platforms, site visits should be made by a Geotechnical Engineer or Engineering Geologist who is familiar with the contents of this report to ensure that topsoil stripping is carried out adequately, proof compaction and cut to fill earthworks are conducted in accordance with AS3798-2007, and to audit compaction of earthworks. Earthworks control testing should be undertaken in accordance with the guidelines set out in AS3798-2007. CMW would be pleased to perform this function if required.

### 10.3 Preliminary Site Classification

Based on our assessment of the materials encountered and within the depth investigated, as reported in AS2870 - 2011, the majority of the site can currently be assigned a CLASS P classification. This is due to the depth of uncontrolled fill encountered across the site.

For the majority of the site, a preliminary site classification of CLASS A would be considered appropriate for design purposes provided the recommendations outlined within Section 10.2 are followed. However, for the southern corner of the site, where the clayey material was encountered, a site classification of CLASS S would be considered appropriate for design purposes, following remediation. The areas of different site classifications are indicated on Figure 02.

It is important to note that the site classifications provided above are subject to change depending on final cut and fill depths.

## 11 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be



considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use by Trustees of the Christian Brothers in WA (Inc) in relation to the Lot 4 and 202 Fern Road, Wilson, WA project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than Trustees of the Christian Brothers in WA (Inc) and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

**For and on behalf of  
CMW Geosciences Pty Ltd**



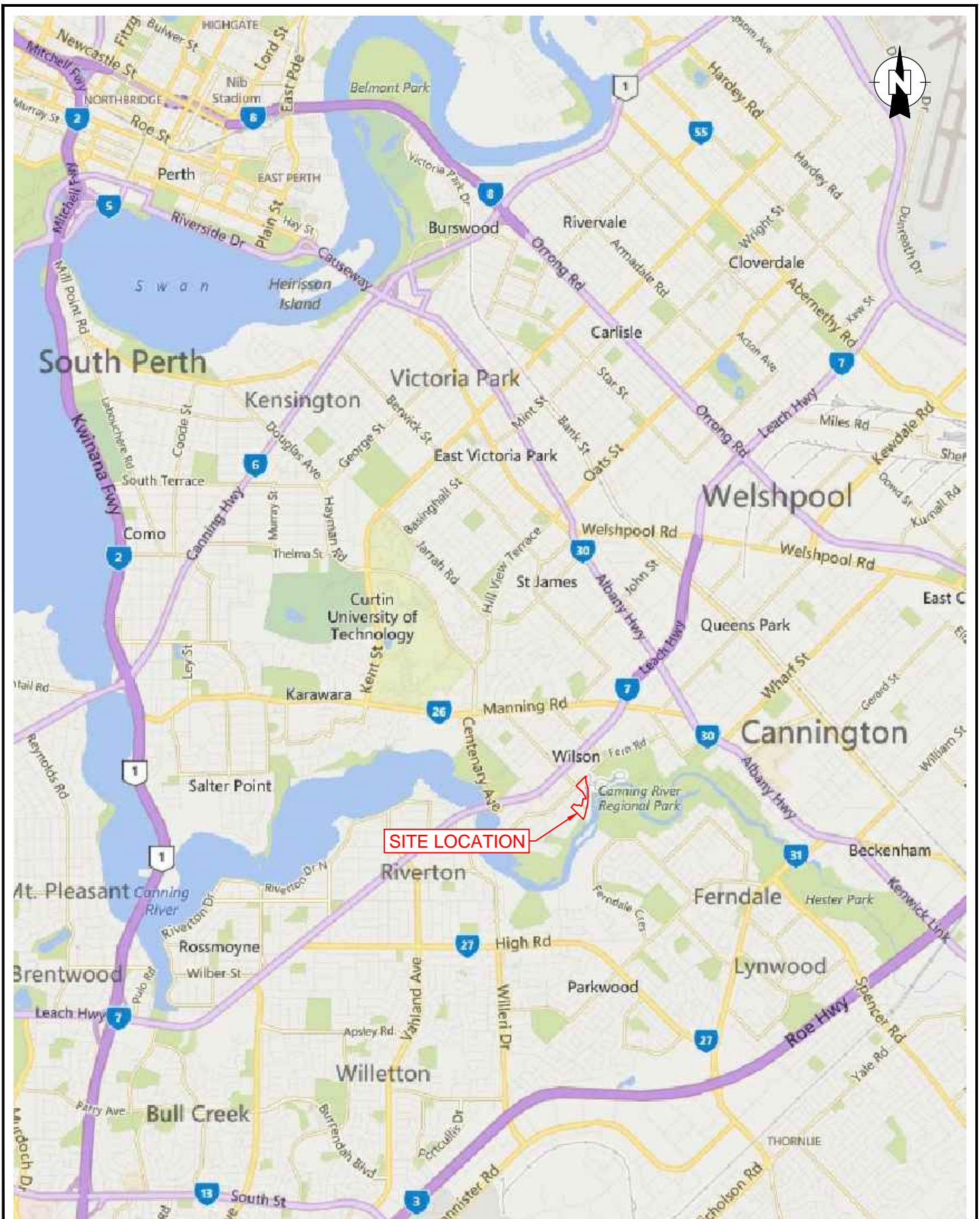
Alex Petty  
**Site Investigation Team Leader**




Craig Butterworth  
**Director / Principal Geotechnical Engineer**

Distribution: 1 copy to Trustees of the Christian Brothers in WA (Inc) (electronic)  
Original held by CMW Geosciences Pty Ltd

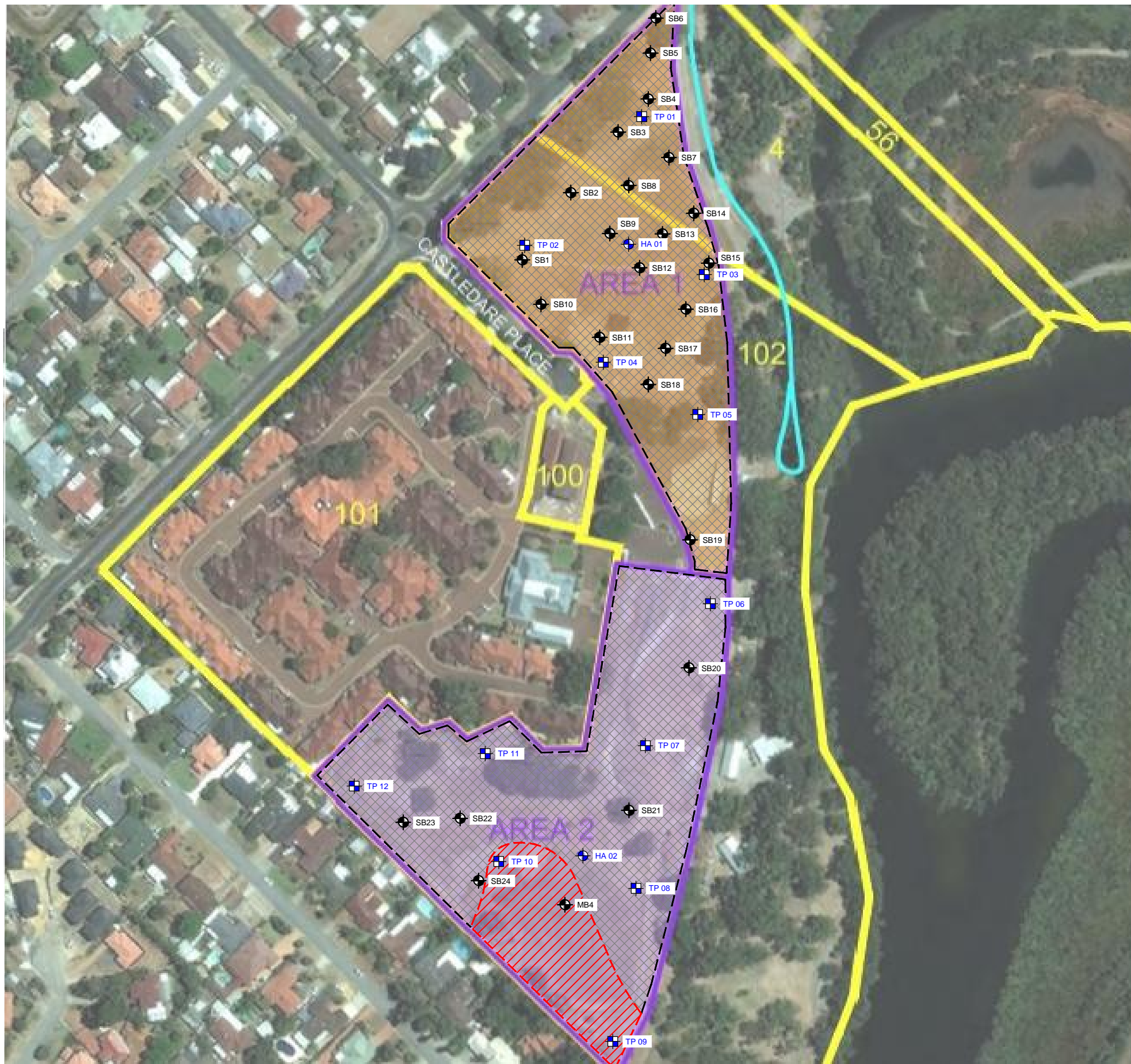
## Figures



NOTE: IMAGERY SOURCED FROM BING.COM

 <p><b>CMW Geosciences</b> Chapman Morton Woodward</p>	CLIENT:	TRUSTEES OF THE CHRISTIAN BROTHERS IN WA (INC)	DRAWN:	CJ	PROJECT:	2015-0574
	PROJECT:	CASTLEDARE, LOTS 4 & 202 FERN ROAD, WILSON, WA	CHECKED:	AP	FIGURE:	01
	TITLE:	SITE LOCATION PLAN	REVISION:	0	SCALE:	1:60 000
			DATE:	01/07/2015	SHEET:	A3 L



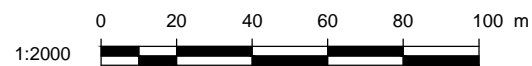


**LEGEND:**

- HA 01 DENOTES HAND AUGER (HA) LOCATION
- TP 01 DENOTES TEST PIT (TP) LOCATION
- SB1 / MB1 DENOTES HISTORICAL SOIL BOREHOLE (SB) / MACHINE BOREHOLE (MB) LOCATION, COFFEY - APRIL 2015
- AS2870 PRELIMINARY SITE CLASS S
- AS2870 PRELIMINARY SITE CLASS A

NOTE: SITE CLASSIFICATIONS ASSUMES RECOMMENDATIONS PROVIDED IN REPORT ARE FOLLOWED

NOTE: BASE PLAN SUPPLIED BY AURORA ENVIRONMENTAL



CLIENT:	TRUSTEES OF THE CHRISTIAN BROTHERS IN WA (INC)	DRAWN:	CJ	PROJECT:	2015-0574
PROJECT:	CASTLEDARE, LOTS 4 & 202 FERN ROAD, WILSON, WA	CHECKED:	AP	FIGURE:	02
TITLE:	SITE INVESTIGATION PLAN	REVISION:	0	SCALE:	1:2000
		DATE:	01/07/2015	SHEET:	A3 L

# **Appendix A**

## **Test Pit Logs**

# TEST PIT LOG - TP01

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP		Position: E.397503m N.6456738m (MGA 50)		Plant: JCB								
Checked by: CB		Elevation:		Contractor: AHD Contracting								
				Dimensions : 1.00m x 2.50m								
Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations
	Depth	Type & Results							5	10	15	
	0.5	1 B				TOPSOIL/SILTY SAND: fine to medium grained, sub-angular to sub-rounded, dark brown.  SP: SAND: fine to medium grained, sub-angular to sub-rounded, pale yellow brown.						
			1			<i>below 1.5m depth locally cemented and dark brown - "coffee rock"</i>		MD				
			2			<i>below 2.0m depth becomes pale grey</i>						PSP Refused.
						Borehole terminated at 2.300 m		M				
			3									

Termination Reason: Repeated Collapse  
 Remarks: Test Pit unstable. No groundwater encountered.



# TEST PIT LOG - TP02

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP Checked by: CB		Position: E.397449m N.6456678m (MGA 50) Elevation:		Plant: JCB Contractor: AHD Contracting		Dimensions : 1.00m x 2.50m							
Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations	
	Depth	Type & Results							5	10	15		
						TOPSOIL/SILTY SAND: fine to medium grained, sub-angular to sub-rounded, dark brown.							
						SP: SAND: fine to medium grained, sub-angular to sub-rounded, grey mottled pale grey.							
			1										
			2			<u>below 2.0m depth locally cemented and dark brown - "coffee rock"</u>							
						Borehole terminated at 2.500 m							PSP Refused.
			3										

Termination Reason: Repeated Collapse  
 Remarks: Test Pit unstable. No groundwater encountered.

# TEST PIT LOG - TP03

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20 Sheet 1 of 1

Logged by: AP	Position: E.397532m N.6456665m (MGA 50)	Plant: JCB	
Checked by: CB	Elevation:	Contractor: AHD Contracting	Dimensions : 1.00m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations	
	Depth	Type & Results							5	10	15		
					[Cross-hatched pattern]	POSSIBLE FILL: TOPSOIL/SILTY SAND: fine to medium grained, sub-angular to sub-rounded, dark brown.							
					[Cross-hatched pattern]	POSSIBLE FILL: SAND: fine to medium grained, sub-angular to sub-rounded, dark grey.	D						
				1	[Dotted pattern]	SP: SAND: fine to medium grained, sub-angular to sub-rounded, orange brown.							
					[Dotted pattern]	<i>below 1.5m depth locally cemented and dark brown - "coffee rock"</i>	M						
				2	[Dotted pattern]		MD						
					[Dotted pattern]	Borehole terminated at 2.600 m							
				3	[Dotted pattern]								

Termination Reason: Repeated Collapse  
 Remarks: Test Pit unstable. No groundwater encountered.

# TEST PIT LOG - TP04

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP	Position: E.397486m N.6456625m (MGA 50)	Plant: JCB
Checked by: CB	Elevation:	Contractor: AHD Contracting
		Dimensions : 1.00m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations
	Depth	Type & Results							5	10	15	
						FILL: TOPSOIL/SILTY SAND: fine to medium grained, sub-angular to sub-rounded, dark brown, with cobbles of construction rubble, trace plastic, metal and bricks.						
						SP: SAND: fine to medium grained, sub-angular to sub-rounded, orange brown.		D				
				1								
							M					
							M					
				2		<u>below 2.0m depth locally cemented and dark brown - "coffee rock"</u>						PSP Refused.
						Borehole terminated at 2.500 m						
				3								

Termination Reason: Repeated Collapse  
 Remarks: Test Pit unstable. No groundwater encountered.



# TEST PIT LOG - TP05

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP Checked by: CB		Position: E.397529m N.6456601m (MGA 50) Elevation:		Plant: JCB Contractor: AHD Contracting		Dimensions : 1.00m x 2.50m							
Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations	
	Depth	Type & Results							5	10	15		
						FILL:TOPSOIL/SILTY SAND: fine to medium grained, sub-angular to sub-rounded, dark brown, with gravel, roots and rootlets.							
						SP: SAND: fine to medium grained, sub-angular to sub-rounded, grey.							
						SP: SAND: fine to medium grained, sub-angular to sub-rounded, yellow brown.							
				1			M						
						<u>below 1.5m depth becomes orange brown</u>							
				2			MD						
						Borehole terminated at 2.500 m							
				3									

Termination Reason: Repeated Collapse

Remarks: Test Pit unstable. No groundwater encountered. Possible buried pipe encountered in northern end - test pit extended southwards.

# TEST PIT LOG - TP06

Client: Trustees of the Christian Brothers in  
WA (Inc)  
Project: Castledare  
Location: Lots 4 & 202 Fern Road, Wilson  
Project: 2015-0574  
Date: 03/07/2015



1:20 Sheet 1 of 2

Logged by: AP	Position: E.397535m N.6456514m (MGA 50)	Plant: JCB
Checked by: CB	Elevation:	Contractor: AHD Contracting

Dimensions : 1.00m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations
	Depth	Type & Results							5	10	15	
				0		POSSIBLE FILL:SILTY SAND: fine to coarse grained, sub- angular to sub-rounded, dark brown, with roots and rootlets.						
				0.5		POSSIBLE FILL:SAND: fine to medium grained, sub- angular to sub-rounded, pale grey and grey bands.		MD				
				1.0		SP: SAND: fine to medium grained, sub-angular to sub- rounded, pale grey.		L				
				1.5				M				
				2.0				MD				
				2.5								
				2.5		Borehole terminated at 2.500 m						
				3.0								
				3.5								

Continued on next sheet

Termination Reason: Repeated Collapse  
Remarks: Test Pit unstable. No groundwater encountered.

# TEST PIT LOG - TP06

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 2 of 2

Logged by: AP      Position: E.397535m N.6456514m (MGA 50)      Plant: JCB  
 Checked by: CB      Elevation:      Contractor: AHD Contracting      Dimensions : 1.00m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations
	Depth	Type & Results							5	10	15	
				4				L				
				5								
				6								

Termination Reason: Repeated Collapse  
 Remarks: Test Pit unstable. No groundwater encountered.



# TEST PIT LOG - TP07

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP Checked by: CB		Position: E.397505m N.6456448m (MGA 50) Elevation:		Plant: JCB Contractor: AHD Contracting		Dimensions : 1.00m x 2.50m							
Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations	
	Depth	Type & Results							5	10	15		
						POSSIBLE FILL:TOPSOIL/SILTY SAND: fine to coarse grained, sub-angular to sub-rounded, dark brown.							
						POSSIBLE FILL:SAND: fine to medium grained, sub-angular to sub-rounded, grey, dark grey and brown. Locally trace fines.	D						
				1		SP: SAND: fine to medium grained, sub-angular to sub-rounded, pale grey.	M						
				2		SP: SAND: fine to medium grained, sub-angular to sub-rounded, brown.	W						
						Borehole terminated at 2.500 m							
				3									

Termination Reason: Repeated Collapse

Remarks: Test Pit unstable. No groundwater encountered but soil becoming wet below 2.0m depth.

# TEST PIT LOG - TP08

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP	Position: E.397501m N.6456383m (MGA 50)	Plant: JCB	
Checked by: CB	Elevation:	Contractor: AHD Contracting	Dimensions : 1.00m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations	
	Depth	Type & Results							5	10	15		
						POSSIBLE FILL:TOPSOIL/SILTY SAND: fine to coarse grained, sub-angular to sub-rounded, dark brown.							
						POSSIBLE FILL:SAND: fine to coarse grained, sub-angular to sub-rounded, brown and grey.							
				1		SP: SAND: fine to coarse grained, sub-angular to sub-rounded, pale grey.	M						
				2			MD						
				3									
						Borehole terminated at 2.500 m							

Termination Reason: Repeated Collapse  
 Remarks: Test Pit unstable. No groundwater encountered.

# TEST PIT LOG - TP09

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP Checked by: CB		Position: E.397490m N.6456312m (MGA 50) Elevation:		Plant: JCB Contractor: AHD Contracting		Dimensions : 1.00m x 2.50m						
Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations
	Depth	Type & Results							5	10	15	
	1.5	1 D		1		FILL:SILTY SAND: fine to coarse grained, sub-angular to sub-rounded, dark brown, with roots and rootlets, trace asphalt gravel.  FILL:SAND: fine to coarse grained, sub-angular to sub-rounded, brown, orange brown and grey, trace asbestos sheeting, metal, plastic and roots.  CH: Sandy CLAY: high plasticity, orange brown mottled brown and grey.  below 1.8m depth locally grades to CLAY with sand	D  MD  L  F to St				Liquid Limit - 67%, Plastic Limit - 23%, Plasticity Index - 44%, Linear Shrinkage - 17.5%, Percent Fines - 64%	
				2								
				3								
						Borehole terminated at 2.400 m						

Termination Reason: Repeated Collapse

Remarks: Test Pit unstable. No groundwater encountered.



# TEST PIT LOG - TP10

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20 Sheet 1 of 1

Logged by: AP Position: E.397438m N.6456395m (MGA 50) Plant: JCB  
 Checked by: CB Elevation: Contractor: AHD Contracting Dimensions : 1.00m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations
	Depth	Type & Results							5	10	15	
						FILL:TOPSOIL/SILTY SAND: fine to coarse grained, sub-angular to sub-rounded, dark brown and grey, trace metal and plastic.						
				1		SP: SAND: fine to medium grained, sub-angular to sub-rounded, pale grey.	M	MD				
	2.0	1 B		2		SC: CLAYEY SAND: fine to medium grained, sub-angular to sub-rounded, low plasticity, orange brown mottled grey. Locally grades to Sandy CLAY.		F to St				Plasticity Index - 11%, Percent Fines - 18%
	2.1	2 D					W					Plasticity Index - 14%, Percent Fines - 21%
						Borehole terminated at 2.600 m						
				3								

Termination Reason: Repeated Collapse

Remarks: Test Pit unstable. Groundwater encountered as seepage below 1.5m depth.

# TEST PIT LOG - TP11

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP	Position: E.397431m N.6456445m (MGA 50)	Plant: JCB
Checked by: CB	Elevation:	Contractor: AHD Contracting
		Dimensions : 1.00m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations
	Depth	Type & Results							5	10	15	
					[Cross-hatched pattern]	FILL: SILTY SAND: fine to coarse grained, sub-angular to sub-rounded, dark brown, trace construction rubble and plastic.						
				1	[Dotted pattern]	SP: SAND: fine to medium grained, sub-angular to sub-rounded, pale grey mottled grey.						
				2	[Dotted pattern]							
				3	[Dotted pattern]							
						Borehole terminated at 2.200 m						

Termination Reason: Repeated Collapse  
 Remarks: Test Pit unstable. No groundwater encountered.

# TEST PIT LOG - TP12

Client: Trustees of the Christian Brothers in WA (Inc)  
 Project: Castledare  
 Location: Lots 4 & 202 Fern Road, Wilson  
 Project: 2015-0574  
 Date: 03/07/2015



1:20

Sheet 1 of 1

Logged by: AP		Position: E.397371m N.6456430m (MGA 50)		Plant: JCB		Dimensions : 1.00m x 2.50m							
Checked by: CB		Elevation:		Contractor: AHD Contracting									
Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/Relative Density	Perth Sand Penetrometer (Blows/150mm)			Structure & other observations	
	Depth	Type & Results							5	10	15		
						TOPSOIL/SILTY SAND: fine to medium grained, sub-angular to sub-rounded, brown.							
						SP: SAND: fine to medium grained, sub-angular to sub-rounded, orange brown.	M						
				1									
						SP: SAND: fine to coarse grained, sub-angular to sub-rounded, pale grey.	MD						
				2			W						
						Borehole terminated at 2.300 m							
				3									

Termination Reason: Repeated Collapse

Remarks: Test Pit unstable. No groundwater encountered but soil becoming wet below 1.9m depth..



## **Appendix B**

# **Test Pit Photographs**

## TEST PIT PHOTOGRAPH: TP01

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

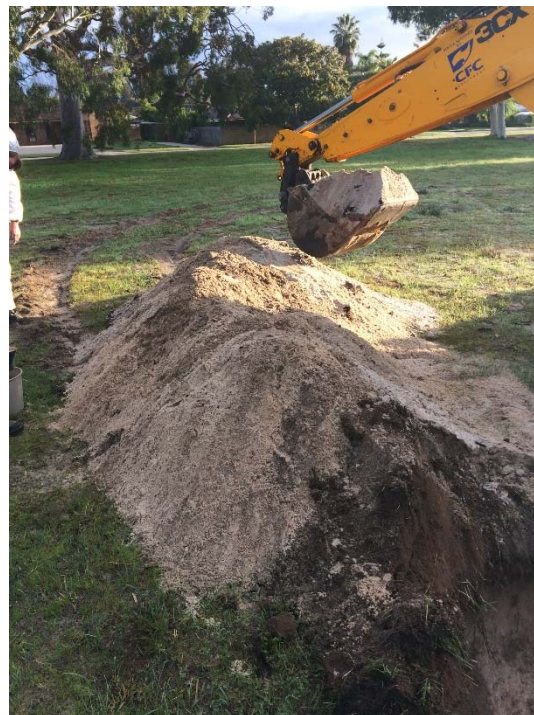
Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP01 – TEST PIT EXCAVATION



TP01 – TEST PIT EXCAVATION

## TEST PIT PHOTOGRAPH: TP02

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP02 – TEST PIT EXCAVATION



TP02 – TEST PIT EXCAVATION



## TEST PIT PHOTOGRAPH: TP03

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP03 – TEST PIT EXCAVATION



TP03 – TEST PIT EXCAVATION



## TEST PIT PHOTOGRAPH: TP04

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP04 – TEST PIT EXCAVATION



TP04 – TEST PIT EXCAVATION

## TEST PIT PHOTOGRAPH: TP05

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP05 – TEST PIT EXCAVATION



TP05 – TEST PIT EXCAVATION



## TEST PIT PHOTOGRAPH: TP06

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP06 – TEST PIT EXCAVATION



TP06 – TEST PIT EXCAVATION

## TEST PIT PHOTOGRAPH: TP07

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP07 – TEST PIT EXCAVATION



TP07 – TEST PIT EXCAVATION



## TEST PIT PHOTOGRAPH: TP08

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP08 – TEST PIT EXCAVATION



TP08 – TEST PIT EXCAVATION

# TEST PIT PHOTOGRAPH: TP09

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP09 – TEST PIT EXCAVATION



TP09 – TEST PIT EXCAVATION



## TEST PIT PHOTOGRAPH: TP09

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP09 – TEST PIT EXCAVATION



## TEST PIT PHOTOGRAPH: TP10

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP10 – TEST PIT EXCAVATION



TP10 – TEST PIT EXCAVATION

## TEST PIT PHOTOGRAPH: TP11

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP11 – TEST PIT EXCAVATION



TP11 – TEST PIT EXCAVATION



## TEST PIT PHOTOGRAPH: TP12

Client: Trustees of the Christian Brothers in WA (Inc)

Project: Castledare

Location: Lots 4 and 202 Fern Road, Wilson

Project ID: 2015-0574

Date: 03/07/15



TP12 – TEST PIT EXCAVATION



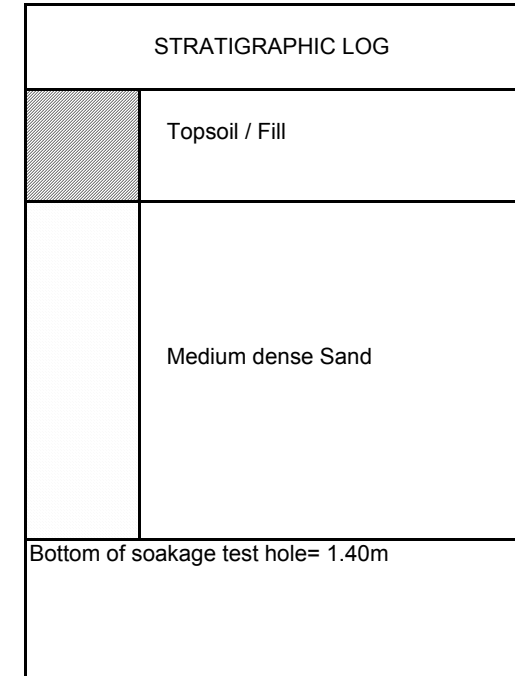
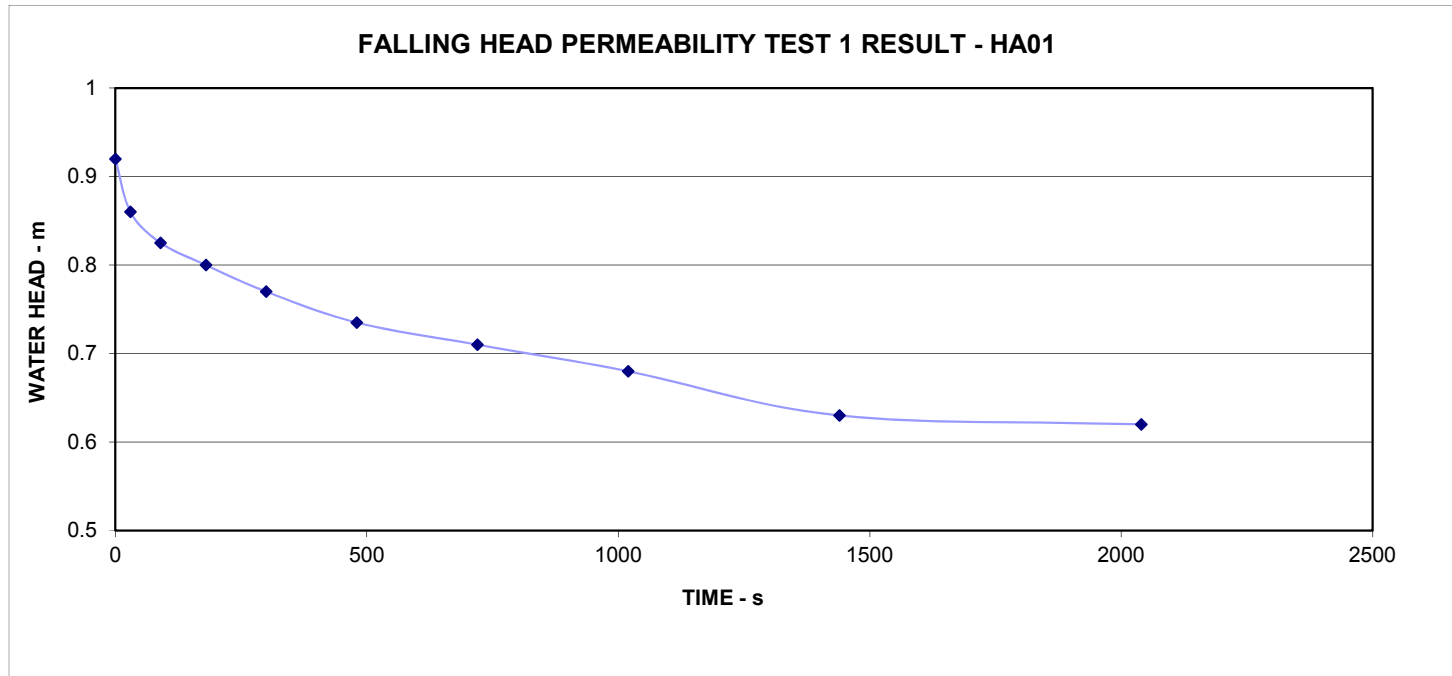
TP12 – TEST PIT EXCAVATION



# **Appendix C**

## **In-situ Permeability Test Results**

CLIENT: TRUSTEES OF THE CHRISTIAN BROTHERS IN WA (INC)  
 PROJECT: CASTLEDARE  
 LOCATION: LOTS 4 & 202, FERN ROAD, WILSON  
 JOB NUMBER: 2015-0574  
 TEST DATE: 3/07/2015



Reference: Appendix 4, Control of Groundwater for Temporary Works (CIRIA Report No. 113)

Borehole diameter = 100 mm

Hydraulic conductivity	$k = \left( \frac{\log\left(\frac{h_1}{h_2}\right) - \log\left(\frac{\alpha h_1 + 1}{\alpha h_2 + 1}\right)}{t_2 - t_1} \right) \times l$	Elapsed Time	t <sub>2</sub> - t <sub>1</sub>	Piezometric Head	Avg head	log (h <sub>1</sub> /h <sub>2</sub> )	Hydraulic Conductivity	
		(s)	(secs)	h (m)	l (m)		k (m/sec)	k (m/day)
		0		0.92				
		30	30	0.86	1.67	0.03	8.68E-05	7
		90	60	0.825	1.62	0.02	2.73E-05	2
		180	90	0.8	1.59	0.01	1.37E-05	1
		300	120	0.77	1.57	0.02	1.30E-05	1
		480	180	0.735	1.53	0.02	1.07E-05	1
		720	240	0.71	1.50	0.02	6.09E-06	1
		1020	300	0.68	1.48	0.02	6.19E-06	1
		1440	420	0.63	1.44	0.03	8.04E-06	1
		2040	600	0.62	1.41	0.01	1.21E-06	0
						Average =	1.92E-05	2

where  $l$  = average piezometric head over chosen time interval

$$l = \frac{(h_1 + h_2)}{2}$$

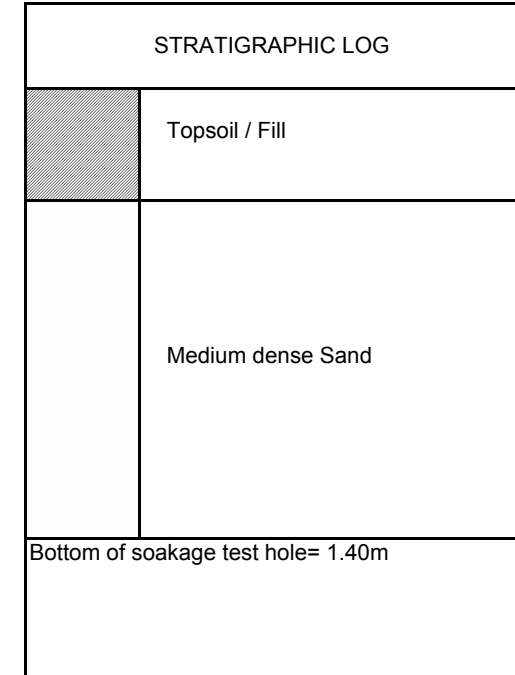
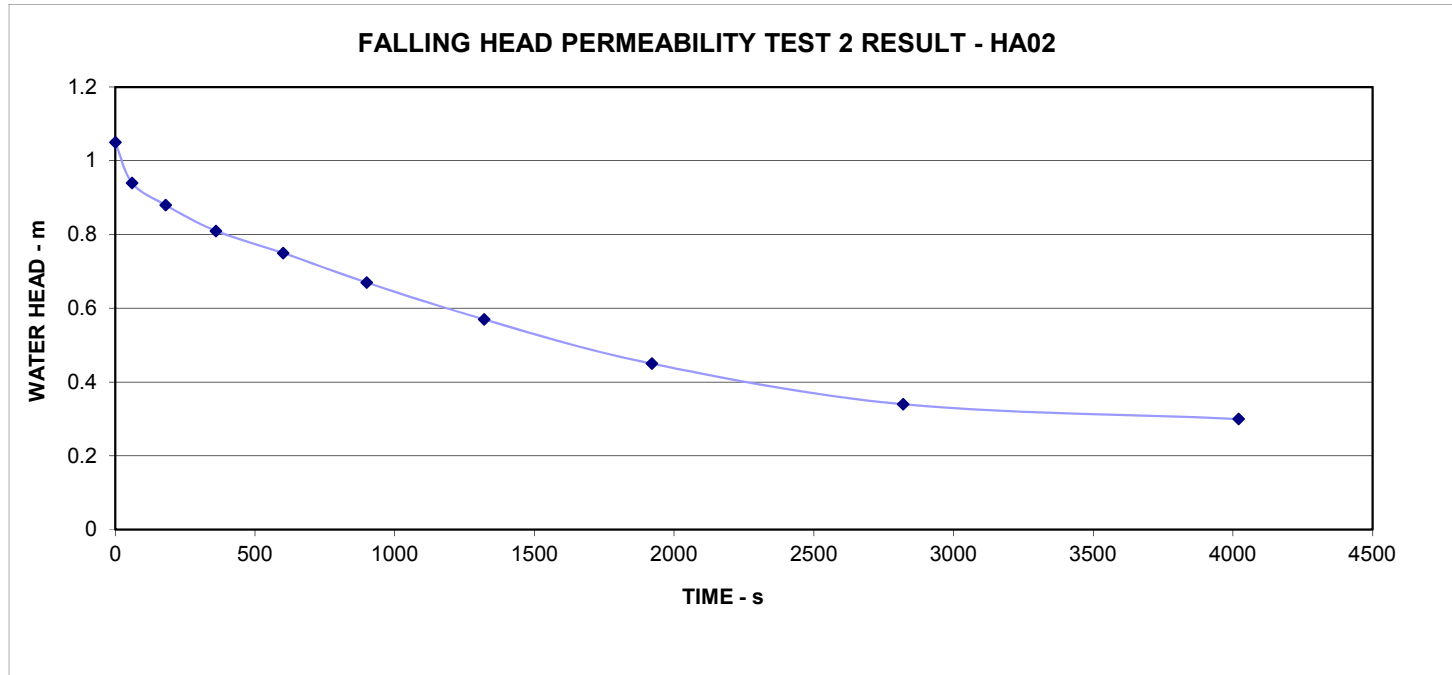
$h_1$  = piezometric head at start of chosen interval (m)

$h_2$  = piezometric head at end of chosen interval (m)

$t_2 - t_1$  = chosen time interval (seconds)

$$\alpha = \frac{\pi d}{\left(\frac{\pi d^2}{2}\right)} = 20.0$$

CLIENT: TRUSTEES OF THE CHRISTIAN BROTHERS IN WA (INC)  
 PROJECT: CASTLEDARE  
 LOCATION: LOTS 4 & 202, FERN ROAD, WILSON  
 JOB NUMBER: 2015-0574  
 TEST DATE: 3/07/2015



Reference: Appendix 4, Control of Groundwater for Temporary Works (CIRIA Report No. 113)

Borehole diameter = 100 mm

Hydraulic conductivity  $k = \left( \frac{\log\left(\frac{h_1}{h_2}\right) - \log\left(\frac{\alpha h_1 + 1}{\alpha h_2 + 1}\right)}{(t_2 - t_1)} \right) \times l$

where  $l$  = average piezometric head over chosen time interval

$$= \frac{(h_1 + h_2)}{2}$$

$h_1$  = piezometric head at start of chosen interval (m)

$h_2$  = piezometric head at end of chosen interval (m)

$t_2 - t_1$  = chosen time interval (seconds)

$$\alpha = \frac{\pi d}{\left(\frac{\pi d^2}{2}\right)} = 20.0$$

Elapsed Time (s)	t2 - t1 (secs)	Piezometric Head h (m)	Avg head l (m)	log (h <sub>1</sub> /h <sub>2</sub> )	Hydraulic Conductivity k (m/sec)	k (m/day)
0		1.05				
60	60	0.94	2.10	0.05	8.04E-05	7
180	120	0.88	2.01	0.03	2.50E-05	2
360	180	0.81	1.95	0.04	2.18E-05	2
600	240	0.75	1.88	0.03	1.58E-05	1
900	300	0.67	1.81	0.05	1.95E-05	2
1320	420	0.57	1.72	0.07	2.15E-05	2
1920	600	0.45	1.61	0.10	2.48E-05	2
2820	900	0.34	1.50	0.12	2.30E-05	2
4020	1200	0.3	1.42	0.05	8.71E-06	1
Average =					2.67E-05	2



# **Appendix D**

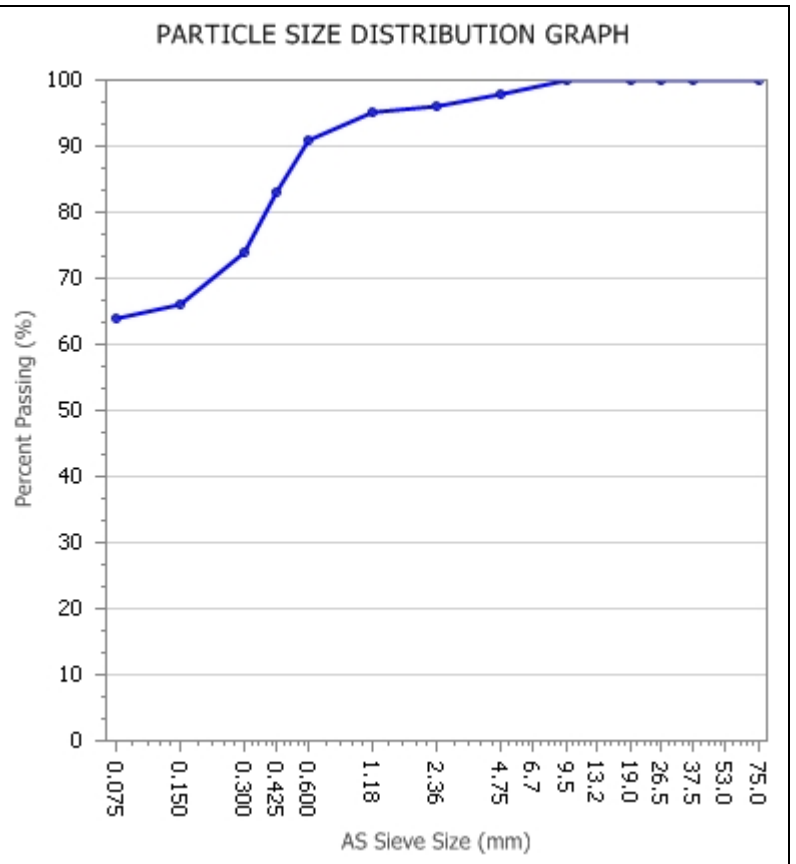
## **Laboratory Test Results**

## PARTICLE SIZE DISTRIBUTION REPORT



<b>Client:</b> CMW Geosciences <b>Client Address:</b> 19/127 Herdsman Parade, WEMBLEY <b>Project:</b> Castledare <b>Location:</b> Perth, WA <b>Component:</b> <b>Area Description:</b>	<b>Report Number:</b> 5029/R/644-1 <b>Project Number:</b> 5029/P/219 <b>Lot Number:</b> TP09 Depth 1.5m <b>Internal Test Request:</b> 5029/T/1012 <b>Client Reference/s:</b> 2015-0574 <b>Report Date / Page:</b> 16/07/2015 <span style="float: right;">Page 1 of 1</span>
---	--

<b>Test Procedures:</b> AS1289.3.6.1 <b>Sample Number:</b> 5029/S/5483 <b>Sampling Method:</b> Tested As Received <b>Date Sampled:</b> 10/07/2015 <b>Sampled By:</b> Client Sampled <b>Date Tested:</b> 13/07/2015 <b>Material Source:</b> -	<b>Sample Location:</b> Unknown  <b>Material Type:</b> Brown sandy Clay
--	---

AS Sieve (mm)	Specification Minimum	Percent Passing (%)	Specification Maximum
75.0		100	
37.5		100	
26.5		100	
19.0		100	
9.5		100	
4.75		98	
2.36		96	
1.18		95	
0.600		91	
0.425		83	
0.300		74	
0.150		66	
0.075		64	



Remarks

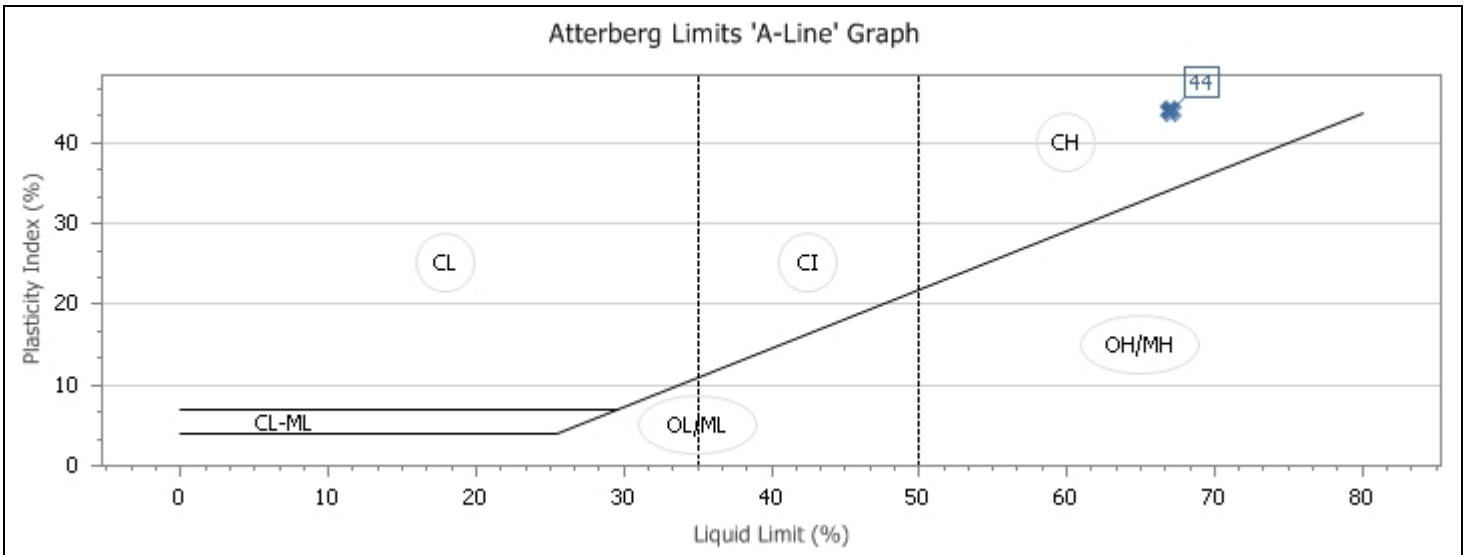
	<p>The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025</p> <p>Accreditation Number: 5029</p>	 <p>Approved Signatory: Paul Kent Form ID: W9Rep Rev 2</p>
--	--	---

## ATTERBERG LIMITS REPORT



<b>Client:</b> CMW Geosciences <b>Client Address:</b> 19/127 Herdsman Parade, WEMBLEY <b>Project:</b> Castledare <b>Location:</b> Perth, WA <b>Component:</b> <b>Area Description:</b>	<b>Report Number:</b> 5029/R/643-1 <b>Project Number:</b> 5029/P/219 <b>Lot Number:</b> TP09 Depth 1.5m <b>Internal Test Request:</b> 5029/T/1012 <b>Client Reference/s:</b> 2015-0574 <b>Report Date / Page:</b> 16/07/2015 <span style="float: right;">Page 1 of 1</span>
---	--

<b>Test Procedures:</b> AS1289.3.1.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1	
<b>Sample Number:</b> 5029/S/5483 <b>Sampling Method:</b> Tested As Received <b>Date Sampled:</b> 10/07/2015 <b>Sampled By:</b> Client Sampled <b>Date Tested:</b> 14/07/2015 <b>Att. Drying Method:</b> Oven Dried <b>Atterberg Preparation:</b> Dry Sieved	<b>Sample Location:</b> Unknown  <b>Material Source:</b> - <b>Material Type:</b> -
<b>Material Description:</b> Brown sandy Clay	

Atterberg Limits Results			
Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		<b>67</b>	
Plastic Limit (%)		<b>23</b>	
Plasticity Index (%)		<b>44</b>	
Linear Shrinkage (%)		<b>17.5</b>	
Linear Shrinkage Defects:	-		



Remarks

	<p>The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025</p> <p>Accreditation Number: 5029</p>	 <p>Approved Signatory: Paul Kent Form ID: W11Rep Rev 1</p>
--	--	--

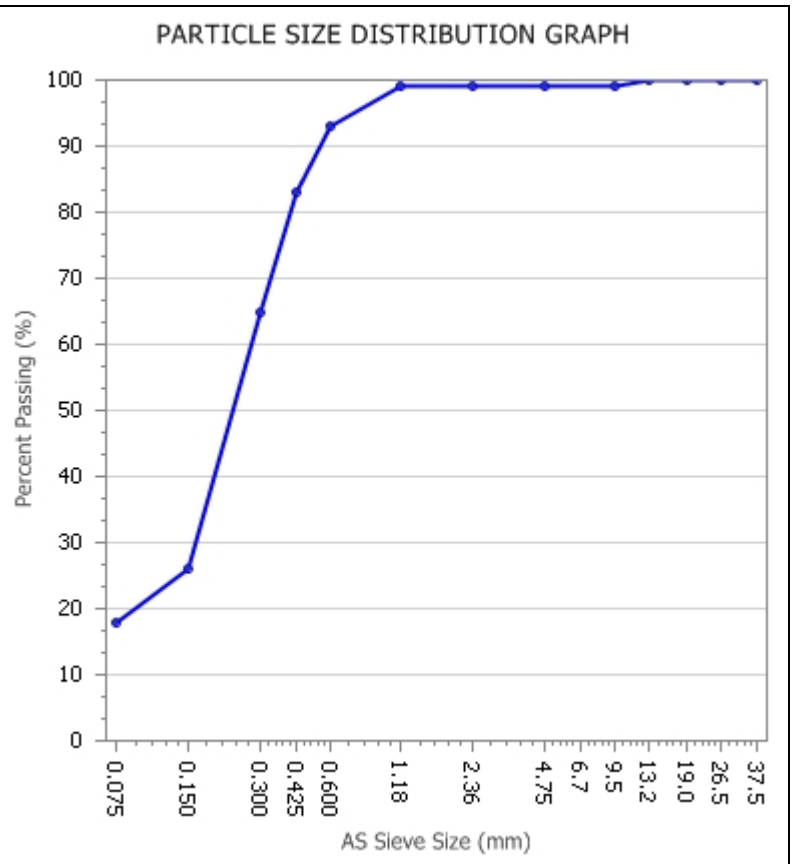


## PARTICLE SIZE DISTRIBUTION REPORT



<b>Client:</b> CMW Geosciences <b>Client Address:</b> 19/127 Herdsman Parade, WEMBLEY <b>Project:</b> Castledare <b>Location:</b> Perth, WA <b>Component:</b> <b>Area Description:</b>	<b>Report Number:</b> 5029/R/646-1 <b>Project Number:</b> 5029/P/219 <b>Lot Number:</b> TP10 Depth 2.0m <b>Internal Test Request:</b> 5029/T/1012 <b>Client Reference/s:</b> 2015-0574 <b>Report Date / Page:</b> 16/07/2015 <span style="float: right;">Page 1 of 1</span>
---	--

<b>Test Procedures:</b> AS1289.3.6.1 <b>Sample Number:</b> 5029/S/5484 <b>Sampling Method:</b> Tested As Received <b>Date Sampled:</b> 10/07/2015 <b>Sampled By:</b> Client Sampled <b>Date Tested:</b> 13/07/2015 <b>Material Source:</b> -	<b>Sample Location:</b> Unknown  <b>Material Type:</b> Brown clayey Sand
--	--

AS Sieve (mm)	Specification Minimum	Percent Passing (%)	Specification Maximum
37.5		100	
26.5		100	
19.0		100	
13.2		100	
9.5		99	
4.75		99	
2.36		99	
1.18		99	
0.600		93	
0.425		83	
0.300		65	
0.150		26	
0.075		18	



Remarks

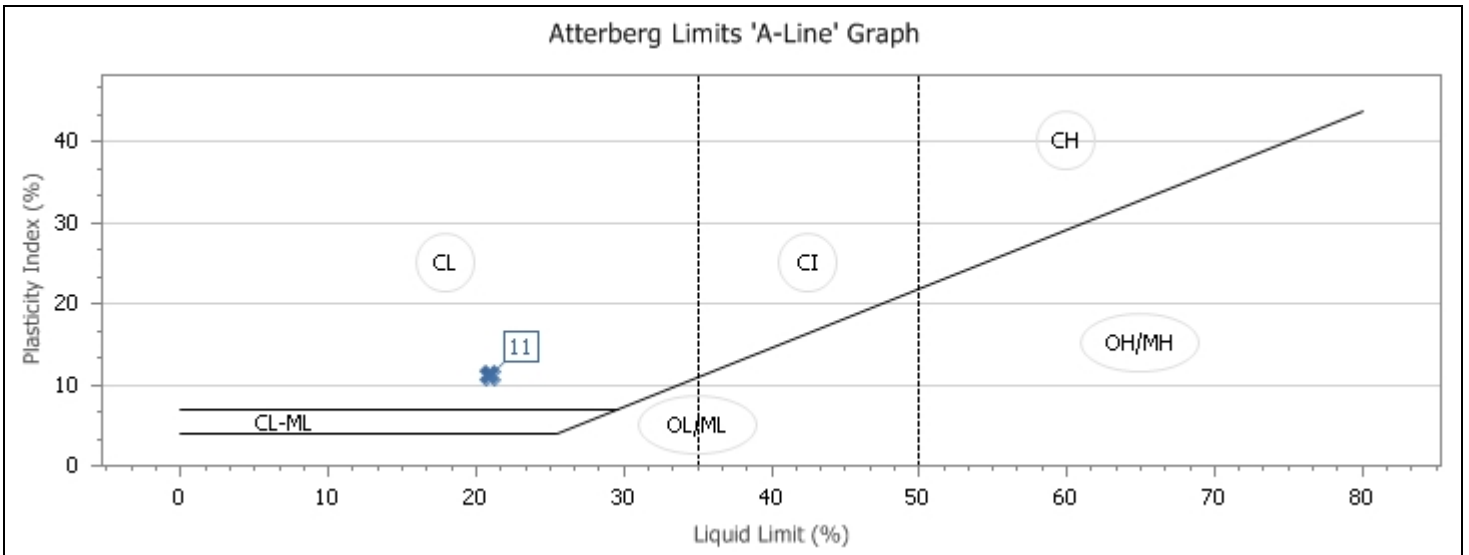
	<p>The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025</p> <p>Accreditation Number: 5029</p>	 <p>Approved Signatory: Paul Kent Form ID: W9Rep Rev 2</p>
--	--	---

## ATTERBERG LIMITS REPORT



<b>Client:</b> CMW Geosciences <b>Client Address:</b> 19/127 Herdsman Parade, WEMBLEY <b>Project:</b> Castledare <b>Location:</b> Perth, WA <b>Component:</b> <b>Area Description:</b>	<b>Report Number:</b> 5029/R/645-1 <b>Project Number:</b> 5029/P/219 <b>Lot Number:</b> TP10 Depth 2.0m <b>Internal Test Request:</b> 5029/T/1012 <b>Client Reference/s:</b> 2015-0574 <b>Report Date / Page:</b> 16/07/2015 <span style="float: right;">Page 1 of 1</span>
---	--

<b>Test Procedures:</b> AS1289.3.1.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1	
<b>Sample Number:</b> 5029/S/5484 <b>Sampling Method:</b> Tested As Received <b>Date Sampled:</b> 10/07/2015 <b>Sampled By:</b> Client Sampled <b>Date Tested:</b> 14/07/2015 <b>Att. Drying Method:</b> Oven Dried <b>Atterberg Preparation:</b> Dry Sieved	<b>Sample Location:</b> Unknown  <b>Material Source:</b> - <b>Material Type:</b> Brown clayey Sand
<b>Material Description:</b> Brown clayey Sand	

Atterberg Limits Results			
Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		<b>21</b>	
Plastic Limit (%)		<b>10</b>	
Plasticity Index (%)		<b>11</b>	
Linear Shrinkage (%)		<b>3.0</b>	
Linear Shrinkage Defects:	-		



Remarks

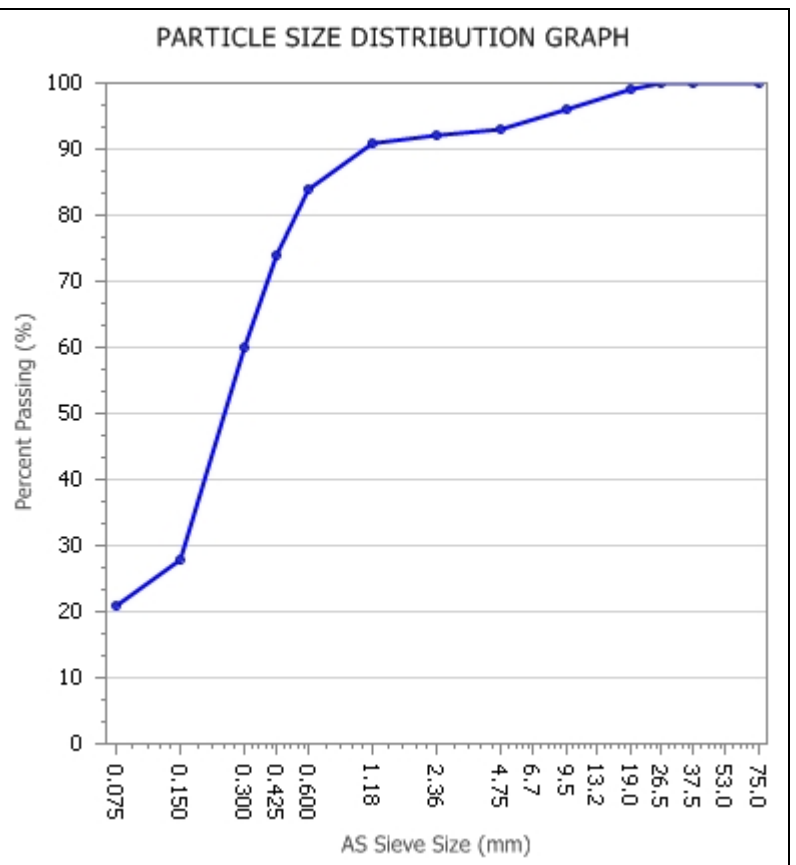
	<p>The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025</p> <p>Accreditation Number: 5029</p>	 <p>Approved Signatory: Paul Kent Form ID: W11Rep Rev 1</p>
--	--	--

## PARTICLE SIZE DISTRIBUTION REPORT



<b>Client:</b> CMW Geosciences <b>Client Address:</b> 19/127 Herdsman Parade, WEMBLEY <b>Project:</b> Castledare <b>Location:</b> Perth, WA <b>Component:</b> <b>Area Description:</b>	<b>Report Number:</b> 5029/R/648-1 <b>Project Number:</b> 5029/P/219 <b>Lot Number:</b> TP10 Depth 2.10m <b>Internal Test Request:</b> 5029/T/1012 <b>Client Reference/s:</b> 2015-0574 <b>Report Date / Page:</b> 16/07/2015 <span style="float: right;">Page 1 of 1</span>
---	---

<b>Test Procedures:</b> AS1289.3.6.1	<b>Sample Location:</b> Unknown
<b>Sample Number:</b> 5029/S/5485	<b>Material Type:</b> Brown very sandy Clay
<b>Sampling Method:</b> Tested As Received	
<b>Date Sampled:</b> 10/07/2015	
<b>Sampled By:</b> Client Sampled	
<b>Date Tested:</b> 13/07/2015	
<b>Material Source:</b> -	

AS Sieve (mm)	Specification Minimum	Percent Passing (%)	Specification Maximum
75.0		100	
37.5		100	
26.5		100	
19.0		99	
9.5		96	
4.75		93	
2.36		92	
1.18		91	
0.600		84	
0.425		74	
0.300		60	
0.150		28	
0.075		21	



Remarks

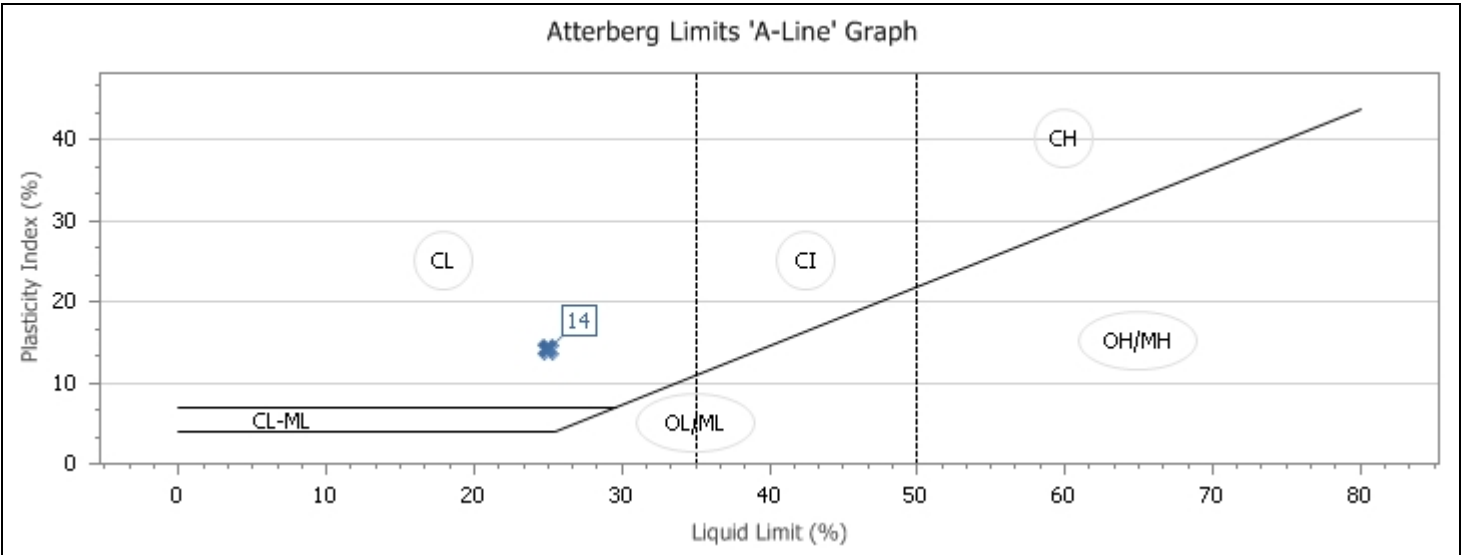
	<p>The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025</p> <p>Accreditation Number: 5029</p>	 <p>Approved Signatory: Paul Kent Form ID: W9Rep Rev 2</p>
--	--	---

## ATTERBERG LIMITS REPORT



<b>Client:</b> CMW Geosciences <b>Client Address:</b> 19/127 Herdsman Parade, WEMBLEY <b>Project:</b> Castledare <b>Location:</b> Perth, WA <b>Component:</b> <b>Area Description:</b>	<b>Report Number:</b> 5029/R/647-1 <b>Project Number:</b> 5029/P/219 <b>Lot Number:</b> TP10 Depth 2.10m <b>Internal Test Request:</b> 5029/T/1012 <b>Client Reference/s:</b> 2015-0574 <b>Report Date / Page:</b> 16/07/2015 <span style="float: right;">Page 1 of 1</span>
---	---

<b>Test Procedures:</b> AS1289.3.1.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1	
<b>Sample Number:</b> 5029/S/5485 <b>Sampling Method:</b> Tested As Received <b>Date Sampled:</b> 10/07/2015 <b>Sampled By:</b> Client Sampled <b>Date Tested:</b> 14/07/2015 <b>Att. Drying Method:</b> Oven Dried <b>Atterberg Preparation:</b> Dry Sieved	<b>Sample Location:</b> Unknown  <b>Material Source:</b> - <b>Material Type:</b> Brown very sandy Clay
<b>Material Description:</b> Brown very sandy Clay	

Atterberg Limits Results			
Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		<b>25</b>	
Plastic Limit (%)		<b>11</b>	
Plasticity Index (%)		<b>14</b>	
Linear Shrinkage (%)		<b>5.5</b>	
Linear Shrinkage Defects:	-		



Remarks

	<p>The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025</p> <p>Accreditation Number: 5029</p>	 <p>Approved Signatory: Paul Kent Form ID: W11Rep Rev 1</p>
--	--	--



APPENDIX C  
Wetland and Waterway Assessment (Emerge 2019)

---

Document Reference: EP18-019(02)--004B TAA

Emerge contact: Tom Atkinson

7 May 2019

PERTH OFFICE  
Suite 4, 26 Railway Road  
Subiaco  
Western Australia 6008

P +61 8 9380 4988  
F +61 8 9380 9636  
emergeassociates.com.au

Emerge Environmental Services Pty Ltd ABN  
57144772510 trading as Emmerge Associates

Attention: Catherine Prideaux  
Department of Biodiversity, Conservation and Attractions  
17 Dick Perry Avenue, Technology Park, Western Precinct  
Kensington WA 6151

*Delivered by email to: [Catherine.Prideaux@dbca.wa.gov.au](mailto:Catherine.Prideaux@dbca.wa.gov.au); [pdockett@rnoble.com.au](mailto:pdockett@rnoble.com.au);  
[jacey.mills@dbca.wa.gov.au](mailto:jacey.mills@dbca.wa.gov.au); [rivers.planning@dbca.wa.gov.au](mailto:rivers.planning@dbca.wa.gov.au)*

Dear Catherine

## **WETLAND AND WATERWAY ASSESSMENT – LOT 4 AND 102 FERN ROAD, WILSON**

### **1 INTRODUCTION**

The Trustees of the Christian Brothers in Western Australia Inc (Christian Brothers) intend to develop Lot 4 Fern Road and Lot 102 Castledare Place in Wilson for residential purposes. These lots (referred to herein as ‘the site’) are located approximately seven kilometres (km) south-east of the Perth Central Business District within the City of Canning, as shown in **Figure 1**.

The site extends over approximately 7.97 hectares and includes land that is currently zoned ‘urban’ and ‘parks and recreation’ in the *Metropolitan Region Scheme* (MRS). An amendment to the MRS was previously proposed within the site that reallocated land to urban and parks and recreation uses (*Burgess Design Group 2017*).

Preliminary comments on the proposed scheme amendment provided by the Department of Biodiversity Conservation and Attractions (DBCA) indicated that specific additional areas of land could be retained as ‘parks and recreation’ to provide an improved buffer to conservation category wetland features within the site (Benson Todd (DBCA) letter to the Western Australian Planning Commission (WAPC) dated 12 October 2018).

#### **1.1 Purpose and scope of work**

Emerge Associates (Emerge) were engaged by Richard Noble & Company to undertake a wetland and waterway assessment within and adjacent to the site to characterise wetland and waterway values such that the implications of the proposed amendment to parks and recreation reserve within the site can be better understood.

As part of this scope of work the following tasks were undertaken:

- A desktop review of relevant information pertaining to the site and surrounds.

- A field survey of the site and adjoining land along the Canning River<sup>1</sup>.
- Mapping of wetland landforms and assessment of wetland values.
- Review of the parks and recreation reserve identified in the *Metropolitan Region Scheme* to protect values of Canning River adjacent to the site.
- Provision of recommendations to ensure appropriate wetland and waterway management outcomes can be accommodated in the development proposal.
- Documentation of the assessment methodology, results and recommendations into a report.

## 2 METHODS

### 2.1 Desktop review

Sources used in the review of relevant information included the following:

- *Determining foreshore reserves* (WRC 2001)
- *FloraBase—the Western Australian Flora* (Western Australian Herbarium 2018)
- *Geology and Landforms of the Perth Region* (Gozzard 2007)
- *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2018)
- *Hydrography Features* dataset (DWER 2018)
- *Protected Matters Search Tool* (DoEE 2018a)
- *Metropolitan Region Scheme* (WAPC 2017)
- *NatureMap* (DPaW 2018a)
- *Swan Canning Riverpark Development Control Area* (Government of WA 2006)
- *Operational Policy 4.3: Identifying and establishing waterways foreshore areas* (DoW 2012)
- *Proposed MRS Zoning Summary Lots 4 Fern Road & 102 Castledare Place Wilson* (Burgess Design Group 2017).

### 2.2 Field survey

An ecologist from Emerge Associates undertook a field survey on 14 February and 11 March 2019. During the survey the site was traversed by foot and changes in landform, soils, vegetation composition and vegetation condition were noted. The locations of significant features was recorded using a hand-held GPS receiver and digital camera. An inventory of flora species observed was recorded and the condition of the vegetation was assessed using methods from Keighery (1994).

Identification of flora species was completed in the field and through comparison with taxonomic guides and databases. Flora species not native to Western Australia were denoted by an asterisk (\*) in text and raw data.

### 2.3 Mapping and data analysis

The local plant communities within the site were identified from the species data collected during the field survey, as well as, information about landforms and soils (Gozzard 2007).

Once a group was defined, the vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (ESCAVI 2003). The identified plant communities were then mapped on aerial photography (1:4,000) from survey data and boundaries interpreted from aerial photography. Vegetation condition was

---

<sup>1</sup>To standard required of a reconnaissance survey under Environmental Protection Authority (EPA) 2016, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth.

mapped on aerial photography (1:4,000) based on notes and images recorded during the field survey.

Wetland features in the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2018) that are mapped within the site were assessed against vegetation and landform information obtained during the survey. A wetland assessment was then completed for each wetland feature based on updated boundaries using the Department of Biodiversity and Conservation and Attractions' (DBCA's) *A methodology for the evaluation of wetlands on the Swan Coastal Plain, Western Australia* (DBCA 2017).

The biophysical assessment recommended in DWER's *Operational Policy 4.3: Identifying and establishing waterways foreshore areas* (DoW 2012) and the Water and Rivers Commission's *Determining foreshore reserves* (WRC 2001) provides a basis for definition of foreshore area. A foreshore area was defined using floodplain mapping (DWER 2019) and a nominal 50 metre distance from the outer edge of wetland associated native vegetation. The adequacy of the 'parks and recreation' reserve proposed in the MRS amendment for the site (*Burgess Design Group 2017*), was then compared to the boundaries of Swan Canning Riverpark 'development control area' (DCA), *Metropolitan Region Scheme* (MRS) 'parks and recreation' reserve; and to environmental features such as the boundary of Bush Forever Site 224, ecological sensitive areas, the extent of riparian vegetation and 100 year annual recurrence interval floodplain extent.

## 2.4 Survey limitations

The survey was undertaken by senior environmental consultant with knowledge of the local area and 17 years' of experience conducting wetland and waterway vegetation surveys. Technical review was undertaken by a principal environmental consultant with 20 years' experience in environmental science in Western Australia.

The survey was conducted within the summer low flow period for the Canning River and outside of the main flowering period for vegetation in the southwest of Western Australia. Nonetheless, given that the hydrological characteristics of the Canning River and adjacent wetlands are well-established and the condition of vegetation within the site was relatively easy to determine (i.e. 'completely degraded' or 'good or better'), the survey was considered sufficient to provide a representative summary of wetland and waterway values.

## 3 RESULTS

### 3.1 General site conditions

The site encompasses a relatively flat area of floodplain and wetland that abuts the Canning River. Parts of the site have been filled and re-contoured. Soils are sandy within the site (inclusive of fill sand) and tend to native alluvial loams and clays closer to the Canning River.

A relatively thin strip of remnant native vegetation occurs along much of the western bank of the Canning River within the site. To the east of the site extensive native vegetation occurs in association with the Canning River, its floodplain and associated fringing wetlands. The remaining vegetation within the site largely comprises planted non-native trees, landscaping and weed species.

An artificial drain managed by the Water Corporation has been constructed through the north west of the site. The central portion of this drain has been revegetated with native wetland plant species by the Wilson Wetland Action Group. Immediately to the east of the drain an upland/terrestrial area has also been revegetated using native species.

Buildings and infrastructure associated within the Castledare Miniature Railway occur in the south west of the site and tracks for the miniature railway extend from the south west corner around to eastern portion of the site.



### 3.2 Environmental features

The site intersects Bush Forever Site 224, a mapped environmentally sensitive area (ESA), a biodiversity linkage and DBCA managed land as shown in **Figure 2**.

### 3.3 Parks and recreation reserve

The parks and recreation reserve in the *Metropolitan Region Scheme* and proposed parks and recreation reserve from the proposed MRS amendment (Burgess Design Group 2017) are shown in **Figure 3**.

### 3.4 Mapped wetlands

The *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2018) shows four floodplain wetland features within the site including:

- conservation category wetland UFI 7151
- conservation category wetland UFI 14809
- conservation category wetland UFI 13316
- multiple use category wetland UFI 14810.

The location of the mapped wetland features is shown in **Figure 4**.

### 3.5 Flora

A total of 30 native, 35 planted native, 40 non-native and 11 planted non-native flora species were recorded within the site. None of the flora species recorded are threaten or priority species or declared pests.

A list of flora species recorded is provided as **Attachment 1**.

### 3.6 Vegetation

Vegetation within the site was determined to represent two native plant communities 'ErMr' and 'Jk' with the remainder comprising 'revegetation', 'non-native parkland cleared' and 'cleared', as described in **Table 1** and shown in **Figure 5**.

**Table 1: Plant communities present within the site**

Plant community	Description	Area (ha)
ErMr	Forest of <i>Eucalyptus rudis</i> over <i>Melaleuca raphiophylla</i> , <i>Casuarina obesa</i> over <i>Juncus kraussii</i> , non-native grasses and native and non-native herbs.	7.48
Jk	Sedgeland of <i>Juncus kraussii</i>	0.39
Revegetation	Shrubland of mixed planted native species.	0.69
Non-native parkland cleared	Forest of predominantly non-native trees over weeds and planted vegetation ( <b>Plate 4</b> ).	2.14
Cleared	Disturbed cleared areas comprising non-native weeds and/or planted vegetation ( <b>Plate 4</b> ).	4.49



***Plate 1: Plant community ErMr in 'very good' condition***



***Plate 2: Plant community Jk in 'very good' condition***





***Plate 3: Plant community revegetation.***



***Plate 4: Plant community 'non-native parkland cleared' in 'completely degraded' condition.***





**Plate 5: Plant community ‘cleared’ in ‘completely degraded’ condition.**

### 3.7 Vegetation condition

The vegetation within the site was determined to range from ‘very good’ to ‘completely degraded’ condition. The majority of the site was classified as being in ‘very good - good condition’. This compound condition category was applied as the interior of much of the wetland area in the east of the site was not traversed during the survey. It was nonetheless assumed that these areas comprised a combination of relatively intact and sometimes degraded vegetation which, when viewed collectively at larger scale, may be considered to be present in good or better condition. The extent of vegetation by condition category is detailed in **Table 2** and shown in **Figure 6**.

**Table 2: Vegetation condition categories within the site**

Condition category (Keighery (1994))	Size (ha)
Very good	0.47
Very good - good	7.33
Completely degraded	6.63
Revegetation	0.69

### 3.8 Wetland and waterways

#### 3.8.1 UFI 7151

Wetland feature UFI 7151 is associated with a section of the Canning River. It is classified as an estuary-peripheral basin (which implies potential for tidal influence). The extent of the UFI 7151 in relation to the site is shown on **Figure 4**. A representative image of UFI 7151 is provided in **Plate 5**.





**Plate 6: Example area within wetland feature UFI 7151**

Based on the mapped extent of the Canning River floodplain and the extent of wetland associated vegetation the boundary of wetland feature UFI 7151 is inaccurate<sup>2</sup>. The wetland assessment for the portion of UFI 7151 adjacent to the site indicated that it comprises values representative of the ‘conservation’ management category that is currently assigned (refer to evaluation output provided in **Attachment 2**).

### 3.8.2 UFI 14809

Wetland feature UFI 14809 is associated with a section of the Canning River. It is classified as a floodplain (which implies seasonal inundation). Based on the current extent of wetland associated (or riparian) vegetation the boundary of wetland feature UFI 14809 is also inaccurate<sup>2</sup>. The wetland assessment for UFI 14809 indicated that it comprises values representative of the ‘conservation’ management category that is currently assigned (refer to evaluation output provided in **Attachment 2**). A representative image of UFI 14809 is provided in **Plate 6**.

---

<sup>2</sup> It is not unusual for the boundaries of wetland features to be inconsistent with physical wetlands as the *Geomorphic Wetlands of the Swan Coastal Plain* dataset was drawn at a relatively coarse, regional scale.



**Plate 7: Example area within wetland feature UFI 14809**

### 3.8.3 UFI 13316

Wetland feature UFI 13316 is associated with a section of the Canning River. It is classified as estuary-waterbody basin (which implies marine and/or tidal influence). The extent of UFI 13316 within the site is minimal and lies outside of the proposed MRS amendment area and was therefore not further assessed.

### 3.8.4 UFI 14810

Wetland feature UFI 14810 is associated with a section of the Canning River. It is classified as a floodplain (which implies seasonal inundation). The extent of UFI 13316 within the site is relatively small and lies outside of the proposed MRS amendment area and was therefore not further assessed.

### 3.8.5 Waterways

The Canning River waterway channel adjacent to the site is well defined. The vegetation associated with the Canning River comprises plant community **ErMr** (refer **Figure 5**) which is present in 'good to very good' and 'very good' condition (refer **Figure 6**).

The 100 year ARI floodplain intersects portions of the site adjacent to the Canning River.

## **4 REVIEW OF THE ADEQUACY OF THE PARKS AND RECREATION RESERVE PROPOSED IN THE MRS AMENDMENT**

According to biophysical assessment recommended in DWER's *Operational Policy 4.3: Identifying and establishing waterways foreshore areas* (DoW 2012) and the Water and Rivers Commission's *Determining foreshore reserves* (WRC 2001) when delineating a foreshore area reference should be made to both hydrology and riparian vegetation. For this assessment the 100 Year ARI floodway, native riparian vegetation and a 50 m buffer from the outer extent of native riparian vegetation were used as basis for defining a foreshore area for the Canning River and associated wetlands within the site. The 50 m buffer was applied as this nominal distance is typically requested by the DBCA in relation to management of conservation category wetland.

The land that would be required to provide a reserve that encompasses this foreshore area falls almost entirely within the parks and recreation reserve proposed in the MRS amendment as shown in **Figure 7**.

The parks and recreation reserve proposed in *MRS Amendment* does not contain the identified foreshore area in two locations:

1. In the southern end of the site the road network connection precludes extending a parks and recreation reserve to the full extent of 50 m buffer from native vegetation.
2. In the north western side of the site urban land use is proposed to be located within the nominal 50m buffer on the basis that asbestos remediation has been completed in this area and the proposed layout achieves desirable urban design outcome.

These two exceptions to the 50 m buffer approach would result in a smaller buffer distance between the outer edge of native riparian vegetation and proposed urban landuses. However, a buffer would remain of approximately 30 m in these locations, which is likely to provide a similar if not equivalent benefit as a 50 m buffer. Therefore the two exceptions are not considered to pose any significant risk to the values of the Canning River or associated wetlands within the site.

Richard Noble has indicated considerable effort has been applied to remediate asbestos contamination within the site and the remediate forms the basis for the proposed urban zoning boundary. Due to benefit provided by asbestos remediation and the low risk that reducing buffer distance in two localised areas would pose, the parks and recreation reserve proposed in the MRS amendment (Burgess Design Group 2017), is therefore considered adequate to protect the waterway values of the Canning River within and adjacent to the site.

## 5 CONCLUSIONS AND RECOMMENDATIONS

Based on our assessment we found the following:

- The site contains relatively flat, low-lying landforms that include floodplain, estuary and near estuary wetland features, as well as, upland/terrestrial land. Parts of the site have been filled including areas that have been remediated for historical asbestos contamination.
- The vegetation within and adjacent to the site is present in 'very good' to 'completely degraded' condition. The vegetation is not considered to represent any listed TEC or PEC.
- The areas of native vegetation in very good to good condition are associated with wetland feature UFI 14809 and UFI 7151. These features are mapped as a conservation category wetlands. When assessed at the scale that each feature is drawn both have values that are representative of a conservation category wetland. However, only the portion of UFI 14809 within the site has values representative of conservation category wetland. UFI 7151 has lower values as vegetation within the portion of this feature within the site has a modified landform and largely contains vegetation in completely degraded condition.
- The parks and recreation reserve proposed in the MRS amendment for the site is considered adequate to protect the waterway values of the Canning River adjacent to the site.

### Summary and closing

We trust that this letter provides a comprehensive summary of the wetland and waterway values relevant to the site and adequacy of the parks and recreation reserve proposed in the MRS amendment to protect values associated with the section of Canning River and associated wetlands within the site.

Should you have any questions regarding the content of this letter, please do not hesitate to contact the undersigned.



Yours sincerely  
Emerge Associates



**Tom Atkinson**

SENIOR ENVIRONMENTAL CONSULTANT, TEAM LEADER - ECOLOGY

cc: Peter Dockett, Senior Development Manager, Richard Noble & Company  
Jacey Mills, A/Manager, Statutory Assessments, Rivers and Estuaries Branch, DBCA  
[rivers.planning@dbca.wa.gov.au](mailto:rivers.planning@dbca.wa.gov.au)

Encl: Figure 1: Site Location  
Figure 2: Environmental Features  
Figure 3: Existing MRS Parks and Recreation Reserve and Proposed MRS Amendment  
Figure 4: Hydrological Features  
Figure 5 Plant Communities  
Figure 6: Vegetation Condition  
Figure 7: Proposed MRS Amendment Review Inputs

Attachment 1 – Flora Species List

Attachment 2 – Completed Wetland Assessment Forms



## General References

- Department of Biodiversity, Conservation and Attractions (DBCA) 2017, *A methodology for the evaluation of wetlands on the Swan Coastal Plain*, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.
- Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.
- Department of Water (DoW) 2012, *Operational policy 4.3: Identifying and establishing waterways foreshore areas*, Perth.
- Department of Water and Environmental Regulation (DWER) 2018, *Hydrography Linear (Heirarchy) (DWER-031)*, Perth.
- Environmental Protection Authority (EPA) 2016, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth.
- ESCAVI 2003, *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0*, Department of the Environment and Heritage, Canberra.
- Government of WA 2006, *Swan and Canning Rivers Management Act 2006*, Perth.
- Gozzard, J. R. 2007, *Geology and Landforms of the Perth Region*, Geological Survey of Western Australia, Perth.
- Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.
- Western Australian Planning Commission (WAPC) 2017, *Metropolitan Region Scheme*, Perth.
- Water and Rivers Commission (WRC) 2001, *Water Note 23: Determining Foreshore Reserves*, East Perth.

## Online References

- Western Australian Herbarium (2018). *FloraBase—the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. <<https://florabase.dpaw.wa.gov.au>>

# Figures



*Figure 1: Site Location*

*Figure 2: Environmental Features*

*Figure 3: Hydrological Features*

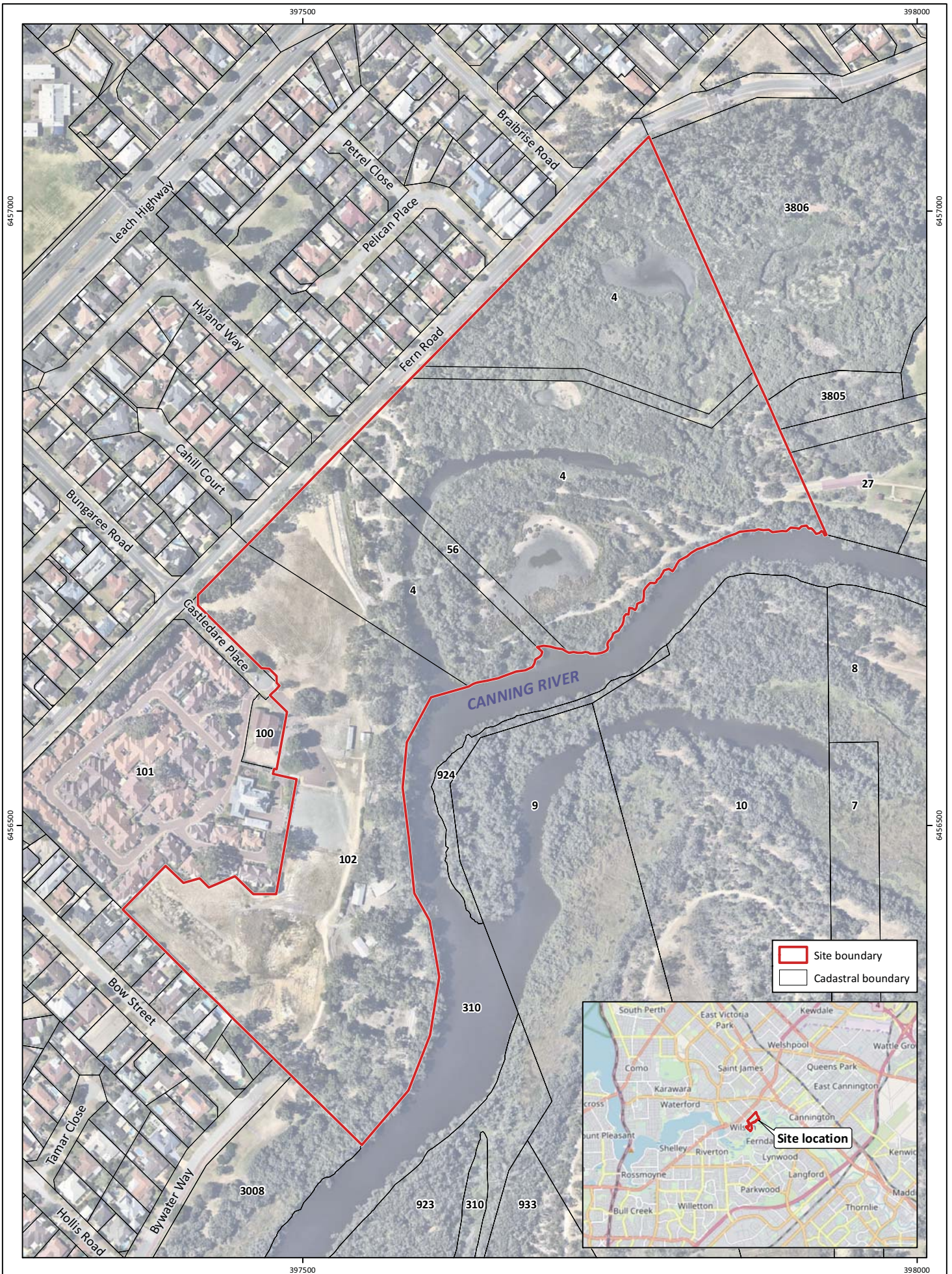
*Figure 4: Plant Communities*

*Figure 5: Vegetation Condition*

*Figure 6: Proposed Wetlands, Waterways and Buffers*







**Figure 1: Site Location**

**Project:** Wetland and Waterway Assessment  
 Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

**Plan Number:** EP18-019(02)--F13  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019

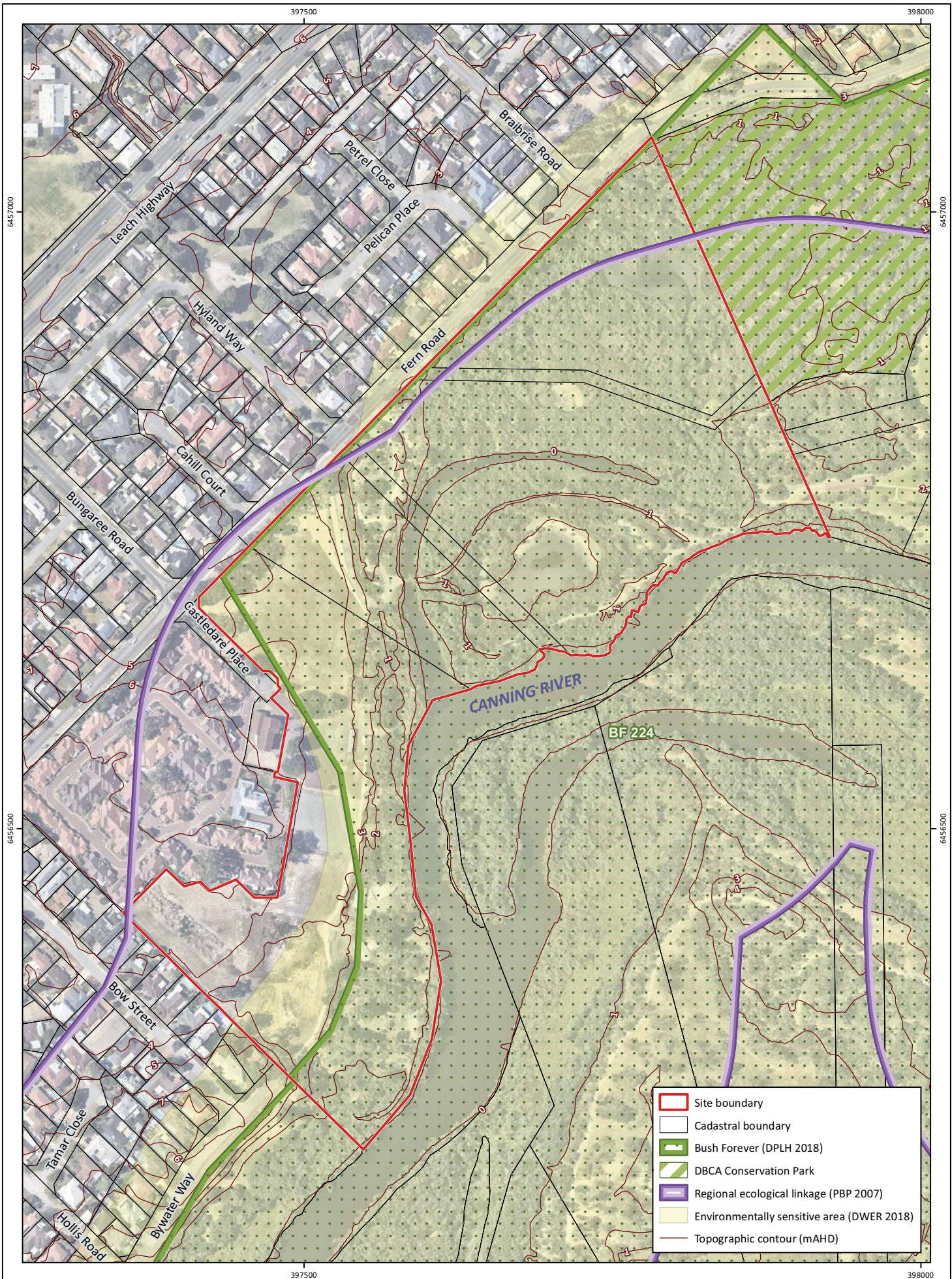


0 50 100  
 Metres  
 Scale: 1:4,000@A4  
 GDA 1994 MGA Zone 50



While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used





**Figure 2: Environmental Features**

**Project:** Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

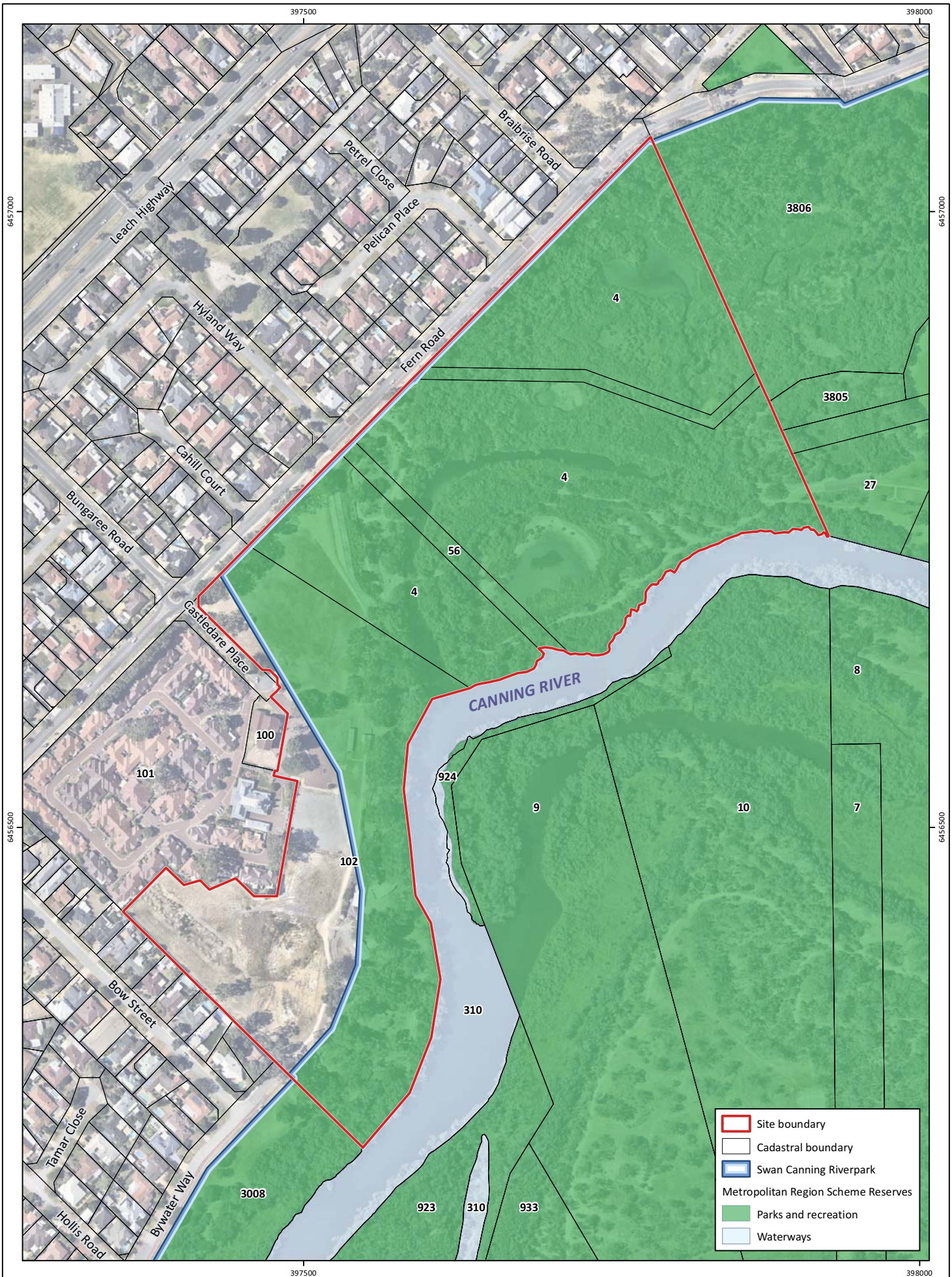
**Plan Number:** EP18-019(02)-F14  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019



0 50 100  
Metres  
**Scale: 1:4,000@A4**  
GDA 1994 MGA Zone 50







**Figure 3: Existing Parks and Recreation Reserve**

**Project:** Wetland and Waterway Assessment  
 Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

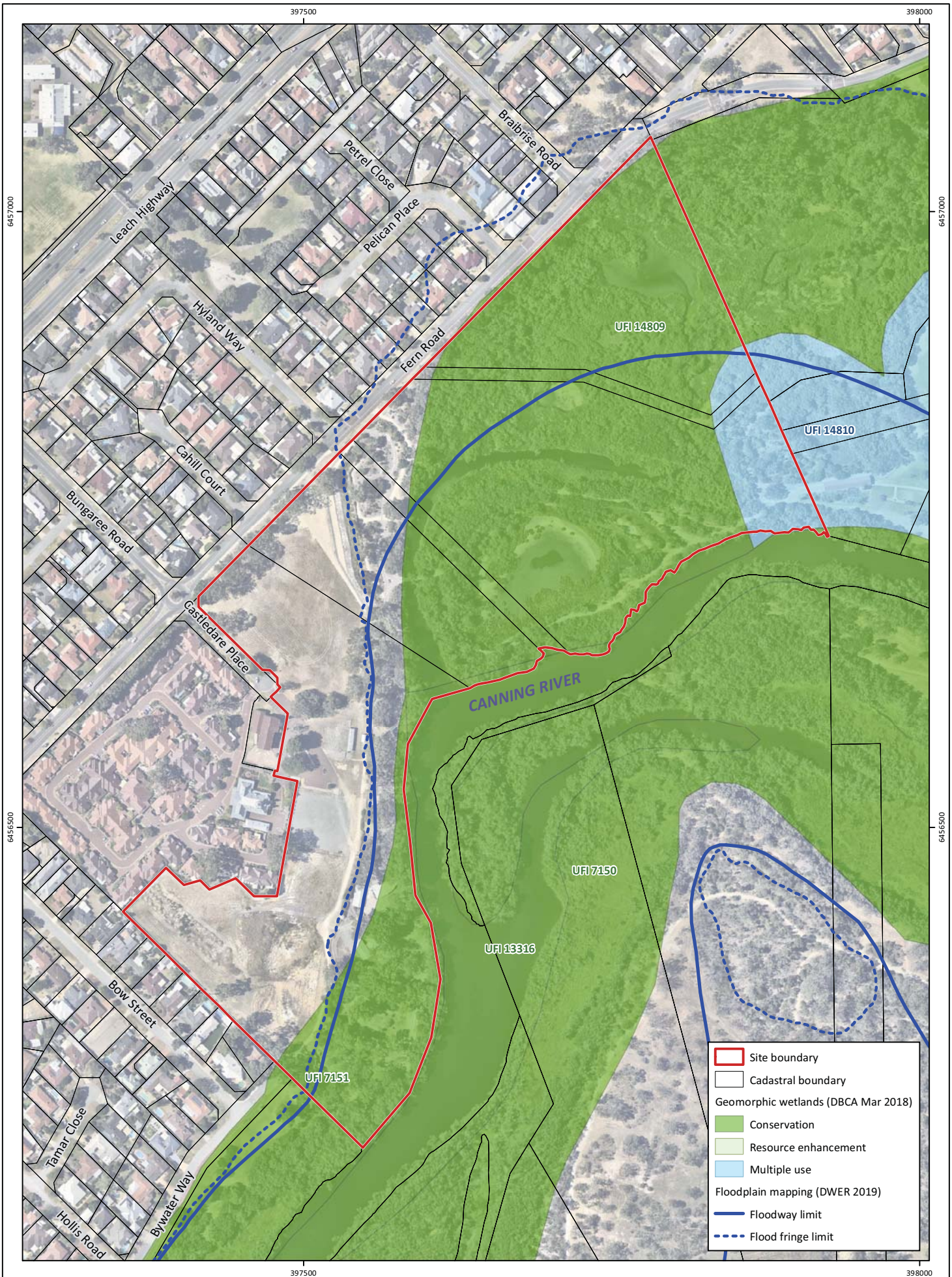
**Plan Number:** EP18-019(02)--F15  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019



0 50 100  
 Metres  
 Scale: 1:4,000@A4  
 GDA 1994 MGA Zone 50







**Figure 4: Hydrological Features**

**Project:** Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment

**Client:** Trustees of the Christian Brothers in WA

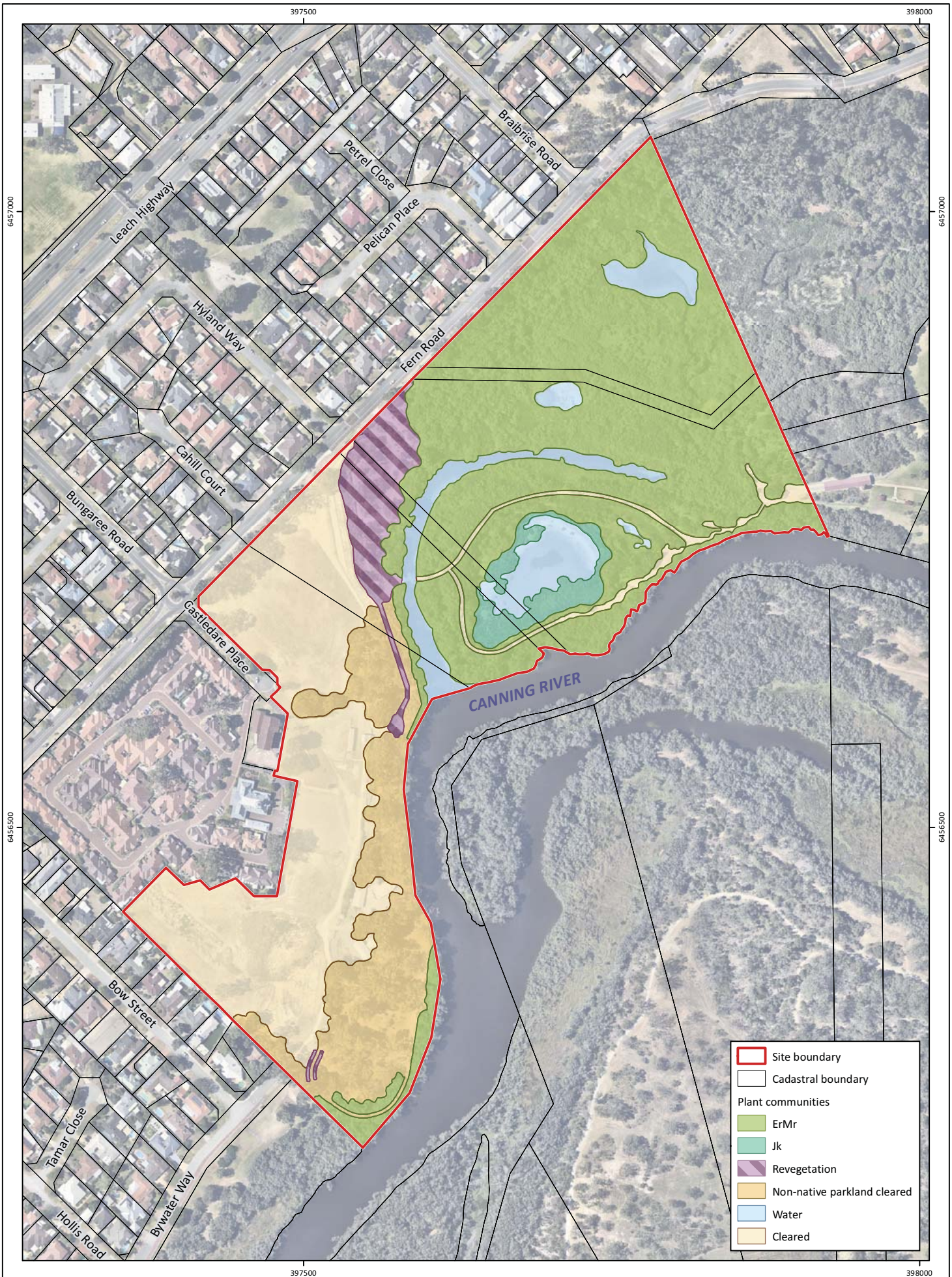
**Plan Number:** EP18-019(02)--F16  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019



0 50 100  
Metres  
Scale: 1:4,000@A4  
GDA 1994 MGA Zone 50







**Figure 5: Plant Communities**

**Project:** Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment  
**Client:** Trustees of the Christian Brothers in WA

**Plan Number:** EP18-019(02)--F17  
**Drawn:** ADB  
**Date:** 22/03/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 26/03/2019

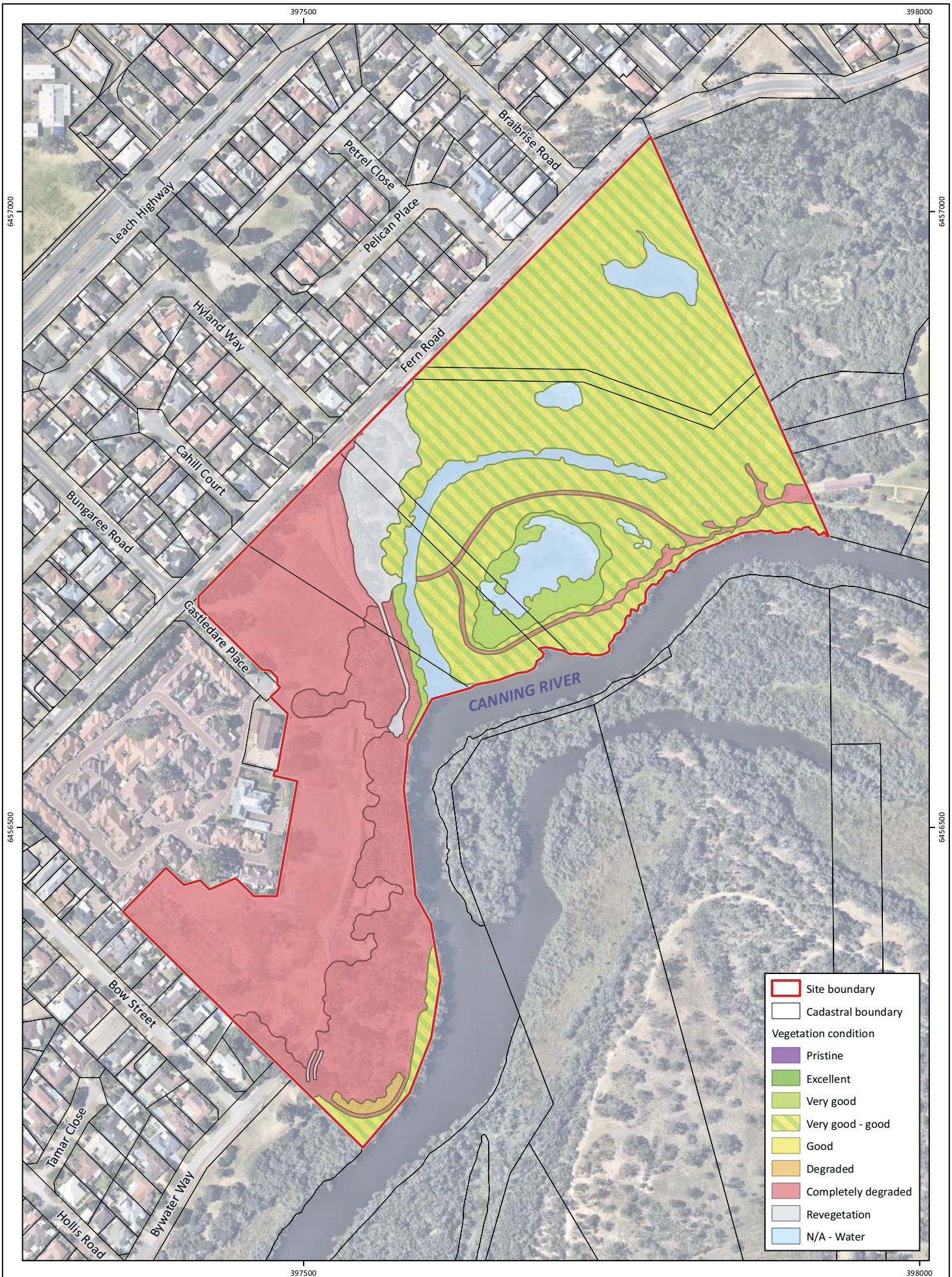


0 50 100  
Metres  
**Scale: 1:4,000@A4**  
GDA 1994 MGA Zone 50



While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used





**Figure 6: Vegetation Condition**

Plan Number:  
EP18-019(02)--F18  
Drawn: ADB  
Date: 22/03/2019  
Checked: TAA  
Approved: TAA  
Date: 26/03/2019

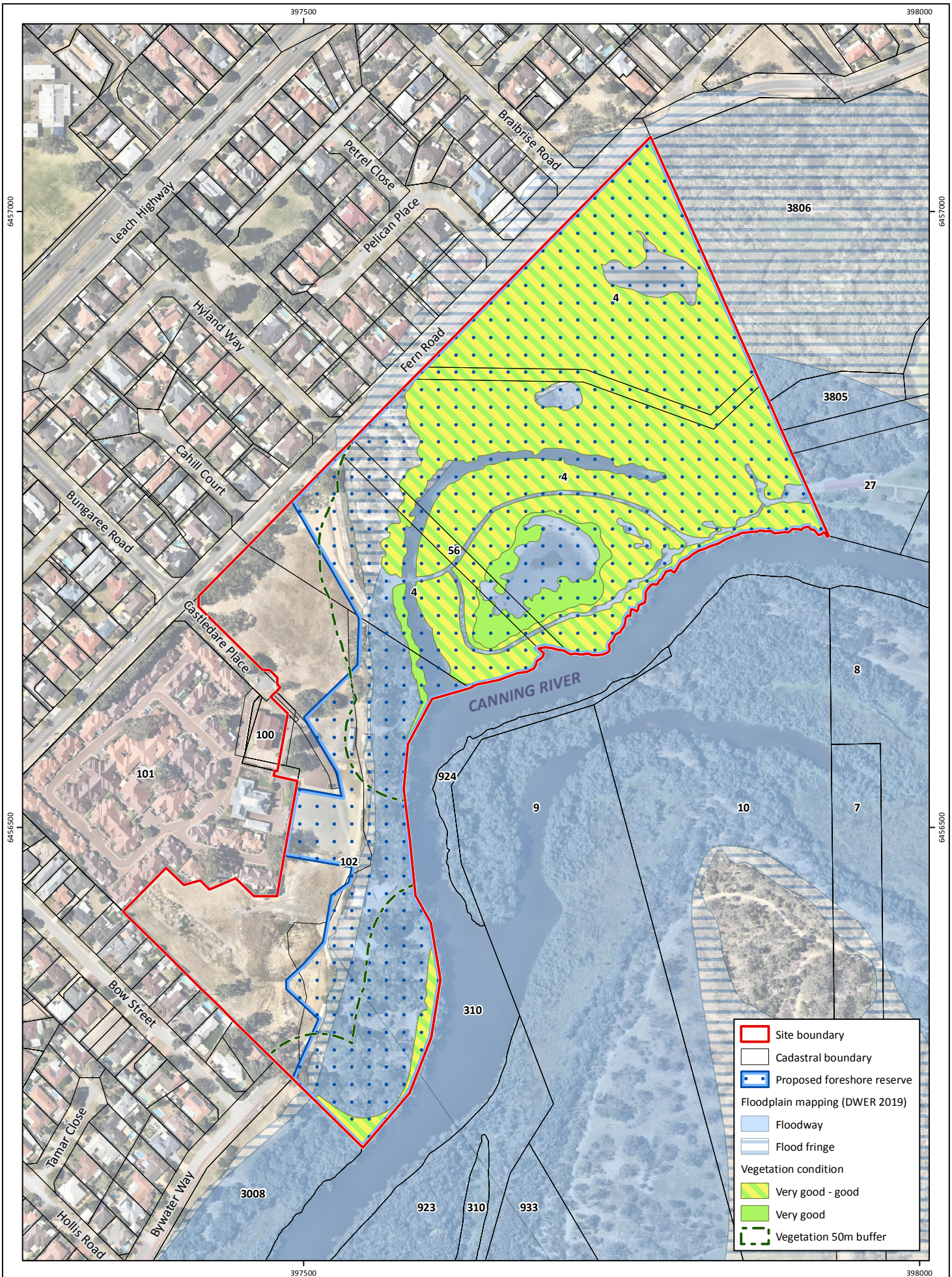


0 50 100  
Metres  
Scale: 1:4,000@A4  
GDA 1994 MGA Zone 50

Project: Wetland and Waterway Assessment  
Fern Road Wilson Scheme Amendment  
Client: Trustees of the Christian Brothers in WA







**Figure 7: Proposed MRS Amendment Review Inputs**

**Project:** Wetland and Waterway Assessment  
 Fern Road Wilson Scheme Amendment

**Client:** Trustees of the Christian Brothers in WA

**Plan Number:** EP18-019(02)-F22  
**Drawn:** RAO  
**Date:** 01/05/2019  
**Checked:** TAA  
**Approved:** TAA  
**Date:** 01/05/2019

0 50 100  
 Metres  
 Scale: 1:4,000@A4  
 GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used







# Attachment 1

Flora Species List





## Flora Species List - Fern Road Wilson

Note: \*=introduced weed species, Pl=planted

Family	Species
<b>Aizoaceae</b>	* <i>Carpobrotus edulis</i>
<b>Anacardiaceae</b>	* <i>Schinus terebinthifolia</i>
<b>Apiaceae</b>	<i>Centella asiatica</i>
<b>Arecaceae</b>	* <i>Washingtonia filifera</i>
<b>Asteraceae</b>	* <i>Conyza bonariensis</i> * <i>Hypochaeris ?glabra</i> * <i>Lactuca serriola</i> * <i>Sonchus oleraceus</i> * <i>Symphotrichum squamatum</i>
<b>Brassicaceae</b>	* <i>Lobularia maritima</i>
<b>Campanulaceae</b>	<i>Lobelia alata</i>
<b>Casurinaceae</b>	<i>Allocasuarina humilis</i> <i>Casuarina obesa</i>
<b>Chenopodiaceae</b>	* <i>Atriplex prostrata</i> <i>Salicornia quinqueflora</i> <i>?Tecticornia halocnemoides</i>
<b>Cyperaceae</b>	<i>Baumea articulata</i> <i>Baumea juncea</i> <i>Baumea preissii</i> <i>Bolboschoenus caldwellii</i> * <i>Carex divisa</i> <i>Carex fascicularis</i> * <i>Cyperus congestus</i> * <i>Cyperus papyrus</i> <i>Ficinia nodosa</i> <i>Gahnia trifida</i> <i>Lepidosperma longitudinale</i> <i>Schoenoplectus tabernaemontani</i>



**Fabaceae**

- Acacia pulchella*
- Acacia saligna*
- \* *Erythrina X sykesii*
- Gastrolobium capitatum*
- Hardenbergia comptoniana*
- Jacksonia furcellata*
- Jacksonia sternbergiana*
- Kennedia prostrata*
- \* *Lupinus* sp.
- Pl *Paraserianthes lophantha*
- \* *Trifolium ?glomeratum*
- \* *Trifolium arvense*
- \* *Trifolium campestre*
- \* *Vicia* sp.
- Viminaria juncea*

**Haemodoraceae**

- \* *Anigozanthos* sp.
- Conostylis ?aculeata*

**Hemerocallidaceae**

- Dianella revoluta* var. *divaricata*

**Iridaceae**

- Patersonia occidentalis*

**Juncaceae**

- Juncus kraussii*
- Juncus pallidus*

**Lamiaceae**

- Pl *Hemiandra pungens*

**Lauraceae**

- Cassytha glabella*

**Malvaceae**

- \* *Hibiscus* sp.

**Meliaceae**

- \* *Melia azedarach*

**Myrtaceae**

- Adenanthos cygnorum*
- \* *Agonis flexuosa*
- Astartea scoparia*
- Pl *Callistemon* sp.
- Corymbia calophylla*

- \* *Corymbia citriodora*
- \* *Corymbia maculata*
- \* *Eucalyptus camaldulensis*
- \* *Eucalyptus cladocalyx*
- \* *Eucalyptus gomphocephala* var. *gomphocephala*
- \* *Eucalyptus grandis*
- \* *Eucalyptus robustum*
- Eucalyptus rudis*
- \* *Eucalyptus salmonophloia*
- \* *Eucalyptus* sp.
- \* *Eucalyptus todtiana*
- Hypocalymma angustifolium*
- Kunzea glabrescens*
- Melaleuca cuticularis*
- Melaleuca lateritia*
- Melaleuca raphiophylla*
- Melaleuca teretifolia*
- Melaleuca viminea*

#### **Onagraceae**

*Epilobium hirtigerum*

#### **Plantaginaceae**

- \* *Bacopa monnieri*

#### **Poaceae**

- Pl *Austrodanthonia ?caespitosa*
- \* *Avena* sp.
- \* *Briza maxima*
- \* *Briza minor*
- \* *Bromus diandrus*
- \* *Cynodon dactylon*
- \* *Ehrharta calycina*
- \* *Ehrharta longiflora*
- \* *Eragrostis curvula*
- \* *Lolium* sp.
- \* *Paspalum dilatatum*
- \* *Paspalum urvillei*
- \* *Pennisetum clandestinum*
- \* *Stenotaphrum secundatum*
- Pl *Themeda australis*
- \* *Vulpia* sp.

#### **Polygonaceae**

*Persicaria decipiens*

- \* *Rumex* sp.

#### **Proteaceae**

- Pl *Banksia dallaneyi*
- Pl *Banksia littoralis*

Pl *Grevillea* sp. (red flowers)  
Pl *Grevillea* sp. (tall yellow flowers)  
*Hakea lissocarpha*  
*Hakea prostrata*

**Rosaceae**

\* *Rubus anglocandicans*

**Scrophulariaceae**

Pl *Eremophila glabra*  
Pl *Myoporum caprarioides*

**Solanaceae**

\* *Solanum nigrum*

**Typhaceae**

*Typha domingensis*  
*Typha orientalis*

**Xanthorrhoeaceae**

Pl *Xanthorrhoea preissii*

**Zamiaceae**

Pl *Macrozamia fraseri*



# Attachment 2

Completed Wetland Assessment Forms





**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 14810

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)



**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 14809

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)

**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 13316

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)

**PRELIMINARY EVALUATION CRITERIA**

CCW UFI No. UFI 7151

No.	Criteria	Y/N
1	The wetland is currently recognised as internationally or nationally significant for its natural values. Lists/registers include: The Ramsar Convention on Wetlands State government endorsed candidate sites for the Ramsar Convention on Wetlands Directory of Important Wetlands in Australia National Heritage List Or equivalent.	N
2	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is identified as significant for its natural values under one or more of the following: <i>Conservation Reserves for Western Australia Systems 1, 2, 3, 5</i> <i>Conservation Reserves for Western Australia, The Darling System – System 6</i> <i>A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton – Walpole Region</i> <i>The Environmental Significance of Wetlands in the Perth to Bunbury Region</i> <i>Bush Forever, Swan Bioplan</i> (including <i>Peel Regionally Significant Natural Area s</i> ) or equivalent.	N
3	The wetland supports a breeding, roosting, or refuge site or a critical feeding site for populations of fauna listed by the Australian Government (for example, <i>Environment Protection and Biodiversity Conservation Act 1999</i> , migratory bird agreements such as JAMBA, CAMBA and RoKAMBA) or the State (for example, threatened and specially protected fauna listed under the <i>Wildlife Conservation Act 1950</i> ).	N
4	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and supports one or more of the following: An occurrence of a Threatened Ecological Community A confirmed occurrence of a Priority 1 or Priority 2 Ecological Community A confirmed occurrence of a Declared Rare (Threatened) flora species.	N
5	Equal to or greater than 90% of the wetland supports vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B.	Y
6	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and is known to support internationally, nationally or state-wide scientific values including geoheritage and geoconservation.	N
7	The wetland is spatially dominated by vegetation in a good or better condition using the vegetation condition scale outlined in Appendix B and meets one of the following: ≤10% of wetlands of the same type are assigned Conservation management category within the Swan Coastal Plain (by area) ≤10% of all wetlands in the same consanguineous suite are assigned Conservation management category (by area) ≤10% of wetlands of the same type in its consanguineous suite are assigned Conservation management category (by area) best representative of its type within its consanguineous suite domain.	N

Note: If a wetland does not satisfy any of the above preliminary evaluation criteria or, does satisfy the preliminary evaluation criteria but is not considered to be commensurate with the values of a Conservation management category wetland then a secondary evaluation including a full site assessment is required. Refer to Step 3 and 4 of the evaluation procedure which indicates the process for conducting a secondary evaluation.

Result	Conservation category wetland
--------	-------------------------------

DBCA A methodology for the evaluation of wetlands on the Swan Coastal Plain, WA (December 2017)



**APPENDIX D**  
**Hydrological Monitoring Results**

---

H16025  
 Lot 2 Fern Road Wilson  
 Groundwater Monitoring



Water Level										
	MB1		MB2		MB3		L&W1606		L&W2436	
	mBTOC	mAHD	mBTOC	mAHD	mBTOC	mAHD	mBTOC	mAHD	mbtoc	mAHD
27-09-16	2.07	3.104	2.56	1.569	3.00	1.144	1.90	5.56	2.40	8.857
26-10-16	2.16	3.014	2.67	1.459	3.01	1.134	2.10	5.36	2.52	8.737
30-11-16	2.33	2.844	2.87	1.259	3.14	1.004	2.23	5.23	Bore n/a	Bore n/a
20-12-16	2.47	2.704	2.97	1.159	Bore n/a*	Bore n/a*	Bore n/a	Bore n/a	Bore n/a	Bore n/a
January*	Bore n/a	Bore n/a	Bore n/a	Bore n/a	Bore n/a	Bore n/a	N/A	N/A	N/A	N/A
February*	Bore n/a	Bore n/a	Bore n/a	Bore n/a	Bore n/a	Bore n/a	N/A	N/A	N/A	N/A
21-03-17	2.42	2.754	2.99	1.139	Bore n/a	Bore n/a	2.28	5.18	Bore n/a	Bore n/a
12-04-17	2.57	2.604	3.06	1.069	Bore n/a	Bore n/a	2.43	5.03	Bore n/a	Bore n/a
30-05-17	2.64	2.534	3.04	1.089	Bore n/a	Bore n/a	2.37	5.09	2.79	8.467
29-06-17	2.52	2.654	2.93	1.199	3.03	1.114	2.26	5.2	2.69	8.567
26-07-17	2.17	3.004	2.60	1.529	2.84	1.304	2.02	5.44	Bore n/a	Bore n/a
23-08-17	1.94	3.234	2.52	1.609	2.82	1.324	1.71	5.75	2.15	9.107
26-09-17	2.01	3.164	2.60	1.529	2.90	1.244	1.64	5.82	2.20	9.057
30-10-17	2.26	2.914	2.80	1.329	3.04	1.104	1.85	5.61	2.43	8.827
28-11-17	2.44	2.734	2.97	1.159	3.14	1.004	2.01	5.45	2.60	8.657
19-12-17	2.49	2.684	3.05	1.079	3.17	0.974	2.07	5.39	2.65	8.607
09-01-18	2.63	2.544	3.16	0.97	3.22	0.924	2.18	5.28	2.77	8.487
27-02-18	2.55	2.624	3.07	1.059	3.13	1.014	2.18	5.28	2.80	8.457
28-03-18	2.74	2.434	3.14	0.99	3.27	0.874	2.43	5.03	2.91	8.347
30-04-18	3.77	1.404	3.17	0.96	3.19	0.954	2.40	5.06	2.94	8.317
30-08-18	1.82	3.354	2.42	1.71	2.84	1.304	1.45	6.01	2.07	9.187

\*NB: Bores n/a due to site remediation works

H16025  
 Lot 2 Fern Road Wilson  
 Groundwater Monitoring



mg/L																			
MB1	WL mBTOC	Temp (°C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc
27-09-16	2.07	20.84	4.52	0.599	3.4	1.7	0.094	1.8	0.007	0.97	0.16	0.001	0.0001	0.003	0.008	0.004	0.001	0.00005	0.026
20-12-16	2.47	21.25	6.49	0.150	4.7	3.6	0.18	1.0	0.021	2.7	0.26	0.006	0.0001	0.009	0.021	0.006	0.002	0.00005	0.033
21-03-17	2.42	21.10	6.17	0.000	4.5	3.2	0.15	1.3	0.005	1.6	0.3	0.001	0.0001	0.001	0.002	0.001	0.001	0.00005	0.006
29-06-17	2.52	18.67	6.29	0.290	3.4	2.0	0.12	1.4	0.005	1.1	0.22	0.001	0.0001	0.001	0.003	0.001	0.001	0.00005	0.008
26-09-17	2.01	18.50	6.75	0.552	15.0	2.7	0.005	12	0.011	1.0	0.069	0.001	0.0001	0.001	0.002	0.001	0.001	0.00005	0.002
19-12-17	2.49	22.40	6.03	0.367	3.1	2.7	0.45	0.048	0.005	0.76	0.008	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.047
MB2	mg/L																		
MB2	WL mBTOC	Temp (°C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc
27-09-16	2.56	20.83	5.76	0.429	4.3	1.7	0.046	2.7	0.005	0.11	0.015	0.001	0.0001	0.001	0.006	0.001	0.001	0.00005	0.008
20-12-16	2.97	22.01	6.28	0.253	1.6	1.6	0.23	0.035	0.005	0.29	0.019	0.019	0.0001	0.01	0.006	0.005	0.002	0.00005	0.04
21-03-17	2.99	21.87	6.18	0.000	4.2	4.2	0.9	0.024	0.005	0.49	0.016	0.002	0.0001	0.002	0.002	0.002	0.001	0.00005	0.005
29-06-17	2.93	21.12	6.97	0.372	1.0	0.9	0.016	0.11	0.005	0.14	0.022	0.001	0.0001	0.001	0.002	0.001	0.001	0.00005	0.003
26-09-17	2.60	22.00	6.67	0.385	2.2	1.3	0.034	0.92	0.005	0.32	0.015	0.001	0.0001	0.001	0.002	0.001	0.001	0.00005	0.001
19-12-17	3.05	24.30	6.35	0.300	1.2	1.1	0.061	0.048	0.005	0.76	0.008	0.003	0.0001	0.003	0.001	0.004	0.001	0.00005	0.059
MB3	mg/L																		
MB3	WL mBTOC	Temp (°C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc
27-09-16	3.00	25.10	6.47	0.550	1.5	1.5	0.036	0.005	0.005	0.03	0.01	0.001	0.0001	0.001	0.002	0.003	0.001	0.00005	0.002
20-12-16	no access to bore																		
21-03-17	no access to bore																		
29-06-17	3.03	19.25	7.73	0.784	2.2	2.2	0.230	0.005	0.005	0.1	0.027	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.007
26-09-17	2.90	21.60	6.77	1.192	3.8	3.8	0.034	0.005	0.005	0.14	0.01	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.008
19-12-17	issue with sample																		
09-01-18	3.22	29.10	6.86	0.840	0.7	0.7	0.076	0.005	0.005	0.01	0.013	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.003
Canning River Surface Sample	mg/L																		
Canning River Surface Sample	WL	Temp (°C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc
26-10-16	n/a	20.36	6.74	0.038	1.1	0.9	0.100	0.17	0.008	0.06	0.055	0.001	0.0001	0.001	0.002	0.001	0.001	0.00005	0.009
21-03-17	n/a	20.87	7.59	0.003	1.5	1.5	0.005	0.005	0.005	0.17	0.057	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.004
29-06-17	n/a	15.35	6.36	0.983	1	0.9	0.063	0.13	0.008	0.08	0.039	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.017
26-07-17	n/a	16.56	7.39	0.644	1.3	0.9	0.023	0.47	0.006	0.07	0.048	0.001	0.0001	0.001	0.002	0.001	0.001	0.00005	0.022
23-08-17	n/a	16.90	7.54	0.470	1.7	0.9	0.032	0.75	0.005	0.08	0.044	0.001	0.0001	0.001	0.003	0.001	0.001	0.00005	0.02
26-09-17	n/a	17.40	7.29	0.568	0.9	0.6	0.017	0.23	0.005	0.06	0.042	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.008
30-10-17	n/a	19.60	7.60	1.031	0.09	0.7	0.048	0.13	0.005	0.08	0.052	0.001	0.0001	0.001	0.001	0.001	0.001	0.00005	0.009
30-08-18	n/a	15.50	6.90	0.660	1.4	0.9	0.022	0.57	0.005	0.07	0.038	0.001	0.0001	0.001	0.003	0.001	0.001	0.00005	0.013
Below Detectable Limit			7.17625		1.12375	0.9125				0.08375					0.00175				0.01275



**APPENDIX E**  
**Monitoring Programme Correspondence**

---

13 March 2017

Your Ref:  
Our Ref: H16025Av1

Department of Water  
7 Ellam Street  
Victoria Park, WA 6100

ATTENTION: Carlie Slodecki

Dear Carlie,

**LOT 102 FERN RD WILSON: PRE DEVELOPMENT MONITORING PROGRAM**

An 18 month hydrological monitoring program is being carried out to support the LWMS for Lot 102 Fern Road Wilson. The program has been developed to be consistent with DoW guidelines for pre development monitoring.

The LWMS will be prepared consistent with Department of Water (DoW) requirements as described in Better Urban Water Management (Western Australian Planning Commission, 2008).

**PRE DEVELOPMENT MONITORING PROGRAM**

Monitoring is being undertaken over an 18 month period (inclusive of two winters) with water quality measured on a quarterly basis, totalling six occasions, and water levels measured monthly, totalling 18 occasions (Table 1). Monitoring is being undertaken at three groundwater monitoring bores installed at the site in September 2016 (water quality and levels), and two nearby DoW bores, L & W 1606 and L & W 2436 (levels only). The locations of the site monitoring bores are provided in Figure 1.

Surface water quality samples are being taken from the Canning River (adjacent to site) over an 18 month period (inclusive of two winters, four times per winter), if water is flowing, totalling a maximum of eight occasions (Table 1).

Water quality samples are to be measured in situ for physical parameters (temperature, electrical conductivity, pH), with samples sent to a NATA approved laboratory for analysis of nutrients and heavy metals. The following parameters are to be analysed: total nitrogen, total Kjeldahl nitrogen, ammonia, nitrate, nitrite, total phosphorus, filterable reactive phosphorus, and heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury, and zinc).

Surface water quality samples are being taken from the Canning River (adjacent to site) over an 18 month period (inclusive of two winters, four times per winter), if water is flowing, totalling a maximum of eight occasions (Table 1).

**Table 1: Pre Development Monitoring Programme**

Monitoring	Parameter	Location	Method	Frequency and Timing
Groundwater level	Water Level (mAHD)	3 bores within site area and 1 DoW bores	Electrical depth bore or similar	Monthly commencing Sept. 2016 and ceasing Feb. 2018 (18 occasions)
Groundwater quality	Physical, nutrients and heavy metals	3 bores within the site area	Pumped bore sample	Monthly commencing Sept. 2016 and ceasing Feb. 18 (6 occasions)
Surface water quality	Physical, nutrients and heavy metals	Canning River	Grab sampler	Maximum 4 times per winter if flowing, maximum total 8 times

**PRE DEVELOPMENT MONITORING PROGRAM AMENDMENT**

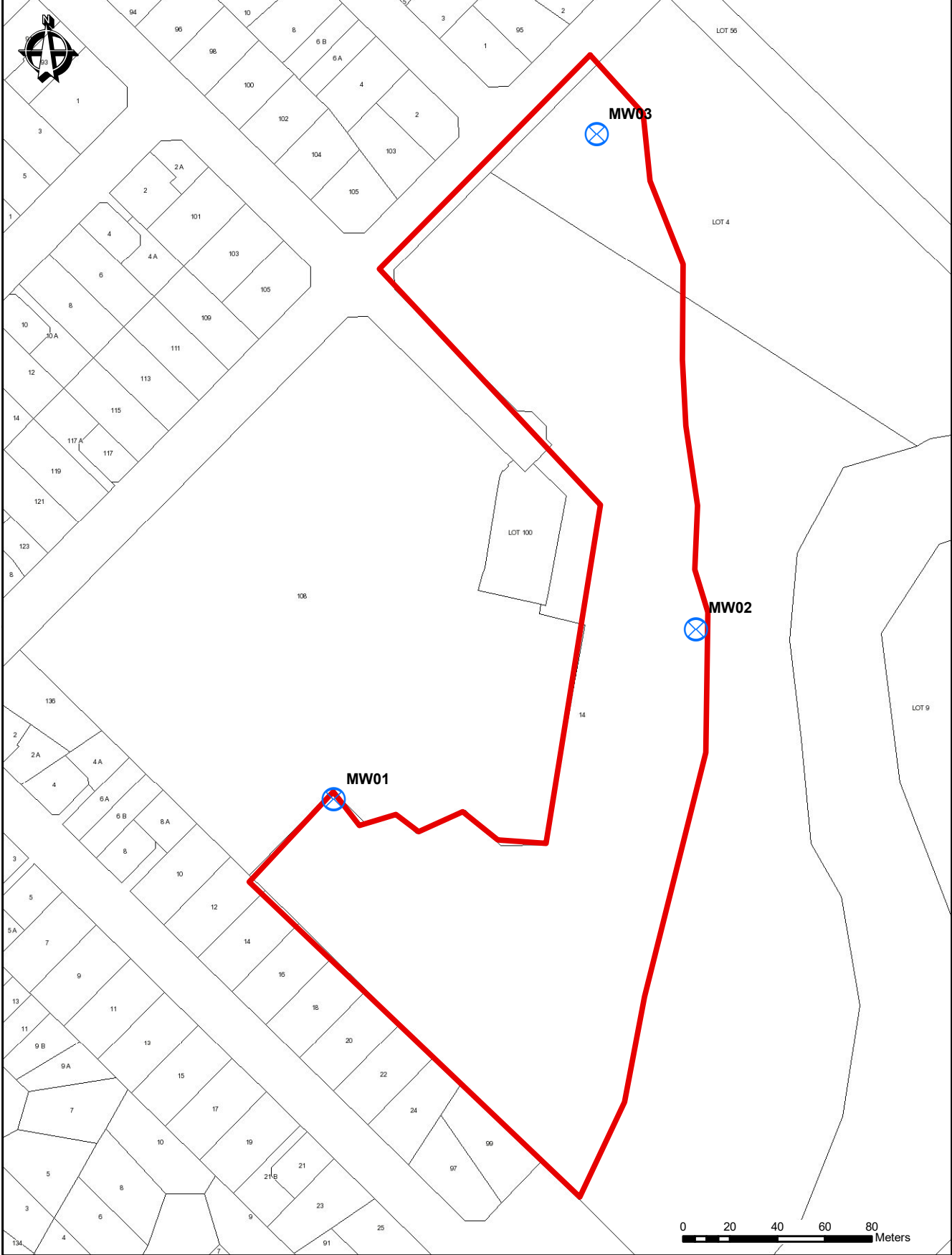
Due to unforeseen site remediation issues it has been necessary to amend the monitoring schedule outlined above. Bore MW03 currently has access issues due to site remediation works. The bore was monitored for groundwater levels from September to November 2016 inclusive, and has had one water quality sample taken (September 2016). It was not possible to obtain results from the bore from December 2016 to February 2017 inclusive. These months are not considered integral to include in the groundwater level monitoring programme as they are outside the critical peak winter level data collection period. The initial groundwater quality results at the site (please see attached) show values consistent with pre development conditions throughout urban environments on the Swan Coastal Plain. It is therefore considered that should monitoring recommence at MW03 in June 2017 and carry on for the remainder of the pre development monitoring program (scheduled to end in February 2018), that sufficient data will be collected to inform pre development conditions at the site.



Yours sincerely,



**Renee Blandin**  
**Environmental Hydrologist**





-  Groundwater Monitoring Bores
-  Site

hyd2o  
Lot 102 Fern Road Wilson Predevelopment Monitoring  
**Groundwater Monitoring Bore Locations**  
**Figure 1**

H16025  
Castledare Site  
Groundwater Monitoring



<b>MB1</b>																				
					mg/L															
	WL mBTOC	Temp (*C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc	
27/09/2016	2.07	20.84	4.52	0.599	3.4	1.7	0.094	1.8	0.007	0.97	0.16	0.001	0.0001	0.003	0.008	0.004	0.001	0.00005	0.026	
20/12/2016	2.47	21.25	6.49	0.15	4.7	3.6	0.18	1	0.021	2.7	0.26	0.006	0.0001	0.009	0.021	0.006	0.002	0.00005	0.033	
<b>MB2</b>																				
					mg/L															
	WL mBTOC	Temp (*C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc	
27/09/2016	2.56	20.83	5.76	0.429	4.3	1.7	0.046	2.7	0.005	0.11	0.015	0.001	0.0001	0.001	0.006	0.001	0.001	0.00005	0.008	
20/12/2016	2.97	22.01	6.28	0.253	1.6	1.6	0.23	0.035	0.005	0.29	0.019	0.019	0.0001	0.01	0.006	0.005	0.002	0.00005	0.04	
<b>MB3</b>																				
					mg/L															
	WL mBTOC	Temp (*C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc	
27/09/2016	3	25.1	6.47	0.55	1.5	1.5	0.036	0.005	0.005	0.03	0.01	0.001	0.0001	0.001	0.002	0.003	0.001	0.00005	0.002	
20/12/2016	no access to bore																			
<b>Canning River Surface Sample</b>																				
					mg/L															
		Temp (*C)	pH	EC (mS/cm)	TN	TKN	Ammonia	Nitrate	Nitrite	TP	FRP	Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Mercury	Zinc	
26/10/2016		20.36	6.74	0.038	1.1	0.9	0.1	0.17	0.008	0.06	0.055	0.001	0.0001	0.001	0.002	0.001	0.001	0.00005	0.009	

**From:** SLODECKI Carlie <Carlie.SLODECKI@water.wa.gov.au>  
**Sent:** Wednesday, March 15, 2017 8:57 AM  
**To:** Renee Blandin (renee@hyd2o.com.au)  
**Subject:** PA Request 013038 - Lot 102 Fern Road Wilson Pre Development Monitoring Programme - Your ref: H16025Av1  
**Attachments:** H16025Av1.pdf

Dear Renee,

Thank you for submitting your request for advice via the Water Online customer portal and for providing the additional information.

The Department of Water (DoW) has reviewed the information provided by Hyd2o and would like to provide the following advice;

- The DoW considers that in the given circumstances, the proposed approach to predevelopment monitoring for the site is acceptable.
- The DoW also recommends that the Local Government and any other relevant agencies are also consulted in regards to their requirements.

Sincere regards,  
Carlie

*Carlie Slodecki*

Land Use Planning – Swan Avon Region

Department of Water

T: 08 6250 8012 | F: 08 6250 8050 | I: [www.water.wa.gov.au](http://www.water.wa.gov.au)

**Note: Office hours are 8:30 am to 4 pm Monday - Friday**

*Save time with*



Government of **Western Australia**  
Department of **Water**

---

**From:** Renee Blandin [<mailto:renee@hyd2o.com.au>]  
**Sent:** Monday, 13 March 2017 10:59 AM  
**To:** SLODECKI Carlie <[Carlie.SLODECKI@water.wa.gov.au](mailto:Carlie.SLODECKI@water.wa.gov.au)>  
**Subject:** RE: Lot 102 Fern Road Wilson Pre Development Monitoring Programme

Hi Carlie,

I've submitted the attached on Water Online.

Thanks,

Renee



Renee Blandin  
Environmental Hydrologist

hyd2o

Suite 6B, 103 Rokeby Rd Subiaco WA 6008  
PO Box 1055, Subiaco WA 6904  
p +61 8 9382 8683 | f +61 8 6380 1910 | m 0431 347 374

---

**From:** SLODECKI Carlie [<mailto:Carlie.SLODECKI@water.wa.gov.au>]  
**Sent:** Tuesday, 7 March 2017 1:47 PM  
**To:** Renee Blandin <[renee@hyd2o.com.au](mailto:renee@hyd2o.com.au)>  
**Subject:** RE: Lot 102 Fern Road Wilson Pre Development Monitoring Programme

Hi Renee,

Thank you for your phone call and email.

Before the DoW provides a written response to your query below, could you please submit via Water Online a general advice request and include some background information such as what is the proposed development (note that the DoW has not received any planning referrals for this location to date), what level of BUWM report is proposed, monitoring bore locations, summary of monitoring results to date etc.?

Apologies for not mentioning this on the phone, but after thinking about it more, I think we need additional information in order to provide a response to your query.

Sincere regards,  
Carlie

*Carlie Slodecki*  
Land Use Planning – Swan Avon Region

**Department of Water**  
T: 08 6250 8012 | F: 08 6250 8050 | I: [www.water.wa.gov.au](http://www.water.wa.gov.au)

**Note: Office hours are 8:30 am to 4 pm Monday - Friday**

Save time with



---

**From:** Renee Blandin [<mailto:renee@hyd2o.com.au>]  
**Sent:** Thursday, 2 March 2017 4:43 PM  
**To:** SLODECKI Carlie <[Carlie.SLODECKI@water.wa.gov.au](mailto:Carlie.SLODECKI@water.wa.gov.au)>  
**Subject:** Lot 102 Fern Road Wilson Pre Development Monitoring Programme

Hi Carlie,

Thank you for taking my phone call this afternoon. Further to our discussion, Hyd2o propose to amend the pre development monitoring programme at Lot 102 Fern Road Wilson. Monitoring at the site began in September 2016

to capture the winter peak for that year. Previously unknown contamination was found recently in the vicinity of one of the three bores installed at the site by Hyd2o on behalf of the client. This bore is now subject to contaminated site access issues. As a result, Hyd2o propose to drop monitoring this bore over the 2017 summer period (backdated to January 2017 and through to May 2017 inclusive). The remaining two bores will continue to be monitored over this time for monthly groundwater levels and quarterly groundwater quality. Pending remediation of the site, Hyd2o will recommence monitoring in June 2017 and capture a second winter peak for the site.

As discussed, could you please advise that, given the circumstance, this approach is acceptable to the DoW.

Kind Regards,

Renee Blandin  
Environmental Hydrologist

hyd2o

Suite 6B, 103 Rokeby Rd Subiaco WA 6008  
PO Box 1055, Subiaco WA 6904  
p +61 8 9382 8683 | f +61 8 6380 1910 | m 0431 347 374

Disclaimer:

This e-mail is confidential to the addressee and is the view of the writer, not necessarily that of the Department of Water, which accepts no responsibility for the contents. If you are not the addressee, please notify the Department by return e-mail and delete the message from your system; you must not disclose or use the information contained in this email in any way. No warranty is made that this material is free from computer viruses.

Disclaimer:

This e-mail is confidential to the addressee and is the view of the writer, not necessarily that of the Department of Water, which accepts no responsibility for the contents. If you are not the addressee, please notify the Department by return e-mail and delete the message from your system; you must not disclose or use the information contained in this email in any way. No warranty is made that this material is free from computer viruses.

**From:** Monk, Emma <Emma.Monk@dpaw.wa.gov.au>  
**Sent:** Wednesday, April 5, 2017 10:33 AM  
**To:** Renee Blandin  
**Subject:** RE: Lot 102 Fern Road Wilson Monitoring Update

Hi Renee

Thanks for the information.

Kind regards,

Emma

**Emma Monk**

Land Use Planning Program Manager

Rivers and Estuaries Division | Department of Parks and Wildlife

17 Dick Perry Avenue, Kensington WA 6151

Locked Bag 104, Bentley Delivery Centre WA 6983

9278 0944 | [emma.monk@dpaw.wa.gov.au](mailto:emma.monk@dpaw.wa.gov.au)

[www.swanrivertrust.wa.gov.au](http://www.swanrivertrust.wa.gov.au) or [www.dpaw.wa.gov.au](http://www.dpaw.wa.gov.au)

*Ngala kaaditj Noongar moort keyen kaadak nidja boodja.*

*We acknowledge the Noongar people as the original custodians of this land.*

Working days: Tuesday to Friday

---

**From:** Renee Blandin [<mailto:renee@hyd2o.com.au>]  
**Sent:** Monday, 3 April 2017 4:55 PM  
**To:** Monk, Emma <[Emma.Monk@dpaw.wa.gov.au](mailto:Emma.Monk@dpaw.wa.gov.au)>  
**Subject:** Lot 102 Fern Road Wilson Monitoring Update

Hi Emma,

My colleague Suzanne spoke with Jennifer Stritzke in May 2016 regarding pre development monitoring at Lot 102 Fern Road Wilson, as the site is in proximity to the Canning River. With Jennifer's advice, a pre development monitoring programme was adopted.

The site underwent some remediation for asbestos last year before we installed our groundwater monitoring bores, however since that time some further contamination has been found, restricting access to one monitoring bore. For your information, we have therefore amended the monitoring programme slightly, with the support of DoW. I have attached a copy of the letter sent to DoW, containing the approved amendment (see below also). Please let me know if you have any queries. If not, I will be in touch with the LWMS in a few months.

Kind Regards,

Renee Blandin

Environmental Hydrologist

hyd2o

Suite 6B, 103 Rokeby Rd Subiaco WA 6008

PO Box 1055, Subiaco WA 6904

p +61 8 9382 8683 | f +61 8 6380 1910 | m 0431 347 374



**From:** SLODECKI Carlie [<mailto:Carlie.SLODECKI@water.wa.gov.au>]

**Sent:** Wednesday, 15 March 2017 8:57 AM

**To:** Renee Blandin ([renee@hyd2o.com.au](mailto:renee@hyd2o.com.au)) <[renee@hyd2o.com.au](mailto:renee@hyd2o.com.au)>

**Subject:** PA Request 013038 - Lot 102 Fern Road Wilson Pre Development Monitoring Programme - Your ref: H16025Av1

Dear Renee,

Thank you for submitting your request for advice via the Water Online customer portal and for providing the additional information.

The Department of Water (DoW) has reviewed the information provided by Hyd2o and would like to provide the following advice;

- The DoW considers that in the given circumstances, the proposed approach to predevelopment monitoring for the site is acceptable.
- The DoW also recommends that the Local Government and any other relevant agencies are also consulted in regards to their requirements.

Sincere regards,  
Carlie

*Carlie Slodecki*

Land Use Planning – Swan Avon Region

**Department of Water**

T: 08 6250 8012 | F: 08 6250 8050 | I: [www.water.wa.gov.au](http://www.water.wa.gov.au)

**Note: Office hours are 8:30 am to 4 pm Monday - Friday**

*Save time with*



**APPENDIX F**  
**DWER Bore Hydrographs**

---

# Department of Water and Environmental Regulation

HYPLOT V134 Output 09/10/2019

Period 64 Year 01/01/1956 to 01/01/2020

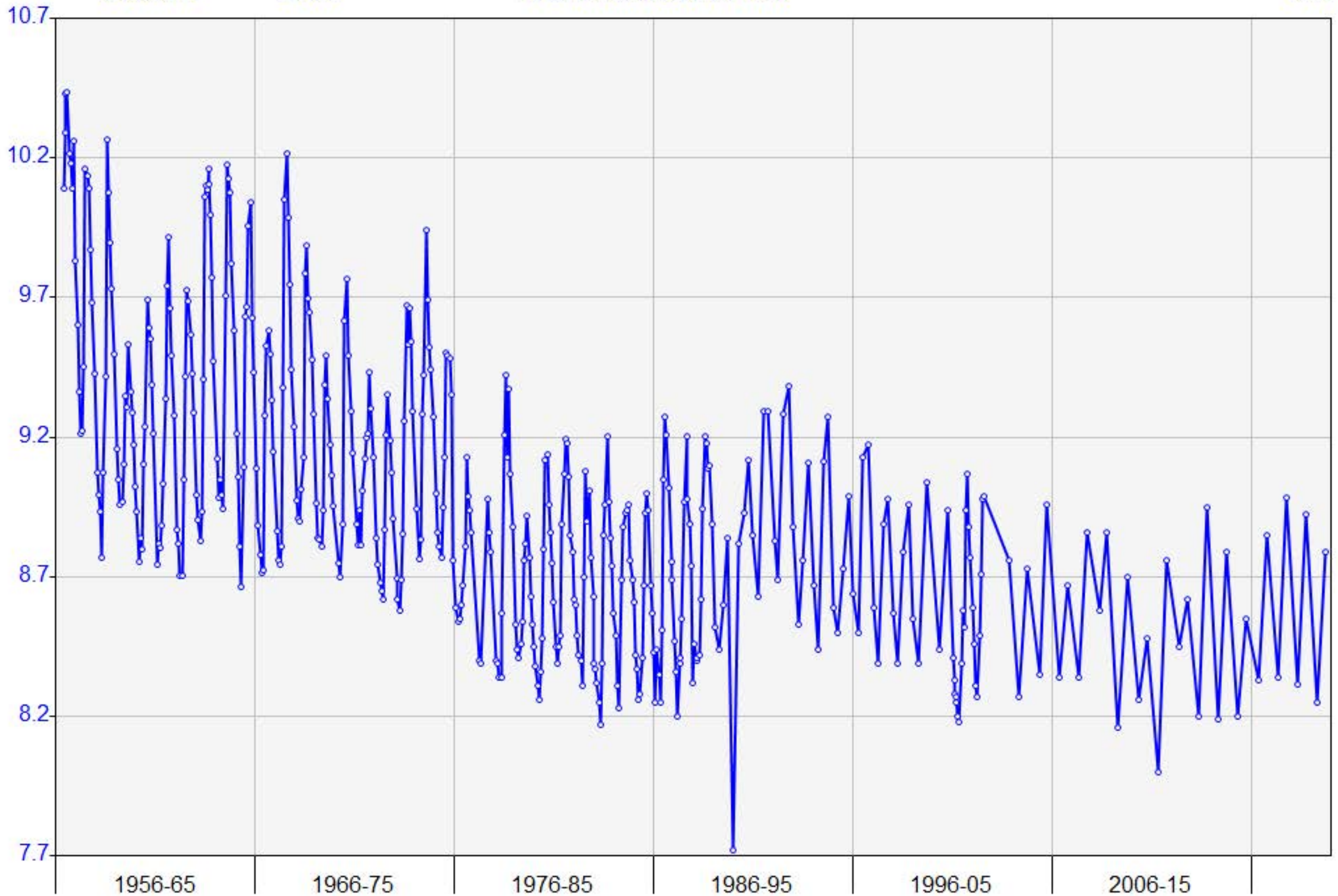
1956-2019

61610449

2436

115.00 Water Level (mAHD)

GW





# Department of Water and Environmental Regulation

Period 119 Year 01/01/1901 to 01/01/2020

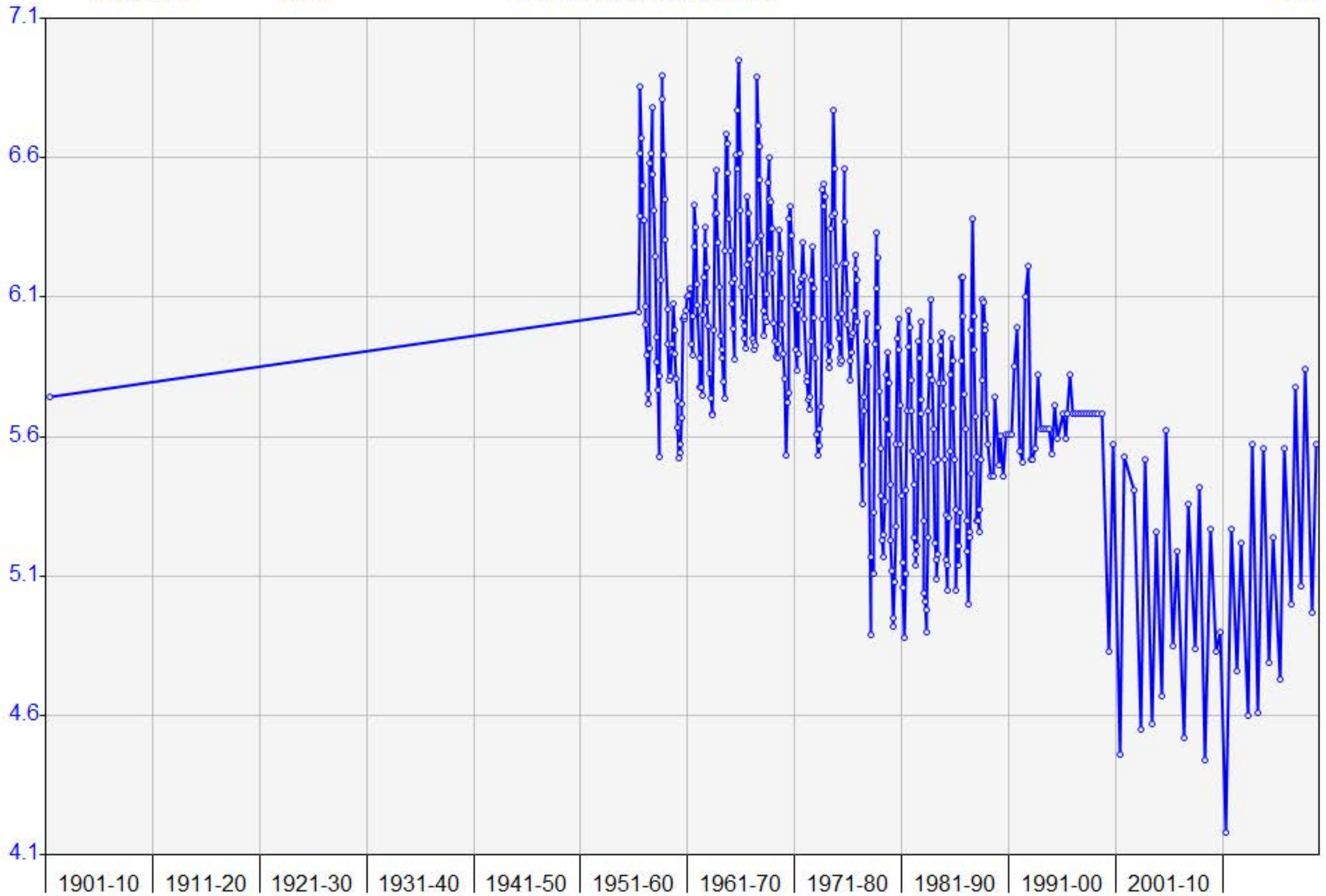
1901-2019

61610356

1606

115.00 Water Level (mAHD)

GW



**APPENDIX G**  
**Landscape Plans (Emerge 2019)**

---



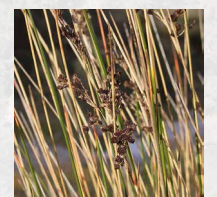
**LEGEND**

-  LANDSCAPE TREATMENT
-  SWALE
-  PRINCIPLE SHARED PATH

**SWALE PLANT SPECIES**



*Ficinia nodosa*



*Juncus kraussii*



*Juncus pallidus*



*Meeboldina scariosa*



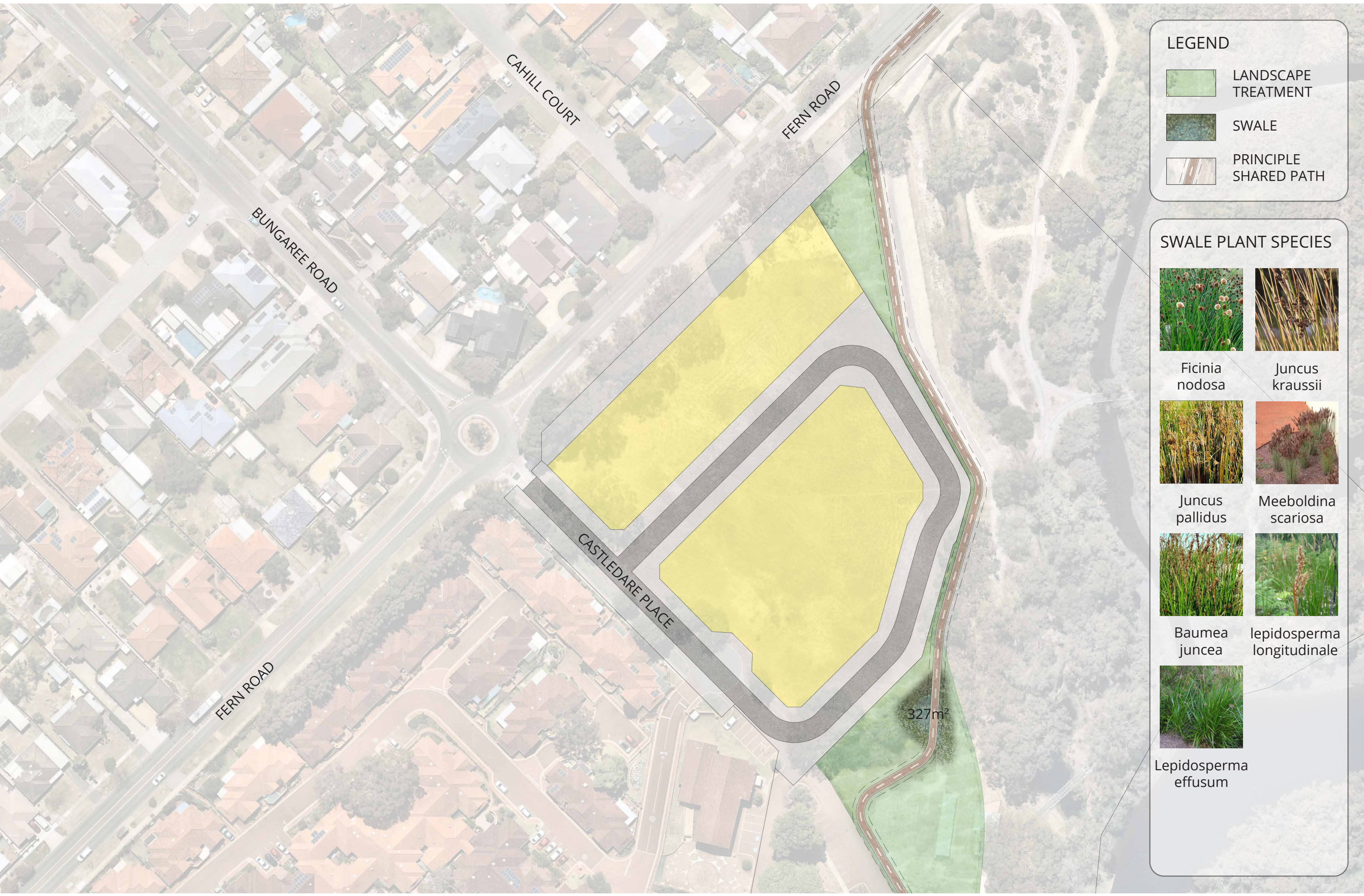
*Baumea juncea*



*lepidosperma longitudinale*



*Lepidosperma effusum*







### LEGEND

-  LANDSCAPE TREATMENT
-  SWALE
-  PRINCIPLE SHARED PATH

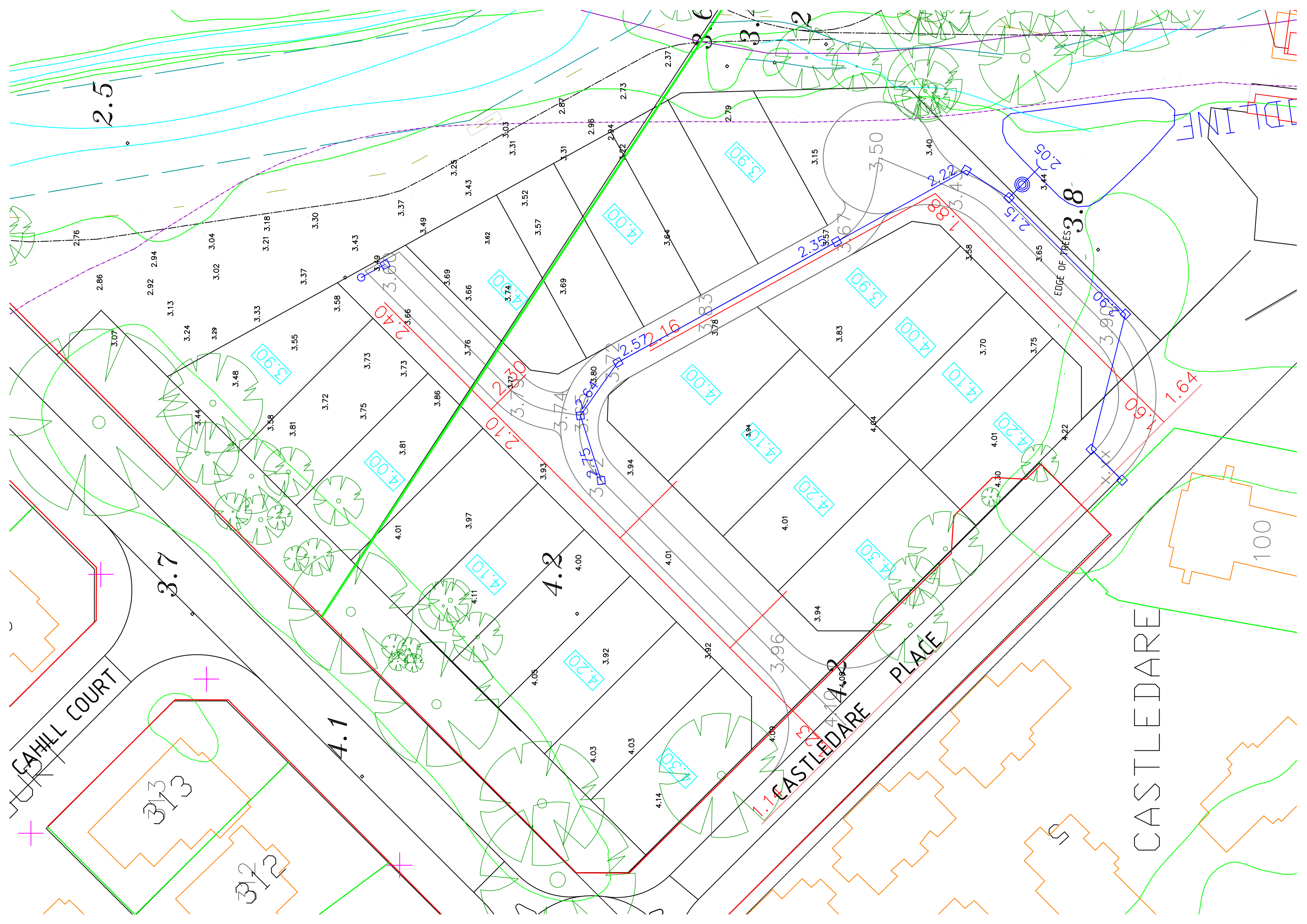
### SWALE PLANT SPECIES

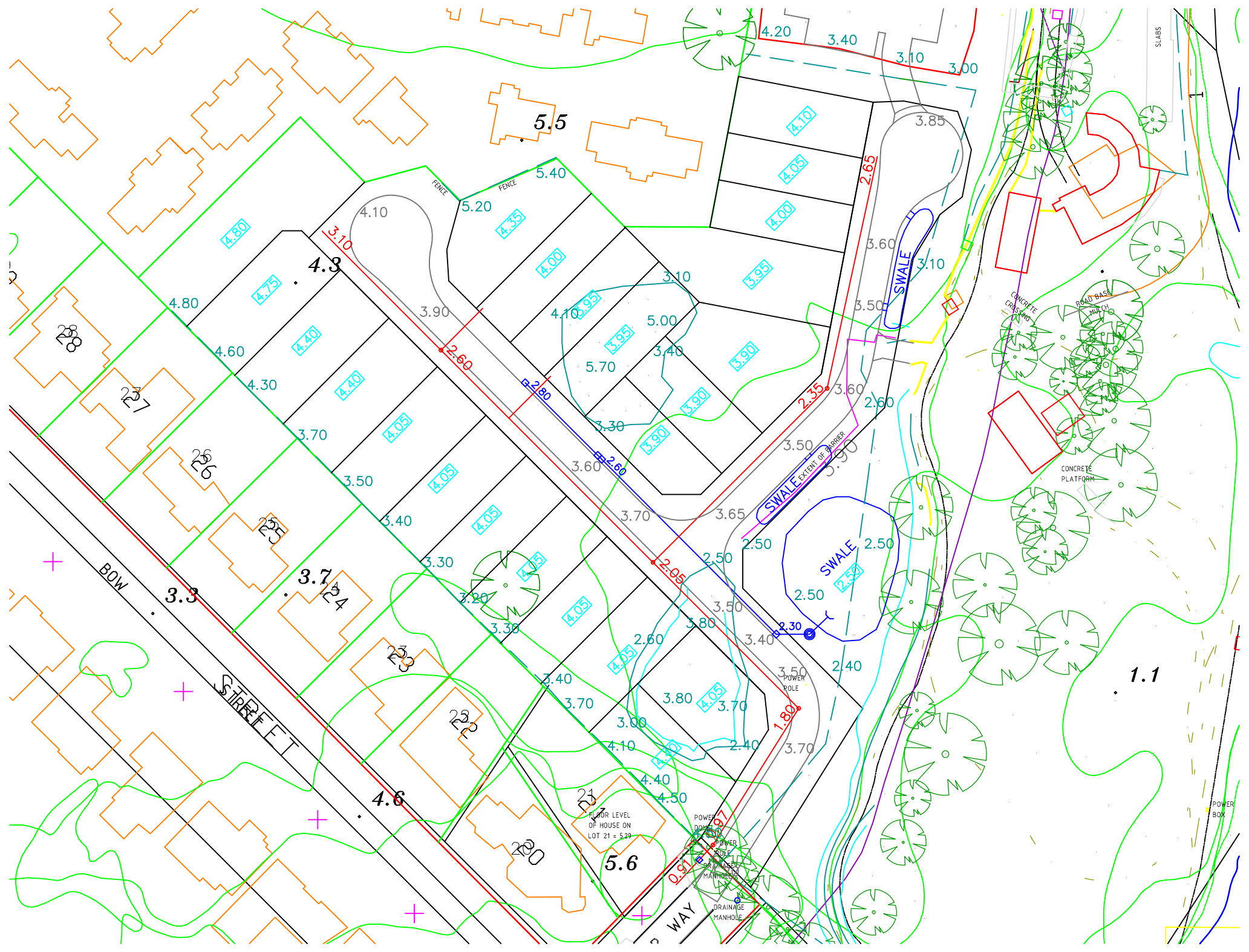
	
Ficinia nodosa	Juncus kraussii
	
Juncus pallidus	Meeboldina scariosa
	
Baumea juncea	lepidosperma longitudinale
	
Lepidosperma effusum	



**APPENDIX H**  
**Preliminary Engineering Drawings (TABEC Engineers)**

---





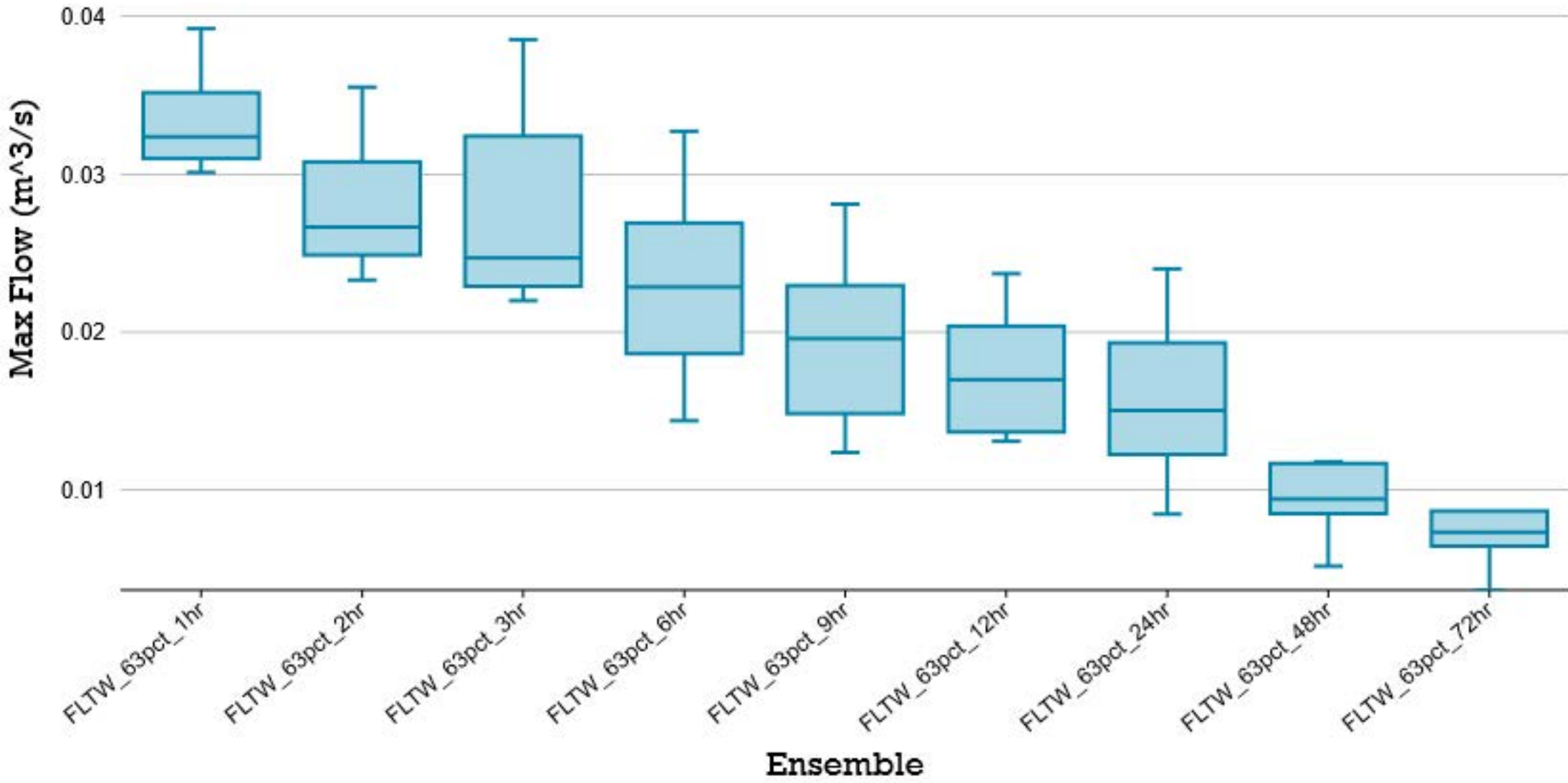


**APPENDIX I**  
**Stormwater Modelling Results**

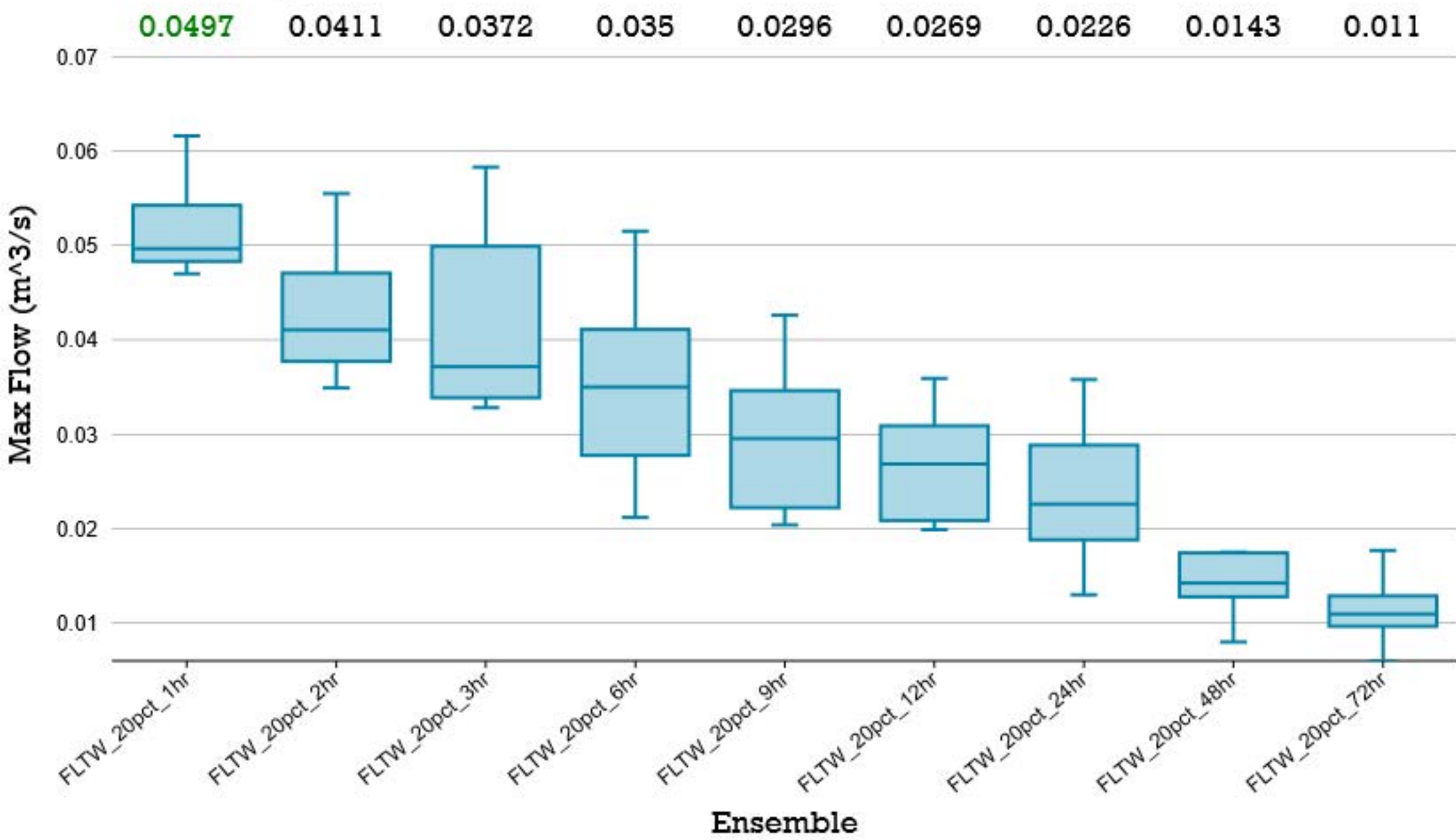
---

# Comparison of Storm Ensembles of different durations for AEP = 63.2%

0.0324    0.0267    0.0247    0.0229    0.0196    0.017    0.0151    0.0095    0.0074

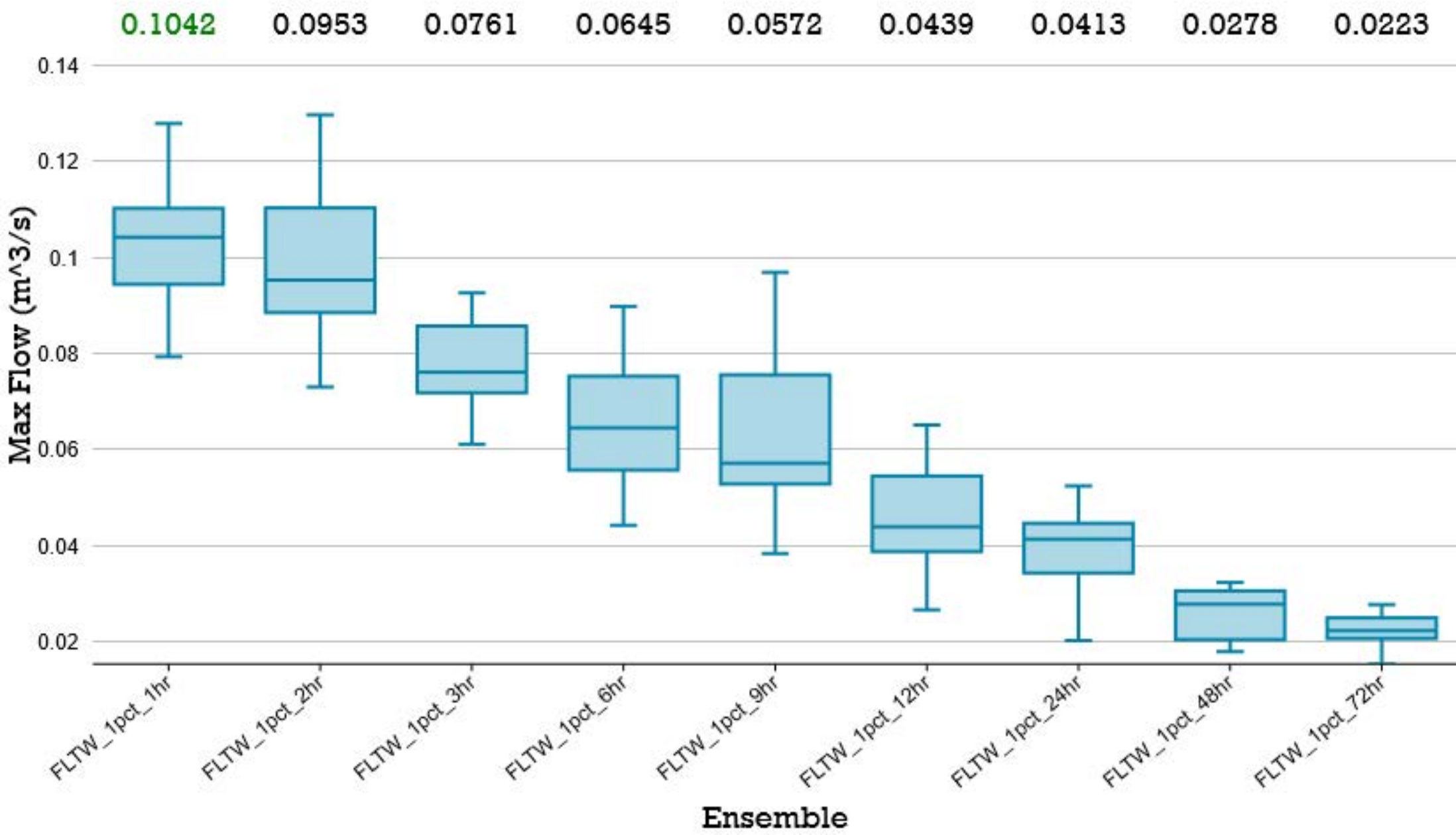


Comparison of Storm Ensembles of different durations for AEP = 20%





Comparison of Storm Ensembles of different durations for AEP = 1%



16 August 2023

Your Ref:  
Our Ref: H23013Av1

Richard Noble  
Level 1 189 Hay Street  
Subiaco WA 6008

Attention: Peter Dockett

Dear Peter,

**STATE ADMINISTRATIVE TRIBUNAL DR 160 OF 2022 - TRUSTEES OF THE CHRISTIAN BROS V WAPC  
LOT 4 FERN ROAD & LOT 102 CASTLEDARE LOCAL WATER MANAGEMENT STRATEGY  
HYDROLOGICAL ADVICE**

Hyd2o wish to confirm the following advice in relation to stormwater management for the carpark catchment at Castledare as detailed in the Lot 4 Fern Road & Lot 102 Castledare Local Water Management Strategy (Hyd2o, 2021):

- The carpark catchment as identified in Figure 8 and Table 7 of the LWMS (Hyd2o, 2021) is separate to catchments associated with the subdivision/structure plan.
- The proposed storage identified in the LWMS for the carpark catchment is only for the carpark area itself and is not required to manage any stormwater for the subdivision/structure plan.

Should you have any queries regarding the above advice, please do not hesitate to contact Sasha Martens of this office.

**REFERENCES**

Hyd2o (2021), Lot 4 Fern Road & Lot 102 Castledare Place Wilson Local Water Management Strategy, March 2021

Yours sincerely,



Sasha Martens

Principal Engineering Hydrologist

Appendix Three

# Transportation Noise Assessment







Lloyd George Acoustics

PO Box 717  
Hillarys WA 6923  
T: 9401 7770  
[www.lgacoustics.com.au](http://www.lgacoustics.com.au)

# Transportation Noise Assessment

**Proposed Subdivision – Lot 4 Fern Road and  
Lot 102 Castledare Place, Wilson**

Reference: 20125999-01a.docx

**Prepared for:**  
Richard Noble

## Report: 20125999-01a.docx

### Lloyd George Acoustics Pty Ltd

ABN: 79 125 812 544

PO Box 717  
Hillarys WA 6923

[www.lgacoustics.com.au](http://www.lgacoustics.com.au)

T: 9401 7770

Contacts	Daniel Lloyd	Terry George	Matt Moyle	Olivier Mallié	Ben Hillion	Rob Connolly
E:	<a href="mailto:daniel@lgacoustics.com.au">daniel@lgacoustics.com.au</a>	<a href="mailto:terry@lgacoustics.com.au">terry@lgacoustics.com.au</a>	<a href="mailto:matt@lgacoustics.com.au">matt@lgacoustics.com.au</a>	<a href="mailto:olivier@lgacoustics.com.au">olivier@lgacoustics.com.au</a>	<a href="mailto:ben@lgacoustics.com.au">ben@lgacoustics.com.au</a>	<a href="mailto:rob@lgacoustics.com.au">rob@lgacoustics.com.au</a>
M:	0439 032 844	0400 414 197	0412 611 330	0439 987 455	0457 095 555	0410 107 440

This report has been prepared in accordance with the scope of services described in the contract or agreement between Lloyd George Acoustics Pty Ltd and the Client. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client, and Lloyd George Acoustics Pty Ltd accepts no responsibility for its use by other parties.

Date:	Rev	Description	Prepared By	Verified
11-Dec-20	0	Issued to Client	Terry George	-
4-Mar-21	A	Updated plan	Terry George	-

## Table of Contents

1	INTRODUCTION	1
2	CRITERIA	3
3	METHODOLOGY	4
4	RESULTS	4

## List of Tables

Table 1-1	Transport Corridor Classification and Trigger Distances	2
Table 2-1	Noise Targets for Noise-Sensitive Land-Use	3

## List of Figures

Figure 1-1	Proposed Subdivision	1
Figure 1-2	Site Locality (PlanWA)	2
Figure 3-1	Noise Exposure Forecast from Guidelines	4

## Appendices

A	Proposed Plans
B	Terminology



# 1 INTRODUCTION

It is proposed to subdivide land for residential use, shown in *Figure 1-1* and referred to as Lot 4 Fern Road & Lot 102 Castledare Place, Wilson.



Figure 1-1 Proposed Subdivision



State Planning Policy No. 5.4 Road and Rail Noise (hereafter referred to as SPP 5.4) provides the following trigger distances:

**Table 1-1 Transport Corridor Classification and Trigger Distances**

Transport Corridor Classification	Trigger Distance	Distance Measured From
<b>Strategic freight and major traffic routes</b> Roads as defined by Perth and Peel Planning Frameworks and/or roads with either 500 or more Class 7 to 12 Austroads vehicles per day, and/or 50,000 per day traffic volume.	300 metres	Road carriageway edge
<b>Other significant freight/traffic routes</b> These are generally any State administered road and/or local government road identified as being a future State administered road (red road) and other roads that meets the criteria of either $\geq 100$ Class 7 to 12 Austroads vehicles daily or $\geq 23,000$ daily traffic count (averaged equivalent to 25,000 vehicles passenger car units under region schemes).	200 metres	Road carriageway edge
<b>Passenger railways</b>	100 metres	Centreline of the closest track
<b>Freight railways</b>	200 metres	Centreline of the closest track

As the proposed subdivision is approximately 250 metres from Leach Highway ('Strategic Freight or Major Traffic Route'), SPP 5.4 is applicable (refer *Figure 1-2* taken from PlanWA Mapping of Department of Planning, Lands and Heritage).



**Figure 1-2 Site Locality (PlanWA)**

Appendix A contains a description of some of the terminology used throughout this report.

## 2 CRITERIA

The criteria relevant to this assessment is the *State Planning Policy No. 5.4 Road and Rail Noise* (hereafter referred to as SPP 5.4) produced by the Western Australian Planning Commission (WAPC). The objectives of SPP 5.4 are to:

- Protect the community from unreasonable levels of transport noise;
- Protect strategic and other significant freight transport corridors from incompatible urban encroachment;
- Ensure transport infrastructure and land-use can mutually exist within urban corridors;
- Ensure that noise impacts are addressed as early as possible in the planning process; and
- Encourage best practice noise mitigation design and construction standards

*Table 2-1* sets out noise targets that are to be achieved by proposals under which SPP 5.4 applies. Where the targets are exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.

**Table 2-1 Noise Targets for Noise-Sensitive Land-Use**

Outdoor Noise Target		Indoor Noise Target	
55 dB L <sub>Aeq</sub> (Day)	50 dB L <sub>Aeq</sub> (Night)	40 dB L <sub>Aeq</sub> (Day) (Living and Work Areas)	35 dB L <sub>Aeq</sub> (Night) (Bedrooms)

Notes:

- Day period is from 6am to 10pm and night period from 10pm to 6am.
- The outdoor noise target is to be measured at 1-metre from the most exposed, habitable<sup>1</sup> facade of the noise sensitive building.
- For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonable drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors (as amended) for each relevant time period.
- Outdoor targets are to be met at all outdoor areas as far as is reasonable and practicable to do so using the various noise mitigation measures outlined in the Guidelines.

The application of SPP 5.4 is to consider anticipated traffic volumes for the next 20 years from when the noise assessment is undertaken.

In the application of the noise targets, the objective is to achieve:

- indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and childcare centres, the design of outdoor areas should take into consideration the noise target.

<sup>1</sup> A habitable room is defined in State Planning Policy 3.1 as a room used for normal domestic activities that includes a bedroom, living room, lounge room, music room, sitting room, television room, kitchen, dining room, sewing room, study, playroom, sunroom, gymnasium, fully enclosed swimming pool or patio.



### 3 METHODOLOGY

The methodology used in this assessment is to follow the screening assessment procedure provided in *Road and Rail Noise Guidelines*. From Table 2 of the Guidelines (refer *Figure 3-1*), noise levels at the proposed subdivision are assessed as 53 dB  $L_{Aeq(Day)}$ , with Leach Highway being a total of 6 lanes and at a distance of 250 metres from the proposed site.

A level of 53 dB  $L_{Aeq(Day)}$  is below the Outdoor Noise Target. Furthermore, some residences would be screened by existing residences such that the Guidelines permit a 4 dB reduction (i.e. 49 dB  $L_{Aeq(Day)}$ ) as well as other residences being further away.

Transport Corridor Classification	Number of lanes (both directions), including bus/priority lanes and entrance/exit ramps	Forecast noise exposure category based on lot distance(m) from edge of nearest main road carriageway (not entrance/exit ramps)																										
		adjacent	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	175	200	225	250	275	300					
Strategic freight/major traffic route • 500 or more Class 7-12 Austroads vehicles per day, or • 50,000+ vehicles per day	2 to 4 lanes	72	68	66	65	63	62	61	61	60	59	59	58	57	57	56	55	54	53	52	51	50						
	5 to 6 lanes	74	70	68	66	65	64	63	62	61	61	60	59	59	58	58	57	56	55	54	53	52	51	50				
	7 to 8 lanes	76	72	69	68	66	65	64	64	63	62	62	61	60	60	59	58	57	56	55	54	53	52	51	50			
	9 to 10 lanes	77	73	70	69	67	66	65	64	63	63	62	61	61	60	59	58	57	56	55	54	53	52	51	50			
	10 or more lanes	78	74	71	70	68	67	66	66	65	64	64	63	62	62	61	60	59	58	57	56	56	55	54				
Other significant freight / traffic routes • Any actual or planned future State Administered Road • Local Government Roads • Carrying 100 or more Class 7 – 12 Austroads vehicles/day • 25,000+ vehicles per days vehicles/day	Urban Region Scheme areas 60-80 km/hr	1 to 2 lanes	67	64	62	61	60	59	58	57	56	56	55	54	54	53	53	52	51	50	49	48	47					
		3 to 6 lanes	69	66	64	63	62	61	60	59	58	58	57	56	56	55	55	54	53	52	51	50	49					
	Urban Region Scheme areas 100+ km/hr	1 to 2 lanes	70	67	65	64	63	62	61	60	59	59	58	57	57	56	55	54	53	52	51	50						
		3 to 6 lanes	74	70	68	66	65	64	63	62	61	61	60	60	59	59	58	57	56	55	54	53	52	51	50			
	Rural areas 60-80 km/hr	1 to 2 lanes	62	59	57	56	55	54	53	52	51	51	50	49	49	48	48	46	45	44	43	42	41					
		3 to 4 lanes	66	63	61	60	59	58	56	56	55	54	53	53	52	52	51	50	49	48	47	46	45					
	Rural areas 100+ km/hr	1 to 2 lanes	67	64	62	61	60	59	58	57	56	55	54	54	53	53	52	51	50	49	48	47	46					
		3 to 4 lanes	69	66	64	63	62	61	60	59	58	57	56	56	55	55	54	53	52	51	50	49	48					

Figure 3-1 Noise Exposure Forecast from Guidelines

### 4 RESULTS

From *Section 3*, it is evident that at the closest point of the proposed subdivision, noise levels are expected to be 49-53 dB  $L_{Aeq(Day)}$ , with other parts being less. Being below the outdoor noise target of 55 dB  $L_{Aeq(Day)}$ , no further mitigation is required.

**Appendix A**

**Terminology**

The following is an explanation of the terminology used throughout this report.

**Decibel (dB)**

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

**A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as  $L_A$  dB.

**$L_1$**

An  $L_1$  level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

**$L_{10}$**

An  $L_{10}$  level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the “intrusive” noise level.

**$L_{90}$**

An  $L_{90}$  level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the “background” noise level.

**$L_{eq}$**

The  $L_{eq}$  level represents the average noise energy during a measurement period.

**$L_{A10,18hour}$**

The  $L_{A10,18hour}$  level is the arithmetic average of the hourly  $L_{A10}$  levels between 6.00 am and midnight. The *CoRTN* algorithms were developed to calculate this parameter.

**$L_{Aeq,24hour}$**

The  $L_{Aeq,24hour}$  level is the logarithmic average of the hourly  $L_{Aeq}$  levels for a full day (from midnight to midnight).

**$L_{Aeq,8hour} / L_{Aeq} (Night)$**

The  $L_{Aeq} (Night)$  level is the logarithmic average of the hourly  $L_{Aeq}$  levels from 10.00 pm to 6.00 am on the same day.

**$L_{Aeq,16hour} / L_{Aeq} (Day)$**

The  $L_{Aeq} (Day)$  level is the logarithmic average of the hourly  $L_{Aeq}$  levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the  $L_{A10,18hour}$ .

**Noise-sensitive land use and/or development**

Land-uses or development occupied or designed for occupation or use for residential purposes (including dwellings, residential buildings or short-stay accommodation), caravan park, camping ground, educational establishment, child care premises, hospital, nursing home, corrective institution or place of worship.



### **About the Term 'Reasonable'**

An assessment of reasonableness should demonstrate that efforts have been made to resolve conflicts without comprising on the need to protect noise-sensitive land-use activities. For example, have reasonable efforts been made to design, relocate or vegetate a proposed noise barrier to address community concerns about the noise barrier height? Whether a noise mitigation measure is reasonable might include consideration of:

- The noise reduction benefit provided;
- The number of people protected;
- The relative cost vs benefit of mitigation;
- Road conditions (speed and road surface) significantly differ from noise forecast table assumptions;
- Existing and future noise levels, including changes in noise levels;
- Aesthetic amenity and visual impacts;
- Compatibility with other planning policies;
- Differences between metropolitan and regional situations and whether noise modelling requirements reflect the true nature of transport movements;
- Ability and cost for mobilisation and retrieval of noise monitoring equipment in regional areas;
- Differences between Greenfield and infill development;
- Differences between freight routes and public transport routes and urban corridors;
- The impact on the operational capacity of freight routes;
- The benefits arising from the proposed development;
- Existing or planned strategies to mitigate the noise at source.

### **About the Term 'Practicable'**

'Practicable' considerations for the purposes of the policy normally relate to the engineering aspects of the noise mitigation measures under evaluation. It is defined as "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge" (*Environmental Protection Act 1986*). These may include:

- Limitations of the different mitigation measures to reduce transport noise;
- Competing planning policies and strategies;
- Safety issues (such as impact on crash zones or restrictions on road vision);
- Topography and site constraints (such as space limitations);
- Engineering and drainage requirements;
- Access requirements (for driveways, pedestrian access and the like);
- Maintenance requirements;
- Bushfire resistance or BAL ratings;
- Suitability of the building for acoustic treatments.

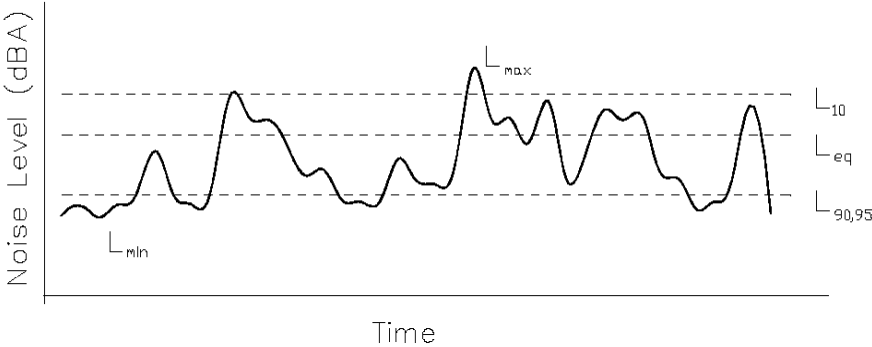
### **$R_w$**

This is the weighted sound reduction index and is similar to the previously used STC (Sound Transmission Class) value. It is a single number rating determined by moving a grading curve in integral steps against the laboratory measured transmission loss until the sum of the deficiencies at each one-third-octave band, between 100 Hz and 3.15 kHz, does not exceed 32 dB. The higher the  $R_w$  value, the better the acoustic performance.

**C<sub>tr</sub>**

This is a spectrum adaptation term for airborne noise and provides a correction to the R<sub>w</sub> value to suit source sounds with significant low frequency content such as road traffic or home theatre systems. A wall that provides a relatively high level of low frequency attenuation (i.e. masonry) may have a value in the order of -4 dB, whilst a wall with relatively poor attenuation at low frequencies (i.e. stud wall) may have a value in the order of -14 dB.

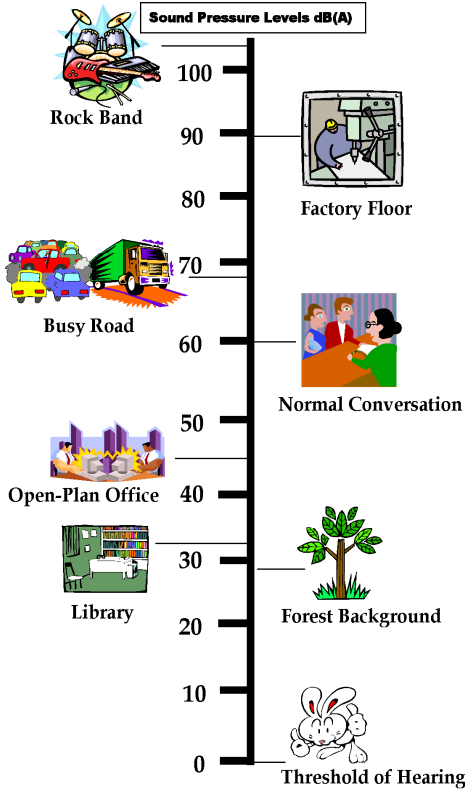
**Chart of Noise Level Descriptors**



**Austrroads Vehicle Class**

VEHICLE CLASSIFICATION SYSTEM	
AUSTRROADS	
CLASS	LIGHT VEHICLES
1	SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle 
2	SHORT - TOWING Trailer, Caravan, Boat 
HEAVY VEHICLES	
3	TWO AXLE TRUCK OR BUS *2 axles 
4	THREE AXLE TRUCK OR BUS *3 axles, 2 axle groups 
5	FOUR (or FIVE) AXLE TRUCK *4 (5) axles, 2 axle groups 
6	THREE AXLE ARTICULATED *3 axles, 3 axle groups 
7	FOUR AXLE ARTICULATED *4 axles, 3 or 4 axle groups 
8	FIVE AXLE ARTICULATED *5 axles, 3+ axle groups 
9	SIX AXLE ARTICULATED *6 axles, 3+ axle groups or 7+ axles, 3 axle groups 
LONG VEHICLES AND ROAD TRAINS	
10	8 DOUBLE or HEAVY TRUCK and TRAILER *7+ axles, 4 axle groups 
11	DOUBLE ROAD TRAIN *7+ axles, 5 or 6 axle groups 
12	TRIPLE ROAD TRAIN *7+ axles, 7+ axle groups 

**Typical Noise Levels**





Appendix Four

**Bushfire Management Plan**



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson

Project No: EP21-006(03)

**Prepared for Trustees of the Christian Brothers  
April 2023**

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## Document Control

<b>Doc name:</b> Bushfire Management Plan Lot 4 Fern Road and Lot 102 Castledare Place, Wilson					
<b>Doc no.:</b> EP21-006(03)—001d BRB					
Version	Date	Author		Reviewer	
1	March 2021	Bianca Bertelli	BRB	Andreas Biddiscombe	ADB
				Dana Elphinstone	DAE
Report issued for client review.					
A	April 2021	Bianca Bertelli	BRB	Andreas Biddiscombe	ADB
				Dana Elphinstone	DAE
Updated to address project team comments.					
B	February 2023	Louis Winer	LSW	Kirsten Knox	KK
				Anthony Rowe	AJR
Updated to address structure plan comments and subdivision design as well as Version 1.4 of the Guidelines for Planning in Bushfire Prone Areas.					
C	March 2023	Kirsten Knox	KK	Anthony Rowe	AJR
				Minor text update to slope descriptions.	
D	April 2023	Kirsten Knox	KK	Anthony Rowe	AJR
				Minor text update following client review.	

© 2023 Emerge Associates All Rights Reserved. Copyright in the whole and every part of this document belongs to Emerge Associates and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Emerge Associates.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Disclaimer:

This document has been prepared in good faith and is derived from information sources believed to be reliable and accurate at the time of publication. Nevertheless, it is distributed on the terms and understanding that the author is not liable for any error or omission in the information sources available or provided to us, or responsible for the outcomes of any actions taken based on the recommendations contained herein. It is also expected that our recommendations will be implemented in their entirety, and we cannot be held responsible for any consequences arising from partial or incorrect implementation of the recommendations provided.

This document has been prepared primarily to consider the layout of development and/or the appropriate building construction standards applicable to development, where relevant. The measures outlined are considered to be prudent minimum standards only based on the standards prescribed by the relevant authorities. The level of bushfire risk mitigation achieved will depend upon the actions of the landowner or occupiers of the land and is not the responsibility of the author. The relevant local government and fire authority (i.e. Department of Fire and Emergency Services or local bushfire brigade) should be approached for guidance on preparing for and responding to a bushfire.

Notwithstanding the precautions recommended in this document, it should always be remembered that bushfires burn under a wide range of conditions which can be unpredictable. An element of risk, no matter how small, will always remain. The objective of the Australian Standard AS 3959-2018 is to “prescribe particular construction details for buildings to reduce the risk of ignition from a bushfire while the front passes” (Standards Australia 2018). Building to the standards outlined in AS 3959 does not guarantee a building will survive a bushfire or that lives will not be lost.



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## Executive Summary

Richard Noble on behalf of Trustees of the Christian Brothers (the proponent) are progressing residential development over Lot 4 Fern Road and Lot 102 Castledare Place, Wilson (herein referred to as 'the site') in accordance with the *Lot 4 Fern Road and Lot 102 Castledare Place– Wilson Local Structure Plan* (herein referred to as the 'structure plan') and plan of subdivision. The site is a portion of the indicated subdivision area, which includes land associated with the Castledare Miniature Railway.

The site is 3.19 hectares (ha) and is zoned 'Urban' under the Metropolitan Region Scheme (MRS) and 'Private Community Purposes' and 'Urban Development' under the City of Canning Local Planning Scheme (LPS) No. 42. The site is located 9.5 km south-east of the Perth Central Business District (CBD). It is bound by Fern Road and existing residential development to the north, the Canning River foreshore area zoned 'Parks and Recreation' under the MRS including the Castledare Miniature Railway site (containing tracks, station, signal boxes, workshops and visitor parking) to the east, and Castledare Place, Castledare Village gated community, Our Lady of Perpetual Help Catholic Church and existing residential development to the west.

The majority of the site is identified as a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2021). The identification of the site within an area declared as bushfire prone necessitates a further assessment of the determined bushfire risk affecting the site (in accordance with *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas* (AS 3959)) and the satisfactory compliance of the proposal with the policy measures described in *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015). This includes its associated *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (the Guidelines).

The purpose of SPP 3.7 and its policy intent is best summarised as preserving life and reducing the impact of bushfire on property and infrastructure through effective risk-based land use planning. Importantly, SPP 3.7 requires that the determining authority is to apply its consideration to the precautionary principle (clause 6.11 in SPP 3.7). Accordingly, the determining authority must be satisfied that the intent of the policy measures have been met before it issues an approval.

Pursuant to the policy measures outlined in SPP 3.7, this Bushfire Management Plan (BMP) examines the various responses to the identified bushfire risk (following development) that will make the land (on completion) suitable for its intended purpose. This BMP was originally prepared to support the structure plan, and has been subsequently updated to address the subdivision. As part of the BMP, a Bushfire Attack Level (BAL) assessment that considers the classification and condition of vegetation within 150 m of the site has been undertaken. The following existing bushfire hazards were identified within and surrounding the site:

- Forest (Class A) vegetation, within the northern and southern portions of the site and to the north-east of the site along the Water Corporation Wilsons Main Drain, associated with stands of planted trees with a mixture of native and non-native shrub understorey.
- Woodland (Class B) vegetation, within the Castledare Miniature Railway site to the east of the site associated with a small area of longer grass under an open woodland overstorey.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



- Shrubland (Class C) vegetation, within the Canning River Foreshore to the south-east and north-east of the site, associated with riparian sedge species.
- Scrub (Class D) vegetation, in areas adjacent to the Canning River to the north-east, east (including on the opposite bank of the Canning River) and to the south.
- Grassland (Class G) vegetation over the majority of the site associated with previously cleared vegetation and external to the site along the Water Corporation Main Drain.

In order to resolve the potential for a bushfire to affect the site, a post-development scenario is proposed in which all classified vegetation within the site and associated with the principal shared path will be removed or managed in a 'low threat' standard as part of implementing future residential subdivision and development. The 'Parks and Recreation' reserve to the east of the site comprises a mixture of recreational and conservation land uses, including the Castledare Miniature Railway carparks, railways and associated infrastructure, as well as managed parkland and riparian vegetation along the Canning River. It has been assumed that the existing vegetation classifications will remain for the foreseeable future, including classified vegetation (bushfire hazards) and low threat managed areas. This is in accordance with the ongoing use and management by the existing miniature railway operator in accordance with the Castledare Miniature Railway Foreshore Management Plan (Castledare Miniature Railways (WA) Inc 2018). Where areas are currently managed but are identified as 'bushland' within the management plan, these have been assumed to be a bushfire hazard in the post development scenario. Classified vegetation within the Water Corporation Main Drain to the east of the site is assumed to remain in its existing state, along with other classified vegetation that has been identified outside of the proponent's landholdings (e.g. associated with the Canning River).

The outcomes of this BMP demonstrate that as development progresses, it will be possible for an acceptable solution to be adopted for each of the applicable bushfire protection criteria outlined in the Guidelines. This includes:

- **Location:** all future built form can be located in an area subject to a low or moderate bushfire hazard and can achieve a BAL rating of BAL-29 or less, without requiring clearing or modification of retained remnant vegetation along the Canning River foreshore area. Based on the bushfire hazard level assessment (which considers the pre-development scenario), the majority of the site is located in an area of moderate bushfire hazard level, with a small portion (associated with pockets of 'forest' vegetation, identified as 'extreme'). As development within the site is progressed, classified vegetation will be removed and development will be located within an area subject to a bushfire hazard level of low or moderate (where within 100 m of other classified vegetation).
- **Siting and Design:** future habitable buildings can be sited within the proposed development so that BAL-29 or less can be achieved based on the proposed development. The majority of lots achieve BAL-12.5 or BAL-LOW. This has been achieved through the strategic location of internal road reserves, public open space, the 5 m-wide principal shared path (dual-use pathway) and the existing managed areas associated with the Castledare Miniature Railway.
- **Vehicular Access:** the proposed development provides for connections with existing public roads, including Castledare Place to the north of the site and Bywater Way to the south-west of the site. Due to existing surrounding road layout, access within the site will be via no

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



through roads, however, both roads connect with the broader road network, including Fern Road which also links to Leach Highway. An emergency access way (EAW) is proposed between the northern and southern portions of the site, providing egress to the two cells in either direction. The EAW will be provided through the existing carpark located on land already reserved for public purposes.

- **Water:** the site is located in an area with existing reticulated water supply which will be extended as part of the proposed development of the site, including the provision of hydrants to support onsite firefighting requirements.

The management/mitigation measures to be implemented through the proposed subdivision of the site (in accordance with the structure plan) have been outlined as part of this BMP. Following certification, the BAL ratings determined within this BMP (or as part of future stage-based BAL assessments) can be used to support future building approval processes.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Background .....	1
1.2	Aim of this report .....	3
1.3	Statutory policy and framework .....	3
1.4	Historic planning context .....	3
1.5	Description of the proposed development .....	4
1.6	Description of land characteristics .....	4
<b>2</b>	<b>Environmental Considerations .....</b>	<b>5</b>
2.1	Native vegetation – modification and clearing .....	7
2.2	Revegetation and landscape plans .....	8
<b>3</b>	<b>Bushfire Assessment Results .....</b>	<b>9</b>
3.1	Bushfire Hazard Level (BHL) and Bushfire Attack Level (BAL) assessment .....	9
3.1.1	Assumptions .....	10
3.1.2	Assessment inputs .....	10
3.1.3	Assessment outputs .....	21
<b>4</b>	<b>Identification of Bushfire Hazard Issues .....</b>	<b>23</b>
4.1	Permanent hazards .....	23
4.2	Temporary/manageable hazards .....	24
4.3	Vulnerable and high-risk land uses .....	24
<b>5</b>	<b>Assessment Against the Bushfire Protection Criteria .....</b>	<b>25</b>
5.1	Additional management strategies .....	29
5.1.1	Future approval considerations .....	29
5.1.2	Landscape management .....	29
5.1.2.1	Within the site .....	29
5.1.2.2	Surrounding the site .....	29
5.1.3	City of Canning Fire Hazard Reduction Notice .....	30
5.1.4	Vulnerable or high-risk land uses .....	31
5.1.5	Public education and preparedness .....	31
<b>6</b>	<b>Responsibilities for Implementation and Management of Bushfire Measures .....</b>	<b>32</b>
<b>7</b>	<b>Applicant Declaration .....</b>	<b>34</b>
7.1	Accreditation .....	34
7.2	Declaration .....	34
<b>8</b>	<b>References .....</b>	<b>35</b>
8.1	General references .....	35



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## List of Tables

Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases) .....	5
Table 2: Vegetation classification, effective slope and future management .....	12
Table 3: Setback distances based on vegetation classification and effective slope and Table 2.5 of AS 3959, as determined by the method 1 BAL assessment .....	21
Table 4: Summary of the bushfire protection criteria and compliance statement .....	25
Table 5: Responsibilities for the implementation of this BMP by the developer to support subdivision clearance .....	32
Table 6: Responsibilities for the implementation of this BMP during development and ongoing management ..	33

## List of Plates

Plate 1: Metropolitan Region Scheme (MRS) zones and reserves within and surrounding the site .....	1
Plate 2: Areas within and surrounding the site identified as 'bushfire prone areas' (as indicated in purple) under the state-wide Map of Bush Fire Prone Areas (OBRM 2021).....	2
Plate 3: The five fuel layers in a forest environment that could be associated with fire behaviour (Gould et al. 2007) .....	11
Plate 4: Excerpt of Table 6 from The Guidelines .....	28

## Figures

Figure 1: Site Location and Topographic Contours
Figure 2: Existing Site Conditions – AS 3959 Vegetation Classifications
Figure 3: Existing Site Conditions – Bushfire Hazard Level
Figure 4: Post Development Conditions – AS 3959 Vegetation Classifications
Figure 5: Effective Slope
Figure 6: Bushfire Attack Level Contour Plan
Figure 7: Spatial Representation of Bushfire Management Features

## Appendices

### Appendix A

Local Structure Plan - Lot 4 Fern Rd & Lot 102 Castledare Place, Wilson

### Appendix B

Proposed Subdivision Layout Lot 102 Castledare Place and Lot 4 Fern Road, Wilson

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
AHD	Australian Height Datum
AS	Australian Standard
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BMP	Bushfire Management Plan
BPAD	Bushfire Planning and Design
FDI	Fire Danger Index
FZ	Flame Zone

Table A2: Abbreviations – Organisations

Organisations	
DBCA	Department of Biodiversity Conservation and Attractions
DFES	Department of Fire and Emergency Services
OBRM	Office of Bushfire Risk Management
WAPC	Western Australian Planning Commission

Table A3: Abbreviations – Legislation and policies

Legislation	
Guidelines	<i>Guidelines for Planning in Bushfire Prone Areas version 1.4 (DPLH &amp; WAPC 2021)</i>
SPP 3.7	<i>State Planning Policy 3.7 Planning in Bushfire Prone Areas (WAPC 2015)</i>

Table A4: Abbreviations – Planning and building terms

Planning and building terms	
AS 3959	<i>Australian Standard 3959-2018 Construction of buildings in bushfire prone areas</i>
MRS	Metropolitan Region Scheme
POS	Public open space
LPS	Local Planning Scheme

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



This page has been left blank intentionally.

# Bushfire Management Plan

## Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 1 Introduction

### 1.1 Background

Richard Noble on behalf of the Trustees of the Christian Brothers (the proponent) are seeking to progress residential development across the site. The structure plan outlines the proposed progressing residential development of Lot 4 Fern Road and Lot 102 Castledare Place, Wilson (herein referred to as 'the site') in accordance with the *Lot 4 Fern Road and Lot 102 Castledare Place– Wilson Local Structure Plan* (herein referred to as the 'structure plan'), provided in **Appendix A** and the plan of subdivision, provided in **Appendix B**. The location of the site is shown in **Figure 1** and is a portion of the broader subdivision area, which includes land associated with the Castledare Miniature Railway and is referenced as the 'Proposed subdivision area'.

The site is 3.19 hectares (ha) in size and located within an established urban area, approximately 9.5 km south-east of the Perth Central Business District (CBD) within the City of Canning. It is bound by Fern Road and existing residential development to the north, the Canning River foreshore area zoned 'Parks and Recreation' under the Metropolitan Region Scheme (MRS) including the Castledare Miniature Railway site (containing tracks, station, signal boxes, workshops and visitor parking) to the south and east, and Castledare Place, Castledare Village gated community, Our Lady of Perpetual Help Catholic Church and existing residential development to the west.

The site is zoned 'Urban' under the MRS and 'Private Community Purposes' and 'Urban Development' under the City of Canning Local Planning Scheme (LPS) No. 42, as shown in **Plate 1**. The proposed development aligns with the existing MRS zoning and will deliver a Residential (R30) zone, public open space (POS) areas, an internal road network and a principal shared path (dual use pathway).

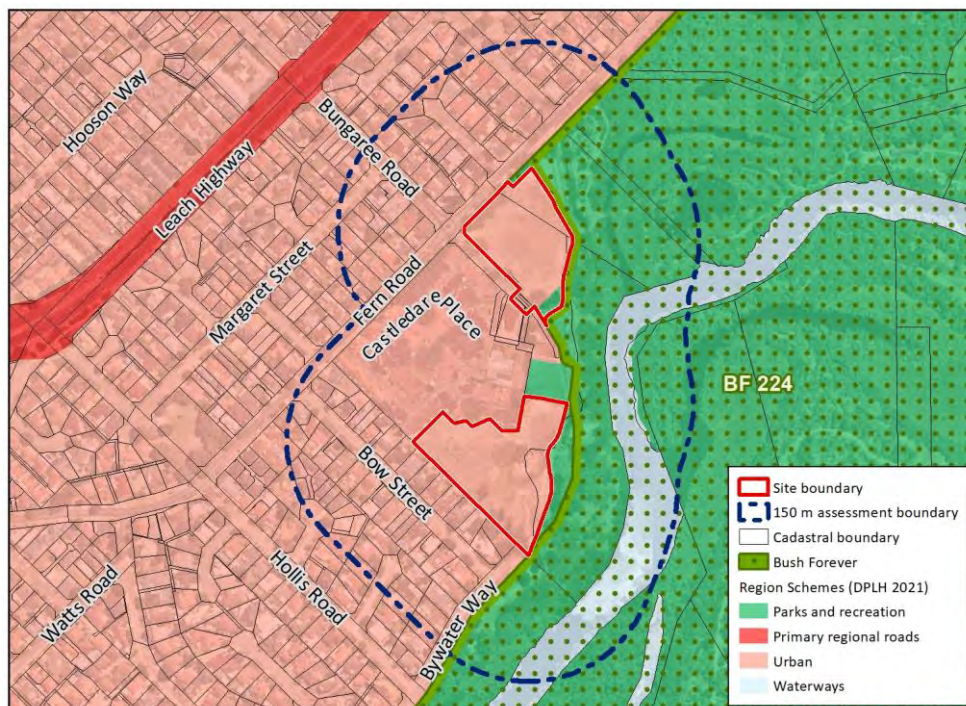


Plate 1: Metropolitan Region Scheme (MRS) zones and reserves within and surrounding the site



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



The majority of the site is identified as a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2021) and is shown in **Plate 2** below. The identification of a site within an area declared as bushfire prone necessitates a further assessment of the determined bushfire risk affecting the site in accordance with *Australian Standard 3959:2018 Construction of buildings in bushfire prone areas (AS 3959)*, and the satisfactory compliance of the proposal with the policy measures described in *State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7) (WAPC 2015)* and the *Guidelines for Planning in Bushfire Prone Areas Version 1.4 (the Guidelines) (DPLH & WAPC 2021)*.

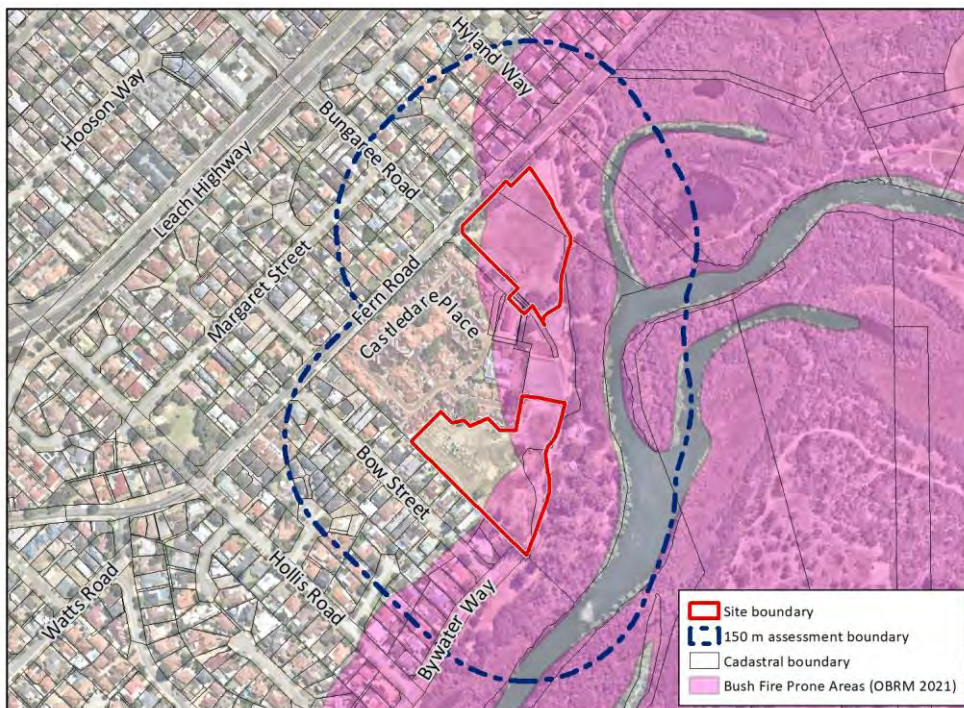


Plate 2: Areas within and surrounding the site are identified as 'bushfire prone areas' (as indicated in purple) under the state-wide *Map of Bush Fire Prone Areas (OBRM 2021)*.

The purpose of SPP 3.7 and its policy intent is to preserve life and reduce the impact of bushfire on property and infrastructure through effective risk-based land use planning. Importantly, it is risk-based, requiring a methodical approach to identify and evaluate the hazards and provide the treatments to ameliorate these hazards to an acceptable level. SPP 3.7 requires that the determining authority give consideration to the precautionary principle (clause 6.11 in SPP 3.7) and they must be satisfied that the potential for significant adverse impacts can be adequately reduced or managed. In particular:

*SPP 3.7 does not require that there be no increase at all in the threat of bushfire to people property or infrastructure. Rather, as is seen in clause 2 of SPP 3.7, the intention of the policy is to 'implement effective, risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure'. (emphasis added)<sup>1</sup>*

<sup>1</sup> Harmanis Holdings No. 2 Pty Ltd and Western Australian Planning Commission [2019] WASAT 43 (Harmanis).

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 1.2 Aim of this report

The aim of this BMP is to assess bushfire hazards within the site and nearby areas and ensure that the threat posed by any identified hazards can be appropriately mitigated and managed. This BMP has been prepared to support the proposed structure plan and subdivision for the site and addresses the requirements of SPP 3.7 (WAPC 2015), the Guidelines (DPLH & WAPC 2021) and AS 3959 (Standards Australia 2018). The document provides an assessment of the bushfire management strategies to be considered as part of the future development within the site and includes:

- An assessment of the existing classified vegetation in the vicinity of the site (within 150 m) and consideration of bushfire hazards that will exist in the post development scenario (**Section 3**).
- Commentary on how the future development can achieve the bushfire protection criteria outlined within the Guidelines (**Section 5**).
- An outline of the roles and responsibilities associated with implementing the BMP (see **Section 6**).

## 1.3 Statutory policy and framework

The following key legislation, policies and guidelines are relevant to the preparation of a bushfire management plan:

- *Bush Fires Act 1954*
- *Fire and Emergency Services Act 1998*
- *Planning and Development Act 2005* and associated regulations
- *Building Act 2011* and associated regulations
- *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)
- *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (DPLH & WAPC 2021)
- *Australian Standard AS 3959 – 2018 Construction of buildings in bushfire prone areas* (Standards Australia 2018)

## 1.4 Historic planning context

The current 'Urban' MRS zoning of the site was established in 2020 under the Western Australian Planning Commission (WAPC) MRS Amendment 1365/57. The purpose of the amendment was to reclassify portions of Lot 4 Fern Road and Lot 102 Castledare Place, Wilson from the 'Urban' zone to 'Parks and Recreation' (0.50 ha) and reclassify other land from the 'Parks and Recreation' reservation to the 'Urban' zone (1.02 ha). As part of the negotiations for the rezoning of the 1.02 ha to the Urban zone, the proponent agreed to cede the regionally significant portion of the 'Parks and Recreation' foreshore reserve within their ownership within Lot 102 Castledare Place and Lot 4 Fern Road to the State free of cost, equating to approximately 12.5 hectares.

MRS amendment 1365/57 was referred to the Environmental Protection Authority (EPA), in November 2019. The EPA determined that the proposed scheme should not be assessed under Part IV Division 3 of the *Environmental Protection Act 1986* (EP Act) and that it was not necessary to provide any advice or recommendations.

# Bushfire Management Plan

## Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Pursuant to Section 126(3) of the *Planning and Development Act 2005*, the WAPC has the option of concurrently rezoning land that is being zoned Urban under the MRS, to a 'Development' zone (or similar), in the corresponding LPS. The WAPC agreed to the northern portion of the site being zoned Urban (along Fern Road) within MRS Amendment 1365/57 being transferred to the 'Urban Development' zone in the City of Canning LPS No. 42. The southern portion of the site zoned 'Private Community Purposes' under the City of Canning LPS No. 42, will be subject to a local planning scheme amendment (concurrent with the structure planning process) to rezone the land to enable residential development.

### 1.5 Description of the proposed development

The site is proposed to be developed for residential purposes in line with the structure plan (provided in **Appendix A**) and proposed subdivision (provided in **Appendix B**). The structure plan and proposed subdivision will assist in the coordination and provision of utility networks, transport networks, public open space, urban water management, development standards and other infrastructure development (WAPC 2012). The structure plan and subdivision extend over Lot 4 Fern Road and Lot 102 Castledare Place (identified as 'the site' in **Figure 1**) applying to the land zoned 'Urban' under the MRS, and proposes the following land uses:

- residential lots
- private community space
- an interconnected public road network including two no through roads
- public open space (POS) areas
- a principal shared path (dual-use pathway)
- emergency access way through an existing carpark already reserved for public purpose, providing a through connection for the proposed no through roads.

### 1.6 Description of land characteristics

The natural topographical contours indicate that the site is gently sloping from 2 metres Australian Height Datum (m AHD) in the eastern portion of the site adjacent to the Canning River, to 5 m AHD in the western portion of the site, as shown in **Figure 1**.

Based on a review of available historic aerial photography (Landgate 2021), the site was historically cleared of remnant vegetation prior to 1953 to support agricultural land uses, with the exception of scattered trees along the site perimeter. The Castledare Railway infrastructure to the east of the site was constructed circa 1965 with additional structures erected between 1965 and 2002. Clearing associated with the construction of the miniature golf course within the central portion of the site and vehicle tracks surrounding the perimeter occurred circa 1989. Scattered trees remain and are most likely planted, largely in the 1980s with the exception of two present in the earliest aerial photograph (1953).

The Canning River foreshore area to the east of the site comprises a mixture of recreational (including the Castledare Miniature Railway site) and conservation land uses. The foreshore vegetation comprises *Melaleuca raphiophylla* (Swamp paperbark) and *Agonis flexuosa* (Peppermint) overstory, approximately 3-5m in width with a heavily degraded understorey.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 2 Environmental Considerations

In accordance with the *Bushfire Management Plan – BAL Contour* template (DPLH 2018), this BMP has considered whether there are any environmental values that may require specific consideration through either protection, retention or revegetation. To support this, a review of publicly available databases as well as site specific information (where available) has been undertaken, with particular reference to the Shared Location Information Platform (SLIP) databases. In addition to this, a number of site-specific environmental investigations and surveys have been undertaken to support MRS amendment 1365/57 and the structure plan that have informed this BMP. These investigations include:

- *Environmental Statement Lot 4 and Lot 102 Fern Road Wilson, Western Australia* (Aurora Environmental 2018)
- *Wetland and Waterway Assessment – Lot 4 and 102 Fern Road, Wilson* (Emerge Associates 2019)
- *Environmental Assessment Management Strategy* (Emerge Associates 2021)

A review of the site-specific environmental investigations and publicly available datasets identified limited environmental values within the site as a result of the historical disturbance and historic vegetation clearing. Considerations of values that may be relevant to the site are outlined in **Table 1**.

*Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases)*

Key environmental feature:	Yes / no / potentially occurring within the site	If yes / potentially, describe the value that may be impacted
Conservation category wetlands and buffer (Geomorphic wetlands Swan Coastal Plain) (DBCA-019)	Yes	One Conservation Category Wetland (CCW) feature 'Shelley Bridge Floodplain' (UFI 7151) intersects with the south-west corner of the site. CCW's are considered priority wetland areas that support a high level of ecological attributes and functions. The site does not contain prominent natural wetland landform features or areas supporting intact native wetland vegetation, as determined by the <i>Wetland and Waterway Assessment</i> (Emerge Associates 2019). The portion of UFI 7151 within the site supports lower values than the 'conservation' management category due to the modified landform and 'completely degraded' vegetation and therefore does not require further management /protection as part of the development of the site.
Waterways (DWER-031)	No	There are no defined natural waterways traversing the site. Surface water bodies surrounding the site comprise the: <ul style="list-style-type: none"> <li>• Canning River located approximately 40 m east of the site.</li> <li>• Water Corporation Wilson Main Drain, located approximately 20 m east of the site which comprises an open stormwater drain that discharges to the Canning River.</li> </ul> An urban water management plan was prepared in consultation with the DWER to address water and wastewater planning requirements for the site as part of MRS amendment 1365/57. There are no specific spatial planning or revegetation considerations that are relevant for the BMP.
RAMSAR wetlands (DBCA-010)	No	Not applicable.



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases) (continued)

Key environmental feature:	Yes / no / potentially occurring within the site	If yes / potentially, describe the value that may be impacted
Threatened and priority flora (DBCA-036)	No	No native plant communities were identified within the site as part of previous surveys (Emerge Associates 2019). Given historical clearing, the site now comprises 'parkland cleared' areas with scattered planted non-native trees, landscaping and weed species in 'completely degraded' condition. As a result, it is considered highly unlikely that the site will provide suitable habitat for threatened or priority flora.
Threatened and priority fauna (DBCA-037)	No	The site has been extensively cleared and as a result does not contain fauna habitat of significant value. It is therefore unlikely to support a diverse fauna assemblage. The Canning River foreshore area provides more intact habitats for fauna to utilise. However, this area will not be impacted by development of the site.
Threatened Ecological Communities (TECs) (DBCA-038)	No	No threatened ecological communities were identified within the site as part of previous surveys (Emerge Associates 2019).
Bush Forever areas (DPLH-019)	Yes	The site does not intersect any Bush Forever sites. Bush Forever site 224 occurs adjacent to the site, and covers a large area extending from Riverton to Langford, associated with the Canning River Regional Park. Land within Bush Forever site 224 currently supports a combination of conservation and recreational land uses, as outlined in <b>Section 1.6</b> . Refer to <b>Plate 1</b> for the Bush Forever site's extent.
Clearing regulations – Environmentally Sensitive Areas (ESAs) (DWER-046)	Yes	An ESA extends over the majority of the site, following the general orientation of the Canning River watercourse. The ESA appears to be associated with the CCW 'Swan River Estuary' (UFI 13316) which extends over a large area, approximately 54 ha in size, to the north, east and south of the site. Within ESAs, exemptions listed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 do not apply and a clearing permit is required to undertake any native vegetation clearing, unless other valid exemptions apply (discussed further in <b>Section 2.1</b> ).
DBCA controlled lands or waters (DBCA-011)	No	Not applicable. No DBCA controlled lands or waters are identified within the site. It is noted that the Swan River Reserve (which includes the Canning River and associated foreshore) is identified to the east of the site and is under Crown tenure for Landscape Protection.
Swan Bioplan Regionally Significant Natural Areas 2010 (DWER-070)	No	Not applicable. The Swan Bioplan Project has identified natural areas with significant flora, vegetation and landform values that existed prior to extensive clearing on the southern Swan Coastal Plain. The site is not mapped as occurring within a Regionally Significant Natural Area (RSNA).

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases) (continued)

Key environmental feature:	Yes / no / potentially occurring within the site	If yes / potentially, describe the value that may be impacted
Aboriginal heritage (DPLH-001)	Yes	<p>One 'Lodged' Aboriginal Heritage Site was identified within the southern portion of the site; 'Castledare Artefacts' (ID 15910), described as an 'Artefacts/scatter'.</p> <p>An archeology survey and Aboriginal community consultation was carried out by McDonald Hales and Associates (1997) to investigate the heritage values of the site. One isolated quartz artefact was recorded during the survey in the western portion of Lot 102, external to the site. The artefact was located in a disturbed context and was reported to not represent an impediment to redevelopment of the area. In addition, the McDonald Hales and Associates (1997) report noted:</p> <ul style="list-style-type: none"> <li>• No previously recorded ethnographic sites were identified.</li> <li>• Aboriginal consultants identified no specific ethnographic sites.</li> <li>• Lot 102 has been subject to long term disturbance resulting from European land use practices including vegetation clearing, farming, sand quarrying and extensive filling (with construction and demolition waste and friable asbestos material resulting in contamination of shallow soils).</li> <li>• On the basis of the data collected during ethnographic research and consultation, it was concluded that there are no Aboriginal heritage impediments to the redevelopment of the area.</li> </ul>
Non-indigenous heritage (DPLH-006)	Yes	<p>A database search of the Heritage Council (<a href="http://inherit.stateheritage.wa.gov.au">http://inherit.stateheritage.wa.gov.au</a>) indicates that one non-indigenous heritage place occurs within the southern extent of the northern portion of the site; Castledare Boys Home (fmr) – Miniature Golf Course (ID 17701). This heritage place is proposed to be retained as part of future development of the site, to provide heritage, amenity and social benefits to the local area. As such, the development layout provides a POS area which accommodates the full extent of the miniature golf course, to enable its future retention in a parkland setting, as shown in <b>Appendix A</b>.</p> <p>Whilst situated outside of the site, the structure plan also notes that the Niana Homestead (associated with Heritage place 4579 Castledare Boys Home (fmr)) will be retained and is not proposed to be impacted through future implementation of development within the site.</p>

Based on the above, while there are a number of environmental values identified within or nearby to the site, no conservation significant values are identified within the site which would affect how bushfire risk is considered for the site.

## 2.1 Native vegetation – modification and clearing

As outlined in **Table 1**, the eastern portion of the site is shown as an environmentally sensitive area (ESA). As previously stated, the entirety of the site has been cleared of vegetation prior to 1953 (based on historical aerial imagery (Landgate 2021)), and as a result does not support any native vegetation communities or conservation significant values. This ESA is likely to be associated with a buffer applied to the Canning River watercourse to the east of the site. ESAs are only a relevant consideration where exemptions for clearing native vegetation pursuant to the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 may be applied.

# Bushfire Management Plan

## Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Future development of the site will endeavour to retain and protect the existing individual trees within areas of managed POS and residential lots for community and social benefits. Clearing undertaken in accordance with addressing conditions associated with future subdivision approval, pursuant to the *Planning and Development Act 2005*, are exempt from requiring a clearing permit pursuant to Schedule 6 of the *Environmental Protection Act 1986* (where approved by a responsible authority).

## 2.2 Revegetation and landscape plans

There are no areas within the site that are intended to be revegetated as part of the proposed development. In addition, no areas external to the site, in particular within the Canning River foreshore area, are proposed to be revegetated by the proponent. As outlined, the 'Parks and Recreation' reserve to the east of the site comprises a mixture of recreational and conservation land uses, including the Castledare Miniature Railway carparks, railways and associated infrastructure, as well as managed parkland and riparian vegetation along the Canning River. The Castledare Miniature Railway (Inc) manage this land in accordance with the Castledare Miniature Railway Foreshore Management Plan. The commitments of this management plan will be a relevant consideration for informing long term bushfire risk to development within the site, particularly areas identified for 'bush', 'river bank', 'revegetation' and 'wetland' management priorities.

Two areas of POS have been proposed within the site and are intended to be utilised for recreational and drainage purposes. The detailed design of these areas will be determined in collaboration with the City of Canning as a condition of subdivision approval. These areas will be designed to achieve low threat vegetation in accordance with Section 2.2.3.2 of AS 3959. The management of the landscaped areas will be the responsibility of the proponent initially prior to handover to the City of Canning, with ongoing management likely to include:

- Regular mowing/slashing of grass to less than 10 cm in height (where present).
- Irrigation of grass and garden beds (where required).
- Regular removal of weeds and built-up dead material (such as fallen branches, leaf litter etc.)
- Where remnant trees are retained, these will be low pruned to 2 m from the ground.
- Application of ground/surface covers such as mulch or non-flammable materials as required.

### 3 Bushfire Assessment Results

Bushfire risk for the site has been appropriately considered in the specific context of the Guidelines and AS 3959. The objective of AS 3959 is to reduce the risk of ignition and loss of a building to bushfire. It provides a consistent method for determining a radiant heat level (radiant heat flux) as a primary consideration of bushfire attack on a building or object. It also prescribes deemed-to-satisfy construction responses that can resist the determined radiant heat level at a given distance from the fire. It is based on six Bushfire Attack Level (BAL) ratings: BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ.

Not all vegetation is a classified bushfire risk. Vegetation and ground surfaces that are exempt from classification as a potential hazard are identified as low threat under Section 2.2.3.2 of AS 3959. Low threat vegetation includes the following:

- a) *Vegetation of any type more than 100 m from the site.*
- b) *Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified.*
- c) *Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site or each other.*
- d) *Strips of vegetation less than 20 m wide (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified.*
- e) *Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.*
- f) *Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves, and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairway), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and wind breaks.*

#### 3.1 Bushfire Hazard Level (BHL) and Bushfire Attack Level (BAL) assessment

To support the proposed development of the site, bushfire hazard levels (BHL) within and nearby to the site have been determined in accordance with Appendix Two of the Guidelines and based on the pre-development vegetation classification (see **Figure 2** and detailed in **Table 2**, discussed further below), as part of supporting the structure plan. The BHLs are shown in **Figure 3**.

In addition, and to support the proposed subdivision, a method 1 BAL assessment (in accordance with AS 3959) has been completed for the site, to understand the BAL ratings likely to be applicable to future habitable buildings, and where relevant inform any separation requirements. The BAL assessment considers the post-development vegetation classifications (**Figure 4**) and effective slopes (**Figure 5**) detailed in **Table 2**, and is outlined further below. The outcomes of the BAL assessment are shown in **Figure 6**.



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 3.1.1 Assumptions

The BAL assessment is based on the following assumptions:

- **Designated Fire Danger Index (FDI):** 80
- **Flame temperature:** 1090 K
- **Classified vegetation:** forest, woodland, shrubland, scrub and grassland (**Figure 4**)
- **Effective slope beneath classified vegetation:** flat/upslope, downslope  $>0-5^\circ$ , downslope  $>5-10^\circ$  and downslope  $>10-15^\circ$  (**Figure 5**)
- Existing classified vegetation within the site will be removed as part of the development.
- The patch of forest to the east of the site (western portion of Plot 1) will be landscaped as part of installing the principal shared path, and in accordance with the Castledare Miniature Railway Foreshore Management Plan. This will include pruning existing mature trees, through trimming of low branches and removal of understorey grass/fuels to enable a low-threat classification synonymous with surrounding areas.
- POS areas within the site will be designed, implemented and maintained to a low threat standard in accordance with Section 2.2.3.2 of AS 3959 by the proponent, and following handover by the City of Canning.
- Areas of low threat vegetation outside the site will continue to be managed and/or considered to achieve low threat (in accordance with Section 2.2.3.2 of AS 3959) based on the existing maintenance regimes, such as the Castledare Miniature Railway's (Inc) Foreshore Management Plan and/or as per the City of Canning's Fire Hazard Reduction Notice.
- Classified vegetation that has been identified outside of the proponent's landholdings has been assumed to remain in its current state (unless stated otherwise) and will therefore continue to be a bushfire hazard to development within the site.
- Areas of grassland can include up to 10% foliage cover from shrubs and trees, as per AS 3959.

## 3.1.2 Assessment inputs

Assessing bushfire hazards takes into account the classes of vegetation within 150 m of the site for context and within 100 m to determine the BAL ratings across the site. The vegetation has been classed in accordance with AS 3959. The vegetation classifications are based on the vegetation structure, which includes consideration of the various fuel layers of different vegetation types. For example, fuel layers in a typical forest environment can be broken-down into five segments as illustrated in **Plate 3** below. These defined fuel layers are considered when determining the classification of vegetation and associated bushfire hazard levels.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Plate 3: The five fuel layers in a forest environment that could be associated with fire behaviour (Gould et al. 2007)

An assessment of existing vegetation within the site and surrounding 150 m as well as effective slope has been undertaken in accordance with AS 3959 and the Guidelines, based on a number of site visits including the 22 February 2018 and 5 March 2021.

**Table 2** below outlines the type of vegetation observed within and surrounding the site, the classification of each area of vegetation in accordance with Section 2.2.3 and Table 2.3 of AS 3959, and its assumed post-development classification and any associated management of this vegetation (where applicable).

**Table 2** details:

- The pre-development AS 3959 vegetation classifications (and associated photo locations), which are also shown in **Figure 2**.
- The bushfire hazard ratings, which are shown in **Figure 3**.
- The post-development AS 3959 vegetation classifications, which are also shown in **Figure 4**.
- The effective slope for each area of classified vegetation present in the post-development scenario, which is also shown in **Figure 5**.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
1	<p>Forest vegetation has been identified within the northern and southern portions of the site, associated with stands of mature planted trees. These areas generally have multiple fuel levels and include a mixture of non-native planted tree species such as <i>Corymbia citriodora</i> (Lemon-scented gum) growing to 6-12 m tall, with an understory of native and non-native shrub species.</p> <p><b>AS 3959 classification (Figure 2):</b> Forest (Class A)</p> <p><b>Bushfire hazard rating (Figure 3):</b> Extreme</p>	 <p>Photo location 1: forest vegetation within the northern portion of the site</p>  <p>Photo location 3: forest vegetation within the southern portion of the site</p>	 <p>Photo location 2: forest vegetation within the northern portion of the site</p>  <p>Photo location 4: forest vegetation within the southern portion of the site.</p>	<p>6</p> <p>The western portion of the patch of forest to the north of the site (<b>Photo points 1 and 2</b>) will be landscaped as part of development within the site and installation of the principal shared path, including low pruning and removal of grass/fuels to enable a low-threat classification synonymous with surrounding areas. The eastern portion of the forest vegetation outside the site is assumed to remain in the long term (discussed further below).</p> <p>The forest vegetation located within the site will be converted to non-vegetated areas in the form of buildings, driveways and roads and has been excluded as a bushfire hazard in accordance with exclusion clause 2.2.3.2 (e). Some of these areas may contain managed garden areas/verges in the future, however for ease of reference have been excluded as non-vegetated.</p> <p><b>AS 3959 classification (Figure 4):</b> Non-vegetated (exclusion clause 2.2.3.2(e))</p> <p><b>Effective slope (Figure 5):</b> Not applicable</p>



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued).

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
1	<p>A patch forest vegetation has also been identified adjacent to/associated with the Water Corporation Wilson Main Drain to the north east of the site. This vegetation is characterised by a mixture of planted <i>Eucalyptus spp.</i> and native <i>Corymbia calophylla</i> (marri) trees in addition to an understory of shrubs. This area of forest vegetation has surface, near-surface, elevated, intermediate and overstorey fuel layers present.</p> <p><b>AS 3959 classification (Figure 2):</b> Forest (Class A)</p> <p><b>Bushfire hazard rating (Figure 3):</b> Extreme</p>	 <p>05.03.2021 11:23</p> <p>Photo location 5: forest vegetation to the east of the site within the Wilson Main Drain</p>	 <p>05.03.2021 11:23</p> <p>Photo location 6: forest vegetation to the east of the site within the Wilson Main Drain</p>	<p>1</p> <p>The eastern portion of Plot 1 external to the site is assumed to remain as forest in the long-term. Therefore, it will remain a bushfire hazard to future development within the site.</p> <p><b>AS 3959 classification (Figure 4):</b> Forest (Class A)</p> <p><b>Effective slope (Figure 5):</b> Flat/upslope</p>







# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued)


Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
2	<p>Woodland vegetation has been identified within the Castledare Miniature Railway site to the south-east, associated with a small area of longer grass under an open woodland overstorey. The overstorey consists of <i>Corymbia calophylla</i> (marrri) and planted <i>Eucalyptus spp.</i> with a 10 - 30% foliage cover, growing to a height of 10 – 20 m with an understory of non-native grassland and isolated shrubs. Due to the increased fuel in the surface and near-surface layers, the vegetation has been classified as woodland.</p> <p><b>AS 3959 classification (Figure 2):</b> Woodland (Class B)</p> <p><b>Bushfire hazard rating (Figure 3):</b> Extreme</p>	 <p>Photo location 7: woodland vegetation to the east of the site</p>  <p>Photo location 9: woodland vegetation to the east of the site</p>	 <p>Photo location 8: woodland vegetation to the east of the site</p>  <p>Photo location 10: woodland vegetation to the east of the site</p>	<p>2</p> <p>The woodland vegetation associated with Plot 2 is assumed to remain in its current state in accordance with the Castledare Miniature Railway Foreshore Management Plan. This area is identified as ‘bush’ and ‘wetland’ in the management plan, with the existing vegetation condition observed over a number of years.</p> <p><b>AS 3959 classification (Figure 4):</b> Woodland (Class B)</p> <p><b>Effective slope (Figure 5):</b> Flat/Upslope</p>

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
3	<p>Shrubland vegetation has been identified along the existing fence line abutting the Canning River Foreshore to the south of the site. This vegetation is composed of a monoculture of sedge species growing less than 1 m in height.</p> <p>In addition, shrubland vegetation occurs to the south-east of the site, on the opposite side of a tributary of the Canning River.</p> <p><b>AS 3959 classification (Figure 2):</b> Shrubland (Class C)</p> <p><b>Bushfire hazard rating (Figure 3):</b> Moderate</p>	 <p><i>Photo location 11: shrubland vegetation to the south of the site associated with a patch of sedges bordering the Canning River Foreshore</i></p>	 <p><i>Photo location 12: shrubland vegetation to the south of the site associated with a patch of sedges bordering the Canning River Foreshore</i></p>	<p>3</p> <p>The shrubland vegetation associated with Canning River and foreshore will remain in its existing condition and protected as part of Canning River Regional Park (Bush Forever Site 224). These areas will therefore pose a permanent bushfire hazard to development.</p> <p><b>AS 3959 classification (Figure 4):</b> Shrubland (Class C)</p> <p><b>Effective slope (Figure 5):</b> Flat/upslope (west) Downslope 0 - &gt;5 (east)</p>



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
4	<p>Scrub vegetation occurs to the east of the site within the Canning River foreshore reserve zoned 'Parks and Recreation'. These areas largely consist of <i>Melaleuca raphiophylla</i> (Swamp paperbark) and <i>Agonis flexuosa</i> (Peppermint) tree species growing up to 5 m tall, with a dense understory over reeds/rushes.</p> <p>Scrub vegetation has also been identified in areas adjacent to the Canning River to the north-east, east (on the opposite bank of Canning River) and to the south of the site within Bush Forever Site 224.</p> <p><b>AS 3959 classification (Figure 2):</b> Scrub (Class D)</p> <p><b>Bushfire hazard rating (Figure 3):</b> Extreme</p>	 <p>Photo location 13: scrub vegetation to the north east of the site on the opposite bank of the Canning River</p>  <p>Photo location 15: scrub vegetation along the Canning River to the south east of the site</p>	 <p>Photo location 14: scrub vegetation within a revegetation site to the east of the site</p>  <p>Photo location 16: scrub vegetation long the Canning River to the east of the site</p>	<p>4</p> <p>The areas identified as scrub vegetation are expected to remain in the long term and protected as part of Canning River Regional Park (Bush Forever Site 224). These areas will therefore pose a permanent bushfire hazard to development within the site.</p> <p>Furthermore, in consideration of the Castledare Miniature Railway Foreshore Management Plan, additional areas adjacent to the Water Corporation Wilson Main Drain have been identified as 'scrub' vegetation (even though these areas are currently managed and/or grassland). This is on the basis that these areas are identified as either 'bush' or 'revegetation'.</p> <p><b>AS3959 classification (Figure 4):</b> Scrub (Class D)</p> <p><b>Effective slope (Figure 5):</b> Flat/upslope (north-east, east and west) Downslope 5 - &gt;10 (north-east and east) Downslope 10 - &gt;15 (central and west)</p>

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
5	<p>Grassland vegetation has been identified throughout the site and is associated with previously cleared areas of vegetation (areas external to the site are discussed further below). The height of the grass varies throughout the site, with tussocky weeds growing in patches.</p> <p><b>AS 3959 classification (Figure 2):</b> Grassland (Class G)</p> <p><b>Bushfire hazard rating (Figure 3):</b> Moderate</p>	 <p>Photo location 17: grassland vegetation within the northern portion of the site.</p>  <p>Photo location 19: tussocky grassland vegetation within the southern portion of the site</p>	 <p>Photo location 18: grassland vegetation within the northern portion of the site.</p>  <p>Photo location 20: grassland vegetation within the southern portion of the site</p>	<p>6</p> <p>Areas of grassland vegetation located within the site will be converted to either non-vegetated areas in the form of buildings, driveways and roads or managed public open space. These areas have been excluded as low threat (in accordance with exclusion clause 2.2.3.2 (e) and 2.2.3.2 (f) respectively).</p> <p><b>AS 3959 classification (Figure 4):</b> Non-vegetated (exclusion clause 2.2.3.2(e) and 2.2.3.2(f))</p> <p><b>Effective slope (Figure 5):</b> Not applicable</p>



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued)





Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
5	<p>Patches of grassland vegetation have also been identified external to the site along the Water Corporation Main Drain to the north east of the site and to the south of the site associated with unmanaged grasses growing &gt;10 cm in height.</p> <p><b>AS 3959 classification (Figure 2):</b> Grassland (Class G)</p> <p><b>Bushfire hazard rating (Figure 3):</b> Moderate</p>	 <p><i>Photo location 21: grassland vegetation to the north of the site within the Water Corporation Main Drain</i></p>	 <p><i>Photo location 22: grassland vegetation to the south of the site abutting the Canning River foreshore area</i></p>	<p>The areas identified as grassland vegetation external to the site and within the Water Corporation Wilson Main Drain is expected to remain in its current condition in the long term. These areas will therefore pose a permanent bushfire hazard to development within the site.</p> <p><b>AS3959 classification (Figure 4):</b> Grassland (Class G)</p> <p><b>Effective slope (Figure 5):</b> Flat/upslope Downslope 0 - &gt;5 (south)</p>

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
6	<p>Non-vegetated areas such as roads, driveways, footpaths existing residential buildings and areas of mineral earth surrounding the site have been excluded in accordance with Clause 2.2.3.2(e) of AS 3959.</p> <p><b>AS 3959 classification (Figure 2):</b> Non-vegetated (exclusion clause 2.2.3.2(e))</p> <p><b>Bushfire hazard rating (Figure 3):</b> Low, however as required under the Guidelines, any areas within 100 m of moderate or extreme hazards would be considered moderate hazard, to reflect the potential increased risk.</p>	 <p>Photo location 23: showing the existing dual use footpath adjacent to the site</p>  <p>Photo location 24: showing the bare mineral earth Castledare miniature train track to the east</p>  <p>Photo location 25: non-vegetated sealed carpark area to the south of the site</p>  <p>Photo location 26: Canning River watercourse to the east of the site</p>	6	<p>The existing maintenance regimes for all existing non-vegetated areas surrounding the site are assumed to continue in the long-term based on current land uses and management arrangements and/or will remain low threat.</p> <p><b>AS 3959 classification (Figure 4):</b> Non-vegetated (exclusion clause 2.2.3.2(e))</p> <p><b>Effective slope (Figure 5):</b> Not applicable</p>



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	AS 3959 classification and bushfire hazard rating	Site photo/s (location points shown in Figure 2)	Plot no.	AS 3959 classification, effective slope and assumptions
7	<p>Surrounding the site, areas of low threat vegetation are largely associated with either existing managed road verges or managed gardens/grounds within the Castledare Miniature Train site.</p> <p>In addition to this, portions of the Canning River Foreshore to the south of the site have been managed to a low threat standard for public recreational uses.</p> <p><b>AS 3959 classification (Figure 2):</b> Low threat vegetation (exclusion clause 2.2.3.2(f))</p> <p><b>Bushfire hazard rating (Figure 3):</b> Low, however as required under the Guidelines, any areas within 100 m of moderate or extreme hazards would be considered moderate hazard, to reflect the potential increased risk.</p>	 <p>Photo location 27: low threat vegetation within the Castledare Miniature Rail grounds to the east</p>  <p>Photo location 29: managed Fern road reserve to the west of the site.</p>	 <p>Photo location 28: areas of managed vegetation along the Canning River within the Castledare grounds</p>  <p>Photo location 30: managed parkland areas along to the Canning River to the south of the site</p>	<p>7</p> <p>The maintenance regimes for all existing low-threat vegetation surrounding the site is assumed to continue in the long-term based on current land uses and management arrangements, in accordance with the requirements of the City of Canning and community expectations.</p> <p><b>AS 3959 classification (Figure 4):</b> Low threat vegetation (exclusion clause 2.2.3.2(f))</p> <p><b>Effective slope (Figure 5):</b> Not applicable</p>

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



### 3.1.3 Assessment outputs

The BAL assessment completed for the site indicates that a BAL rating of BAL-29 or less can be achieved at new future residential buildings based on the indicated spatial layout for the structure plan (**Appendix A**) and the proposed subdivision layout (**Appendix B**). The majority of lots will be subject to BAL-12.5 or BAL-LOW, as shown in **Figure 6**.

**Table 3** provides a summary of the setback distances necessary from classified vegetation to achieve the indicated BAL ratings, with the BAL Contour Plan (**Figure 6**) being a visual representation of these distances. The setback distances are based on the post-development classified vegetation (**Figure 4**), effective slope (**Figure 5**) and are taken from Table 2.5 of AS 3959.

*Table 3: Setback distances based on vegetation classification and effective slope and Table 2.5 of AS 3959, as determined by the method 1 BAL assessment*

Post development plot number (see Figure 4)	Vegetation classification (see Figure 4)	Effective slope (see Figure 5)	Distance to vegetation (from Table 2.5 of AS 3959)	BAL rating (see Figure 6)
Plot 1	Forest (Class A)	Flat/upslope	< 16 m	BAL-FZ
			16 - < 21 m	BAL-40
			21 - < 31 m	BAL-29
			31 - < 42 m	BAL-19
			42 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 2	Woodland (Class B)	Flat/upslope	< 10 m	BAL-FZ
			10 - <14 m	BAL-40
			14 - <20 m	BAL-29
			20 - <29 m	BAL-19
			29 - <100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 3	Shrubland (Class C)	Flat/upslope	< 7 m	BAL-FZ
			7 - < 9 m	BAL-40
			9 - < 13 m	BAL-29
			13 - < 19 m	BAL-19
			19 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 3: Setback distances based on vegetation classification and effective slope and Table 2.5 of AS 3959, as determined by the method 1 BAL assessment (continued)

Post development plot number (see Figure 4)	Vegetation classification (see Figure 4)	Effective slope (see Figure 5)	Distance to vegetation (from Table 2.5 of AS 3959)	BAL rating (see Figure 6)
Plot 3	Shrubland (Class C)	Downslope 0 - 5°	< 7 m	BAL-FZ
			7 - < 10 m	BAL-40
			10 - < 15 m	BAL-29
			15 - < 22 m	BAL-19
			22 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 4	Scrub (Class D)	Flat/upslope	< 10 m	BAL-FZ
			10 - < 13 m	BAL-40
			13 - < 19 m	BAL-29
			19 - < 27 m	BAL-19
			27 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
	Scrub (Class D)	Downslope 5 - 10°	< 12 m	BAL-FZ
			12 - < 17 m	BAL-40
			17 - < 24 m	BAL-29
			24 - < 35 m	BAL-19
			35 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
	Scrub (Class D)	Downslope 10 - 15°	< 14 m	BAL-FZ
			14 - < 19 m	BAL-40
			19 - < 28 m	BAL-29
			28 - < 39 m	BAL-19
			39 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 5	Grassland (Class G)	Flat/upslope	< 6 m	BAL-FZ
			6 - < 8 m	BAL-40
			8 - < 12 m	BAL-29
			12 - < 17 m	BAL-19
			17 - < 50 m	BAL-12.5
			> 50 m	BAL-LOW

## 4 Identification of Bushfire Hazard Issues

From a bushfire hazard management perspective, based on the requirements of SPP 3.7 and the Guidelines, the key issues that are likely to require management and/or consideration as part of ongoing operation and any future development within the site include:

- Provision of appropriate separation distance from permanent bushfire hazards surrounding the site (i.e. classified vegetation within the Canning River foreshore area and the Water Corporation Wilson Main Drain) to ensure a BAL rating of BAL-29 or less can be achieved at new buildings.
- Ensuring that future public open space is appropriately designed and managed to achieve low threat standard in accordance with AS 3959 and the requirements of the City of Canning.
- Ongoing implementation of the existing management regimes within miniature railway (in accordance with the existing foreshore management plan) to maintain a low threat standard as part of ongoing operations, which will minimise the hazard to the residential development.
- Provision of appropriate vehicular access to ensure that when development within the site is fully constructed, egress to at least two different destinations will be available to future residents and emergency personnel. The site is located in an area with an existing public road network, namely Fern Road to the north and Bywater Way to the south, which connect to the broader public road network, including Leach Highway which is less than 250 m north of the site.
- Provision of appropriate water supply dedicated to firefighting purposes (i.e. reticulated water supply and associated hydrant network).

These issues are considered further in **Section 5**.

### 4.1 Permanent hazards

The majority of areas to the west of the site within 150 m and also to the immediate east comprises existing residential areas or well managed parkland within the Canning River foreshore (maintained as part of the Castledare Miniature Railway and also recreation areas by the City of Canning), that have been identified as low threat in accordance with AS 3959 and are not considered a bushfire hazard.

While some portions of the Canning River foreshore to the east of the site are considered to be low threat, large portions of the foreshore have been identified as bushfire hazards and are associated with remnant native vegetation or revegetation areas which are not actively managed from a fuel load perspective. No management has been assumed in these areas, and they will remain a permanent bushfire hazard.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 4.2 Temporary/manageable hazards

As discussed in **Section 2.2**, the classified vegetation identified within the site as part of the pre-development assessment (grassland and forest, shown in **Figure 2**) will be removed and instead will be excluded as low threat. If staging of development does not result in the development of the site in a single stage, existing grassland and forest vegetation is able to be managed to achieve low threat to reduce the risk of temporary hazards. The vegetation within the site is therefore considered a temporary/manageable hazard. **Section 4** of this report provides guidance on mitigating these hazards to reduce the risk to future development within the site.

## 4.3 Vulnerable and high-risk land uses

The definition of a vulnerable land use and high-risk land use in accordance with SPP 3.7 and the Guidelines includes:

- A vulnerable land use is where occupants are less able to respond in an emergency. The types of land use considered vulnerable includes “facilities that, due to building design or use, or the number of people accommodated, are likely to present evacuation challenges.”
- A high-risk land use is a land use that may lead to the potential ignition, prolonged duration and/or increased intensity of a bushfire. Such uses may also expose the community, fire fighters and the surrounding environment to dangerous, uncontrolled substances during a bushfire event.

The identification of a land use as a vulnerable or high-risk use is at the discretion of the decision maker in the event of a proposed development being lodged for planning approval.

The proposed development within the site does not contain any vulnerable or high-risk land uses.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 5 Assessment Against the Bushfire Protection Criteria

This BMP provides an outline of the mitigation strategies that will ensure that as development progresses within the site, an acceptable solution and/or performance-based system of control can be adopted for each of the bushfire protection criteria detailed within Appendix Four of the Guidelines. The bushfire protection criteria identified in the Guidelines and addressed as part of this BMP are:

- Element 1: Location of the development
- Element 2: Siting and design of the development
- Element 3: Vehicular access
- Element 4: Water supply.

This section has been updated to address Version 1.4 of the Guidelines but is in accordance with the approaches previously considered and assessed by approval authorities. As part of future development, it is likely that an ‘acceptable solution’ will be able to address the intent of all four bushfire protection criteria. A summary of how this can be achieved and an associated compliance statement for each has been provided in **Table 4**.

*Table 4: Summary of the bushfire protection criteria and compliance statement*

Bushfire protection criteria	Proposed bushfire management strategies
<b>Element 1: Location</b>	
A1.1 Development location	<p>It is possible for all future proposed habitable buildings to be located in an area subject to a low or moderate bushfire hazard, given buildings will be located within areas identified as non-vegetated in accordance with Clause 2.2.3.2(e) of AS 3959. Appendix Two of the Guidelines states that non-vegetated or low threat areas will be considered a ‘low’ hazard, except where within 100 m of a moderate or extreme hazard (associated with areas of classified vegetation), and in that case would be subject to a ‘moderate’ hazard. The proposed development is therefore able to satisfy the acceptable solution.</p> <p>The BAL contour plan (<b>Figure 6</b>) indicates that all new proposed habitable buildings can be located in areas subject to a BAL rating of BAL-29 or less. Part of the site will be subject to a BAL rating of BAL-19 or BAL-12.5, whilst the remainder will be subject to BAL-LOW. The acceptable solution can therefore be satisfied and future development would be able to comply with and meet the intent of Element 1: Location.</p>



# Bushfire Management Plan

## Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 4: Summary of the bushfire protection criteria and compliance statement continued

Bushfire protection criteria	Proposed bushfire management strategies
<b>Element 2: Siting and Design</b>	
A2.1 Asset Protection Zone	<p>All lots are required to be managed to a low threat condition with a minimum Asset Protection Zone (APZ) equivalent to enable BAL-29 or less to be achieved. APZs are typically contained within a lot, but can also include areas of low threat vegetation managed in accordance with Section 2.2.3.2 of AS 3959 where the APZ cannot be contained within the boundaries of the lot, particularly within urban areas. For the site, the APZ includes managed road reserves, managed POS areas within the site and the principal shared path.</p> <p>Separation from permanent bushfire hazards within the Canning River foreshore area to achieve BAL-29 or less is accommodated by these features. As outlined above, the outcomes of the BAL assessment (see <b>Figure 6</b>) indicates that all new proposed habitable buildings can be located in areas subject to a BAL rating of BAL-29 or less, with portions of the site subject to BAL-19 and the majority of the site subject to BAL-12.5 or BAL-LOW.</p> <p>Maintenance of POS areas will be routine and ongoing, initially by the proponent and then by the City of Canning following the handover. This is discussed in <b>Section 5.1.2</b>.</p> <p>Overall, the acceptable solution can be satisfied for all new proposed habitable buildings. Class 1, 2, 3 and 10a buildings, where located within a designated bushfire prone area and an area subject to a BAL rating of BAL-12.5 or higher will need to satisfy higher construction standards in accordance with AS 3959.</p> <p>Based on the outlined measures, future development would be able to comply with and meet the intent of Element 2: Siting and design.</p>
<b>Element 3: Vehicular access</b>	
A3.1 Public roads	<p>Existing roads surrounding the site, in addition to the proposed new public roads within the site, can and will comply with the minimum standards outlined by the Institute of Public Works Engineering Australasia (IPWEA) Subdivisional Guidelines Edition No.2.3 (2016) (see <b>Plate 4</b>). Bywater Way and Castledare Place are constructed to a two-lane undivided road standard. The road reserve widths for the new internal road network are proposed to be 15 m All proposed road reserves will be able to meet the minimum technical requirements of the Guidelines. The proposed development complies with A3.1.</p>
A3.2a Multiple access routes.	<p>The proposed development layout (<b>Appendix A</b> and <b>Appendix B</b>) provides for a public road network within the site that connects to the existing public road network, including Castledare Place to the west of the site and Bywater Way to the south-west of the site. Castledare Place connects onto Fern Road which further connects to Leach Highway, allowing further egress in multiple directions, similar to Bywater Way. The speed limit for Fern Road is 50 km/h, enabling safe entry and exit to the road from the future development. Access to two different destinations for all future lots can be facilitated through an emergency access way (EAW) which will connect the two portions of the proposed development, providing for multiple access routes, as further discussed in A3.2b and A3.3 below.</p>

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 4: Summary of the bushfire protection criteria and compliance statement continued

Bushfire protection criteria	Proposed bushfire management strategies
<b>Element 3: Vehicular access (continued)</b>	
A3.2b Emergency Access Way	To address both the multiple access route and no-through road considerations for the site, an emergency access way (EAW) will be provided through the existing carpark, as shown on <b>Figure 7</b> . The emergency access way is 100 m in length and will be implemented to meet the technical requirements of the Guidelines. As the EAW is located on land already reserved for a public purpose and under the management of the City of Canning, a right-of-way or easement may not be required, but can be conditioned as part of subdivision if required.
A3.3 Through-roads	<p>The northern portion of the site would not meet the requirements for multiple access routes (a public road that loops back on itself and is greater than 200 m), while the southern portion of the site contains two no-through roads which are longer than 200 m when measured from the nearest intersection (Bow Street) that provides access in at least two directions.</p> <p>While no-through roads should be avoided where possible in bushfire-prone areas, in this instance the use of no through roads has been proposed due to the location of the site within the existing road network and the resulting design constraints in an enclosed and relatively small development area (particularly with regard to levels). The proposed development is bound by an established residential area, including the Castledare Village (a gated retirement community) to the north and west of the site, and therefore require access via no-through roads due to the inability to create additional road linkages to the existing road network. The no-through road (cul-de-sac) design in the southern cell is an efficient use of urban zoned land and responds to the constraints identified. Accordingly, a no through road is considered a required response due to development constraints.</p> <p>Spatial provision has been provided within the proposed road reserves to accommodate turn-around areas in accordance with Figure 24 of the Guidelines, and as discussed for A3.2b, a compliant EAW has been accommodated between Castledare Place and the new no-through roads in the southern portion of the site, to address these roads being greater than 200 m in length.</p> <p>The acceptable solution for A3.3 can be satisfied.</p>
A3.4a Perimeter Roads	The subdivision design provides for a road interface between proposed lots and classified vegetation. All perimeter roads are public roads that will be constructed to the standards outlined in Table 6, Column 1, in the Guidelines (provided in <b>Plate 4</b> ). Furthermore, a 5 m-wide principal shared path provides separation between the site and land to the east, can be used for emergency access if required. The proposed development is compliant with A3.4a.
A3.4b Fire service access route	The existing and proposed road network and EAW response provides satisfactory fire service access to bushfire prone areas. No additional perimeter roads are necessary. It is noted that the principal shared path (shown in <b>Appendix A</b> and <b>Figure 7</b> ) located along the boundary between the site and the Canning River foreshore will be a 5 m-wide cleared area and could support firebreak/fire access if required (in accordance with the existing foreshore management plan). The development is compliant with A3.4b.
A3.5 Battle-axe access legs	No battle axe legs are proposed as part of the subdivision of the site, therefore this criterion is not applicable.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 4: Summary of the bushfire protection criteria and compliance statement continued

Bushfire protection criteria	Proposed bushfire management strategies
<b>Element 4: Water</b>	
A4.1 Identification of future water supply	The site is located in an area with existing reticulated water supply, which will be extended as part of the proposed development of the site. Fire hydrants will be installed by the developer to meet the specifications of the water authority (in this case the Water Corporation (Design Standard DS 63)) and DFES. Fire hydrants on land zoned for residential purposes are generally required to be sited at or within 200 m of dwellings (Class 1a). The acceptable solution can be satisfied.
A4.2 Provision of water for firefighting purposes	As per above, A4.2 is able to be satisfied by an acceptable solution.

Table 6: Vehicular access technical requirements

TECHNICAL REQUIREMENTS	1 Public roads	2 Emergency access way <sup>1</sup>	3 Fire service access route <sup>1</sup>	4 Battle-axe and private driveways <sup>2</sup>
Minimum trafficable surface (metres)	In accordance with A3.1	6	6	4
Minimum horizontal clearance (metres)	N/A	6	6	6
Minimum vertical clearance (metres)	4.5			
Minimum weight capacity (tonnes)	15			
Maximum grade unsealed road <sup>3</sup>	As outlined in the IPWEA Subdivision Guidelines	1:10 (10%)		
Maximum grade sealed road <sup>3</sup>		1:7 (14.3%)		
Maximum average grade sealed road		1:10 (10%)		
Minimum inner radius of road curves (metres)		8.5		

**Notes:**

<sup>1</sup> To have crossfalls between 3 and 6%.

<sup>2</sup> Where driveways and battle-axe legs are not required to comply with the widths in A3.5 or A3.6, they are to comply with the Residential Design Codes and Development Control Policy 2.2 Residential Subdivision.

<sup>3</sup> Dips must have no more than a 1 in 8 (12.5% -7.1 degree) entry and exit angle.

Plate 4: Excerpt of Table 6 from The Guidelines

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 5.1 Additional management strategies

### 5.1.1 Future approval considerations

The BAL assessment within this document is a conservative assessment of potential bushfire risk posed to future habitable buildings within the site based on the proposed management of vegetation and assumptions outlined in **Section 3**.

The measures to be implemented through the subdivision process have been outlined as part of this BMP and can be used to support future planning and development approval processes. This includes the predicted BAL ratings (see **Figure 6**), which may be used to inform construction requirements for future dwellings following certification.

As no future habitable buildings are likely to exceed BAL-29, additional planning or development approval will not be required to address bushfire considerations.

### 5.1.2 Landscape management

#### 5.1.2.1 Within the site

##### **Public open space**

As part of the proposed works within the site, formal landscaping will be undertaken within the two areas of public open space within the site and both will be designed and maintained to achieve low threat vegetation in accordance with Section 2.2.3.2 of AS 3959. The management of the landscaped areas will be the responsibility of the proponent/landowner initially and following handover, long-term the City of Canning. Ongoing management will be aligned with typical urban requirements (and already occurring with existing road reserves and public open space in the area) and will likely include:

- Irrigation of grass and garden beds (where required).
- Regular removal of weeds and built up dead material (such as fallen branches, leaf litter etc.)
- Low pruning of trees (branches below 2 m in height removed where appropriate).
- Application of ground/surface covers such as mulch or non-flammable materials as required.
- Regular mowing/slashing of grass to less than 10 cm in height.

##### **Future lots**

All lots within the site will be managed to a low threat standard by the applicable landowners in accordance with the City of Canning's Fire Hazard Reduction Notice (as published).

#### 5.1.2.2 Surrounding the site

##### **Within existing private landholdings**

Where indicated as a low threat in **Figure 3**, it is assumed that the private landholdings surrounding the site will be managed by the applicable landowners in accordance with the City of Canning Fire Hazard Reduction Notice (as published) and/or in accordance with existing maintenance regimes.



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## Canning River Foreshore Area

Overall, the Canning River foreshore area is assumed to remain in the same condition as the predevelopment scenario, including existing managed areas that achieve low threat, and areas identified as classified vegetation and a bushfire hazard. No change to existing arrangements has been assumed as part of this BMP. Particular considerations have been noted below.

### Castledare Miniature Railway

It is understood that portions of the Canning River foreshore area east of the site (reserved 'Parks and Recreation') will continue to be utilised by the Castledare Miniature Railway, with the land to continue to be managed and in accordance with the Castledare Miniature Railway (Inc) Foreshore Management Plan. This includes maintaining some areas to a low threat standard in accordance with Clause 2.2.3.2(f) of AS 3959 (e.g. areas identified as mown grass, railway facilities, carparking, parkland within the management plan), while others will have limited to no fuel load management and will be considered a bushfire hazard (e.g. areas identified a revegetation, bush, wetland, river bank etc. within the management plan). This is reflected in the post-development vegetation classifications provided in **Figure 4**.

Ongoing management of this area will be the responsibility of Castledare Miniature Railway (Inc), the operators of the railway, who have been managing this area since the mid-1960's when the railway was first built. Where low threat, management will continue to involve irrigation of grass and garden areas (where required), regular mowing of grass to less than 10 cm in height and removal of built-up dead material such as leaf litter and fallen branches.

### All other areas

The areas of low threat vegetation surrounding the site are mainly associated with managed public open space located within the Canning River foreshore (located within Bush Forever Site 224) to the south of the site, which include pedestrian footpaths, irrigated/regularly mown turf and passive recreation facilities, as well as highly maintained road verges to the south-west and north-east of the site. These areas are currently maintained by the City of Canning and it is expected that this maintenance will continue in the long-term, based on existing practices.

Areas of remnant native vegetation or revegetation have been identified as a bushfire hazard and no ongoing management of fuel loads has been assumed.

### 5.1.3 City of Canning Fire Hazard Reduction Notice

The City of Canning releases a Fire Hazard Reduction Notice annually (or as required) to provide a framework for bushfire management within the City. The City of Canning is able to enforce this order in accordance with Section 33 of the *Bush Fires Act 1954* and landowners will need to ensure compliance with the Fire Hazard Reduction Notice, as published, or any directions provided by the City of Canning.

All landowners of future lots will be required to comply with the Fire Hazard Reduction Notice as published, which for residential lots is likely to include ensuring that property is cleared of all flammable material, except for living standing trees, and ensuring grass height is no longer than 10 cm.

## Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



### 5.1.4 Vulnerable or high-risk land uses

There are no vulnerable or high-risk land uses, as defined under SPP 3.7, currently proposed within the site. If any high-risk or vulnerable land uses are proposed in the future as part of future subdivision, the requirements of SPP 3.7 will need to be addressed, including the preparation of an emergency evacuation plan and/or risk assessment for flammable materials.

### 5.1.5 Public education and preparedness

Community bushfire safety is a shared responsibility between individuals, the community, government and fire agencies. DFES has an extensive Community Bushfire Education Program including a range of publications, a website and Bushfire Ready Groups. The DFES website (<https://www.dfes.wa.gov.au/bushfire/prepare/>) provides a range of materials to help the community prepare for and survive the bushfire season.

The City of Canning provides bushfire safety advice to residents available from their website <https://www.canning.wa.gov.au/our-community/community-services/rangers-and-community-safety-services/emergency-preparedness/fire-and-fire-prevention>. Professional, qualified consultants also offer bushfire safety advice and relevant services to residents and businesses in high risk areas in addition that provided in this BMP.

In the case of a bushfire in the area, advice would be provided to businesses by DFES, the Department of Biodiversity Conservation and Attractions (DBCA) and/or the City of Canning on any specific recommendations with regard to responding to the bushfire, including evacuation if required. However, it is highly recommended that residents make themselves aware of their responsibilities with regard to preparing for and responding to a potential bushfire that may impact upon them, their property and their visitors at the time, regardless of the BAL rating the building is subject to.

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 6 Responsibilities for Implementation and Management of Bushfire Measures

**Table 5** outlines the outlines the developer responsibilities to be undertaken to support subdivision and prior to clearance of titles. These items will be certified by a bushfire consultant prior to clearance.

**Table 6** outlines the future responsibilities of the proponent (developer), future landowners and the City of Canning associated with implementing this BMP with reference to ongoing bushfire risk mitigation measures for existing land uses (through compliance with the Canning Fire Hazard Reduction Notice) or future mitigation measures to be accommodated as part of the development process but not necessary for title clearances. These responsibilities will need to be considered as part of the subsequent development and implementation process.

*Table 5: Responsibilities for the implementation of this BMP by the developer to support subdivision clearance*

Proponent – Prior to Issue of Certificates of Title for New Lots	
No.	Implementation action
1	Install an emergency accessway (to the standard described in Guidelines V1.4 and Table 6 Technical Specifications Column 2 of the Guidelines V1.4) linking the southern and northern portions of the site, as shown in <b>Figure 7</b> . The alignment can be varied if/as required. As the land is reserved for a public purposes, an easement in gross or right-of way may not be required. This should be confirmed with the City of Canning. Where required, the EAW location should be provided as an easement in gross or right-of way.
2	Install the public roads to the standards outlined in Appendix Four of the Guidelines or as agreed with the City of Canning. This includes no-through roads, which are required to have a suitable turn-around area. Public road reserves should be designed and maintained to achieve low threat in accordance with Section 2.2.3.2 of AS 3959.
3	Within the site, remove classified vegetation within 100 m (or 50 m where only grassland is present) of lots to be titled.
4	Reticulated water supply and hydrants are to be installed as per standard Water Corporation requirements, unless otherwise agreed.
5	Where relevant**, certify BAL ratings for the lots designated bushfire prone within the <i>Map of Bush Fire Prone Areas</i> at the time lot titles are created, based on the BAL Contour Plan (see <b>Figure 6</b> ) and/or in accordance with a revised BAL assessment if the vegetation classifications are different to those identified within this BMP (in particular if vegetation classifications change as a result of the detailed landscape design and assumptions regarding the retained vegetation). The certified BAL ratings can then be submitted to the City to support future building licenses. All future habitable buildings must be able to achieve a BAL rating of BAL-29 or less. <i>**The developer may choose to certify BAL ratings, or may leave this for future lot owners to complete at the time of building licence**</i>
6	Where development is staged: <ul style="list-style-type: none"> <li>• Temporary no-through must meet the minimum requirements of the Guidelines, in particular provision of a temporary turn-around area.</li> <li>• Two access routes must be provided at all times, unless no through road requirements can be met (e.g., less than 200 m in length).</li> </ul>

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



Table 6: Responsibilities for the implementation of this BMP during development and ongoing management

Proponent	
No.	Implementation and management actions
1	<p>Establish the areas of proposed public open space to a low threat standard in accordance with Section 2.2.3.2 of AS 3959. The management of the landscaped areas will be the responsibility of the proponent/landowner initially and following handover, long-term the City of Canning. Ongoing management will be aligned with typical urban requirements (and already occurring with existing road reserves and public open space in the area) and will likely include:</p> <ul style="list-style-type: none"> <li>• Irrigation of grass and garden beds (where required).</li> <li>• Regular removal of weeds and built up dead material (such as fallen branches, leaf litter etc.)</li> <li>• Low pruning of trees (branches below 2 m in height removed where appropriate).</li> <li>• Application of ground/surface covers such as mulch or non-flammable materials as required.</li> <li>• Regular mowing/slashing of grass to less than 10 cm in height</li> </ul>
2	Comply with the City of Canning Fire Hazard Reduction Notice for all lots within the site until sold. The fire hazard reduction notice should be referred to annually for details.
3	Make a copy of the BMP and BAL certification/assessment available to each lot owner within designated bushfire prone areas.
City of Canning	
No.	Management action
1	Maintaining fuel loads in existing public road reserves and the City of Canning Foreshore Reserve (under their management) to appropriate standards to minimise fuel loads (as per current maintenance regimes).
2	Monitoring vegetation fuel loads in private landholdings against the requirements of the City's Fire Hazard Reduction Notice (and/or existing maintenance regimes outlined in this BMP) and liaising with relevant stakeholders to maintain fuel loads at minimal/appropriate fuel levels.
Property owner/occupier	
No.	Management action
1	Where mapped as bushfire prone, ensuring the construction of dwelling/s complies with AS 3959, as per the applicable BAL rating, determined as part of this BMP (outlined within <b>Section 3</b> of this BMP) or through a separate BAL assessment. The BAL rating for a dwelling should not exceed BAL-29.
2	Ensuring that their property complies with the City of Canning Fire Hazard Reduction Notice/s as published and/or in accordance with directions given by the City. This includes maintaining the entire lot to a low threat standard until developed.
3	Ensuring fire hydrants are accessible at all times.
Water Corporation	
No.	Management action
1	The Water Corporation is responsible for the ongoing maintenance and repair of water hydrants.



# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 7 Applicant Declaration

### 7.1 Accreditation

This assessment report has been prepared by Emerge Associates who have a number of team members who have undertaken Bushfire Planning and Design (BPAD) Level 1 and Level 2 training and are Fire Protection Association of Australia (FPAA) accredited practitioners. Emerge Associates have been providing bushfire risk management advice for more than 10 years, undertaking detailed bushfire assessments (and associated approvals) to support the land use development industry.

Anthony Rowe is a Fire Protection Association of Australia (FPAA) Level 3 Bushfire Planning and Design (BPAD) accredited practitioner (BPAD no. 36690) with over nine years' experience and is supported by a number of team members who have undertaken BPAD Level 1 and Level 2 training and are in the processing of gaining formal accreditation.

### 7.2 Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Signature:

A handwritten signature in black ink, appearing to read "Anthony Rowe", written over a light grey dotted signature line.

**Name:** Anthony Rowe

**Company:** Envision Bushfire Protection/Emerge Associates

**Date:** 4<sup>th</sup> April 2023

**BPAD Accreditation:** Level 3 BPAD no. 36690

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



## 8 References

### 8.1 General references

Castledare Miniature Railways (WA) Inc 2018, *Foreshore Management Plan*, Revision D.

Department of Planning, Lands and Heritage, and Western Australian Planning Commission, (DPLH & WAPC) 2021, *Guidelines for Planning in Bushfire Prone Areas Version 1.4*, Perth, Western Australia.

Emerge Associates 2019, *Wetland and Waterway Assessment - Lot 4 and 102 Fern Road, Wilson*, EP18-019(02)--004 TAA, B.

Emerge Associates 2021, *Environmental Assessment and Management Strategy - Lot 4 Fern Road and Lot 102 Castledare Place, Wilson*, EP21-006(02)--004 PPS, 1.

Standards Australia 2018, *AS 3959:2018 Construction of buildings in bushfire-prone areas*, Sydney.

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Perth.

#### Online references

Department of Water 2008, *LIDAR derived 1 m elevation contours* dataset, Government of Western Australia

Landgate 2019, *Locate V5*, viewed March 2021, <<https://maps.slip.wa.gov.au/landgate/locate/>>

Office of Bushfire Risk Management (OBRM) 2021, *Map of Bush Fire Prone Areas*, viewed January 2023, <https://maps.slip.wa.gov.au/landgate/bushfireprone/>

# Bushfire Management Plan

Lot 4 Fern Road and Lot 102 Castledare Place, Wilson



This page has been left blank intentionally.

# Figures



*Figure 1: Site Location and Topographic Contours*

*Figure 2: Existing Site Conditions – AS 3959 Vegetation Classifications*

*Figure 3: Existing Site Conditions – Bushfire Hazard Level*

*Figure 4: Post Development Conditions – AS 3959 Vegetation Classifications*

*Figure 5: Effective Slope*

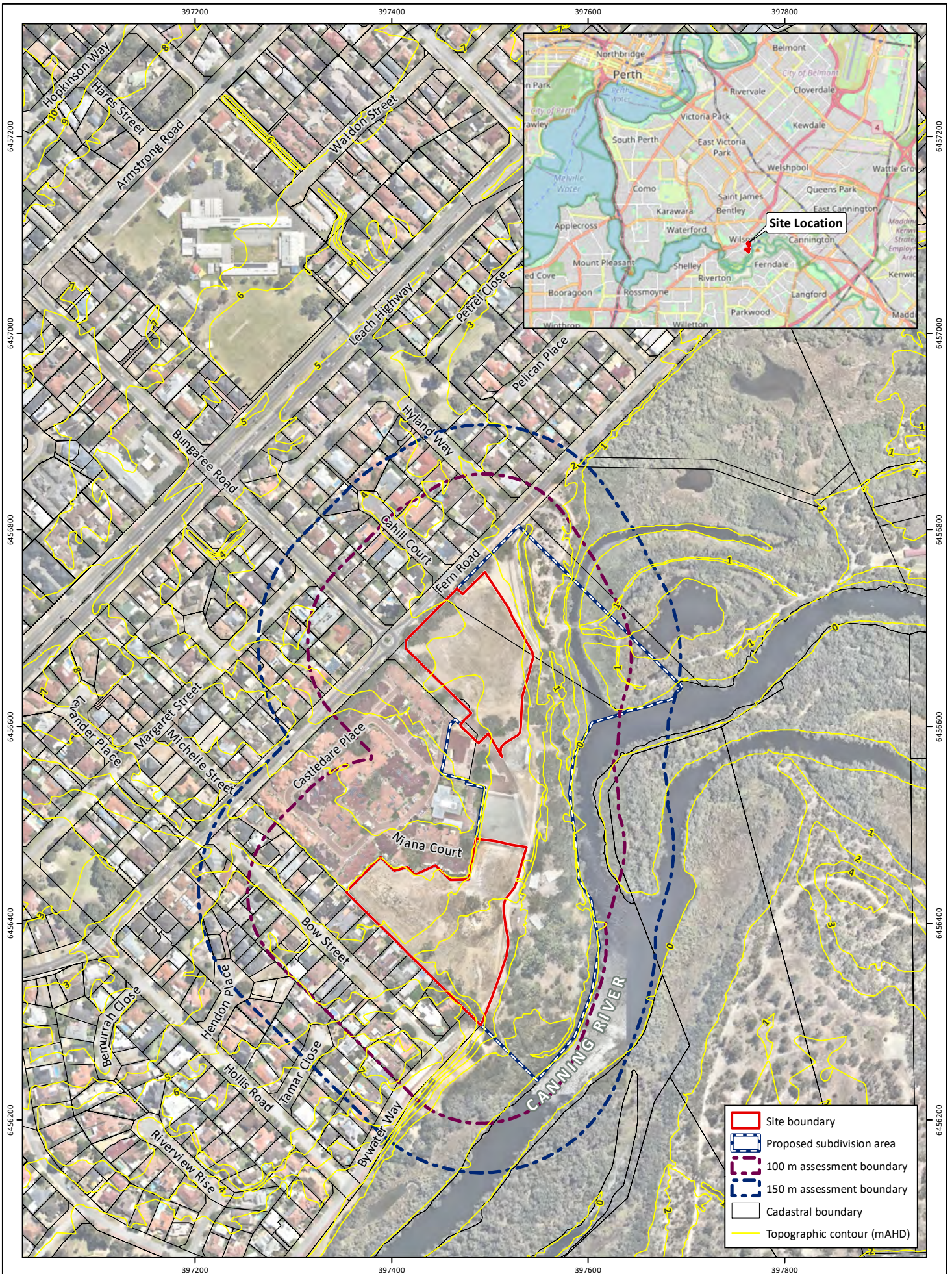
*Figure 6: Bushfire Attack Level Contour Plan*

*Figure 7: Spatial Representation of Bushfire Management Features*









**Figure 1: Site Location and Topographic Contours**

**Project:** Bushfire Management Plan  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(03)-F02b  
**Drawn:** GAR  
**Date:** 27/01/2023  
**Checked:** KK  
**Approved:** LSW  
**Date:** 08/02/2023

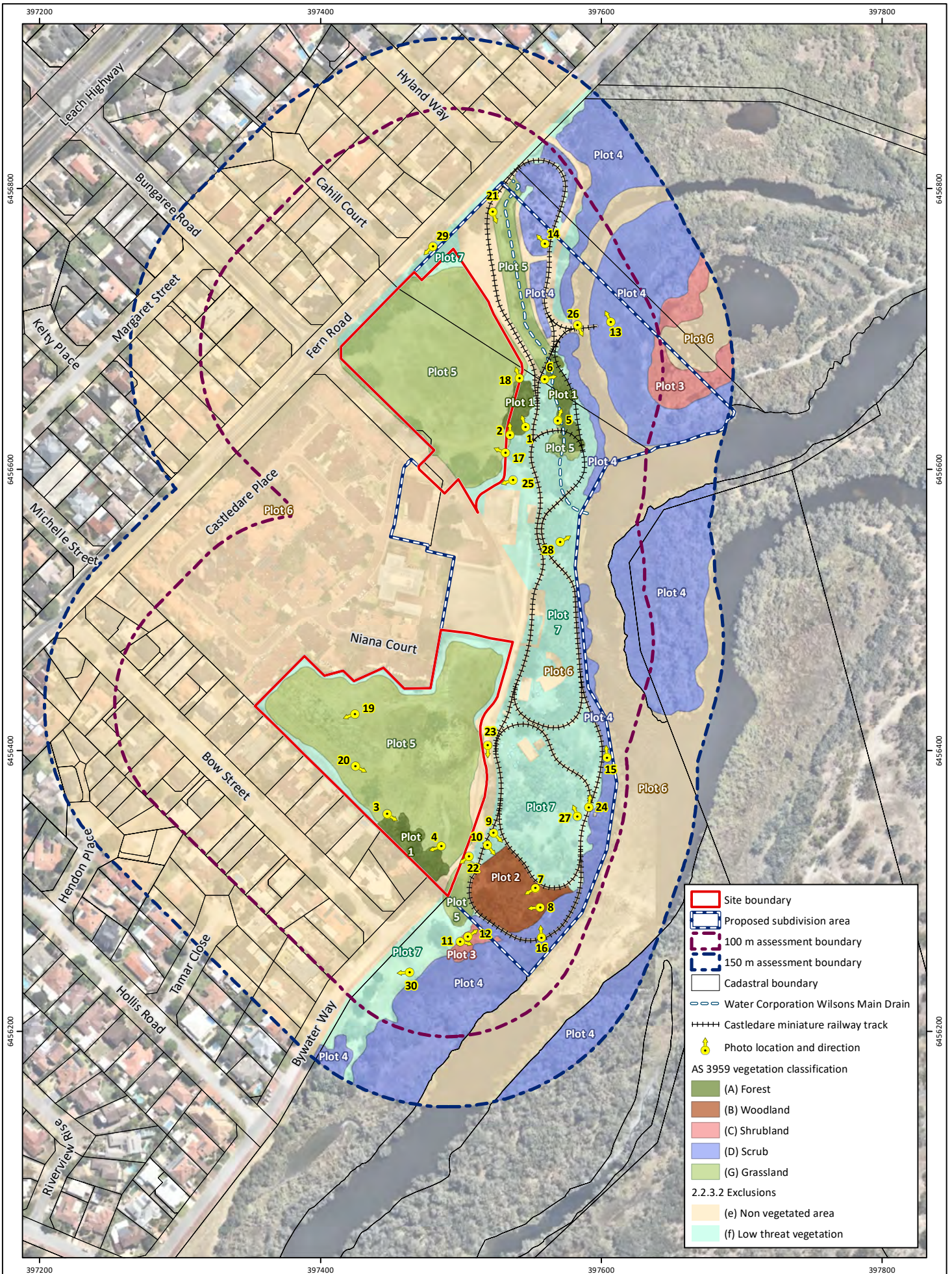


0 50 100 150  
 Metres  
 Scale: 1:5,000@A4  
 GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.  
 ©Landgate (2020). Nearmap Imagery date: 03/01/2021





**Figure 2: Existing Site Conditions - AS 3959 Vegetation Classifications**

**Project:** Bushfire Management Plan  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson

**Client:** Trustees of the Christian Brothers

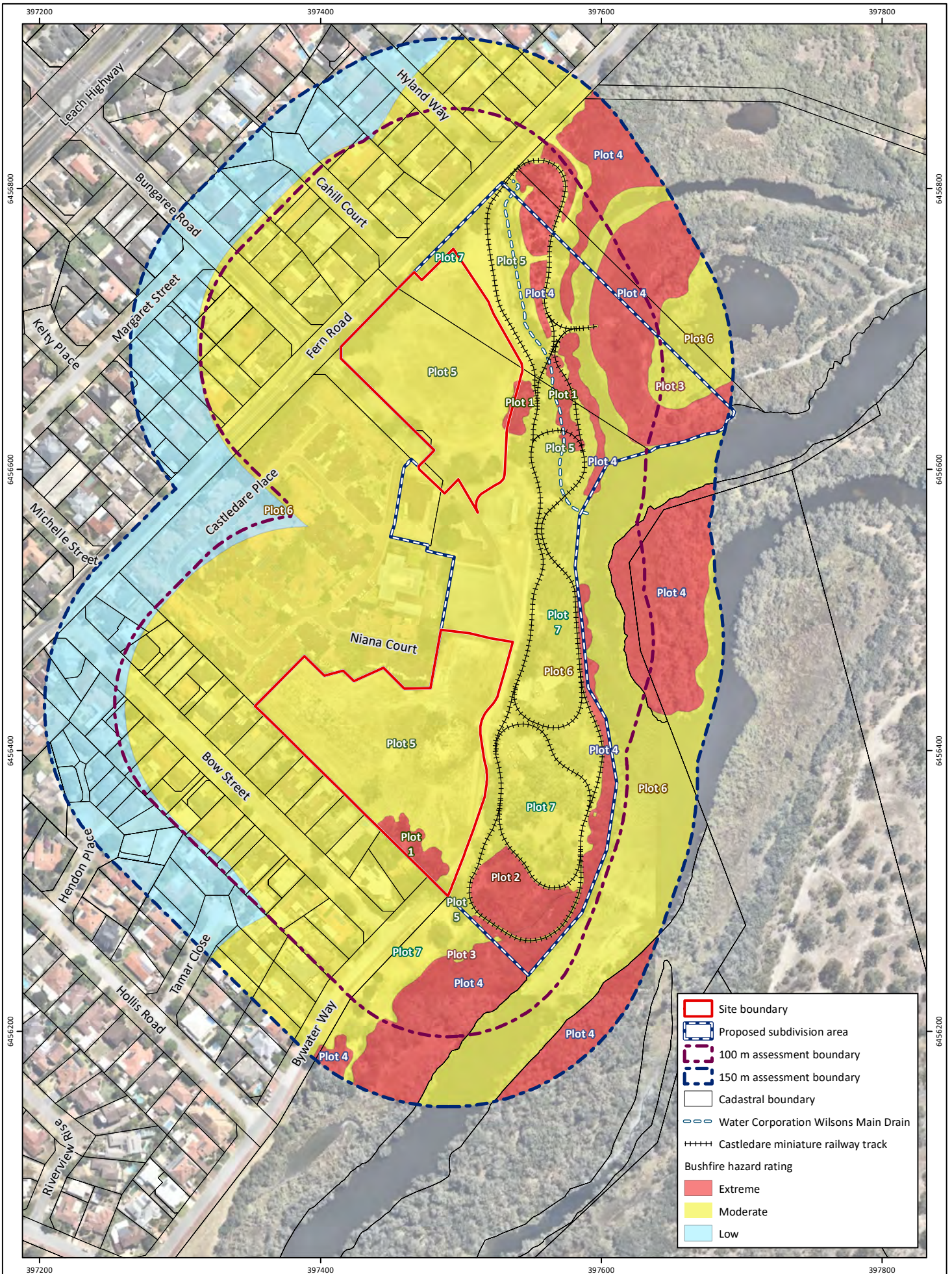
Plan Number: EP21-006(03)-F03b  
 Drawn: GAR  
 Date: 27/01/2023  
 Checked: KK  
 Approved: LSW  
 Date: 08/02/2023

0 50 100  
 Metres  
 Scale: 1:3,500@A4  
 GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.  
 ©Landgate (2020). Nearmap Imagery date: 03/01/2021





**Figure 3: Existing Site Conditions - Bushfire Hazard Level**

**Project:** Bushfire Management Plan  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(03)-F04b  
**Drawn:** GAR  
**Date:** 27/01/2023  
**Checked:** KK  
**Approved:** LSW  
**Date:** 08/02/2023

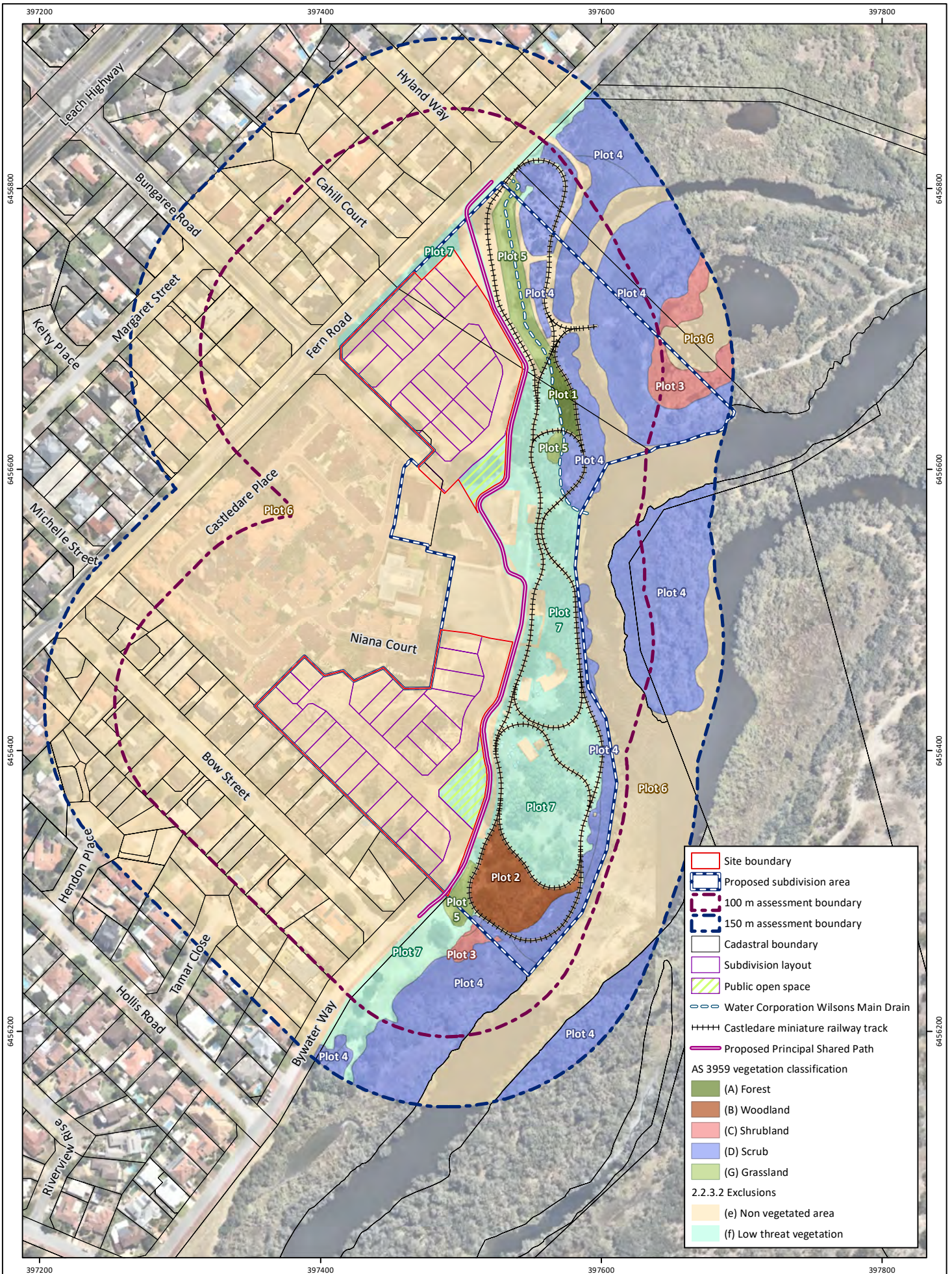


0 50 100  
 Metres  
 Scale: 1:3,500@A4  
 GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.  
 © Landgate (2020). Nearmap Imagery date: 03/01/2021





**Figure 4: Post Development Conditions - AS 3959 Vegetation Classifications**

**Project:** Bushfire Management Plan  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(03)-F05b  
**Drawn:** GAR  
**Date:** 27/01/2023  
**Checked:** LSW  
**Approved:** KK  
**Date:** 30/01/2023

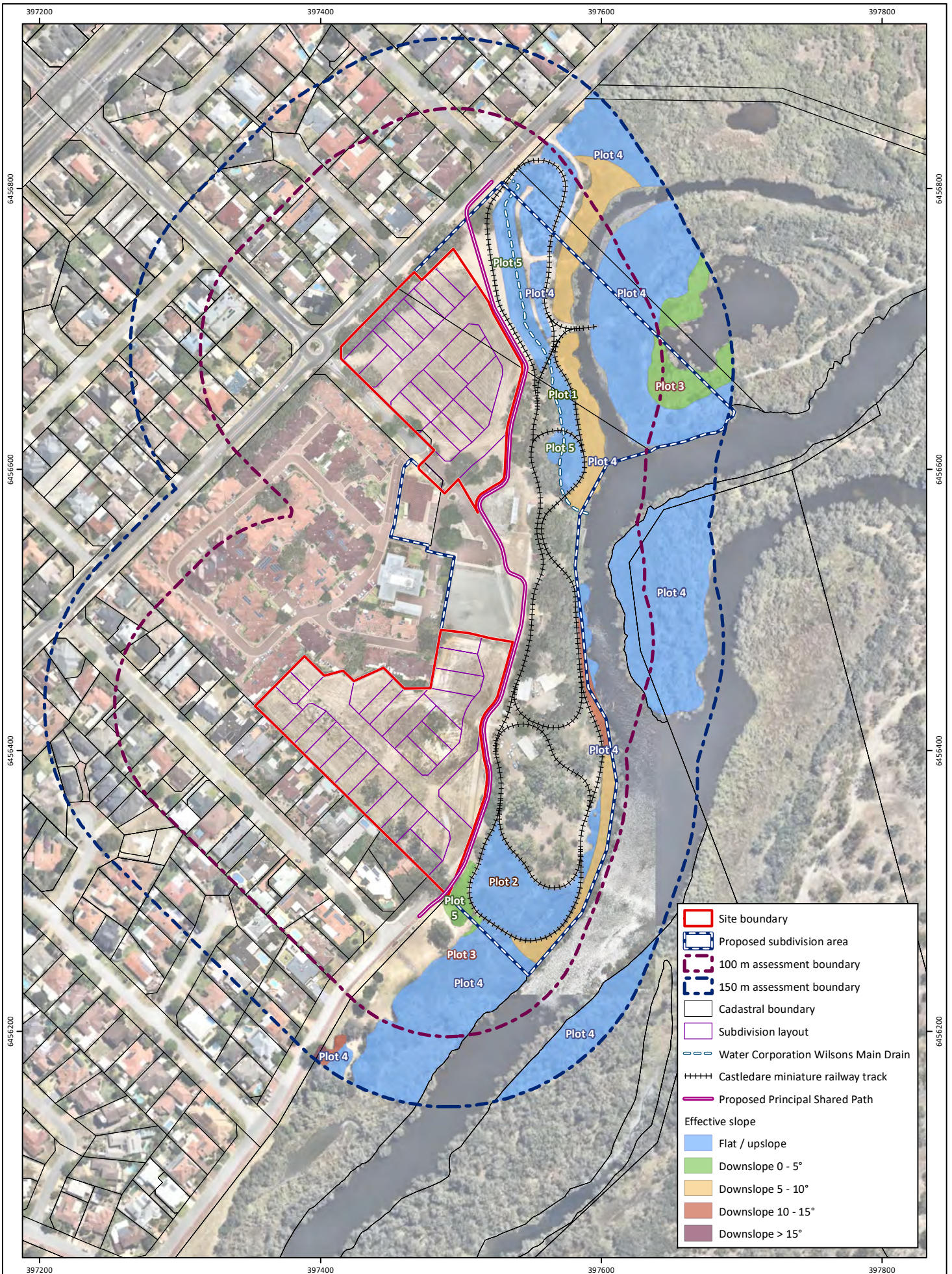


0 50 100  
 Metres  
 Scale: 1:3,500@A4  
 GDA 1994 MGA Zone 50



While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used.  
 ©Landgate (2020). Nearmap Imagery date: 03/01/2021

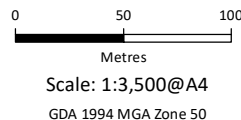




**Figure 5: Effective Slope**

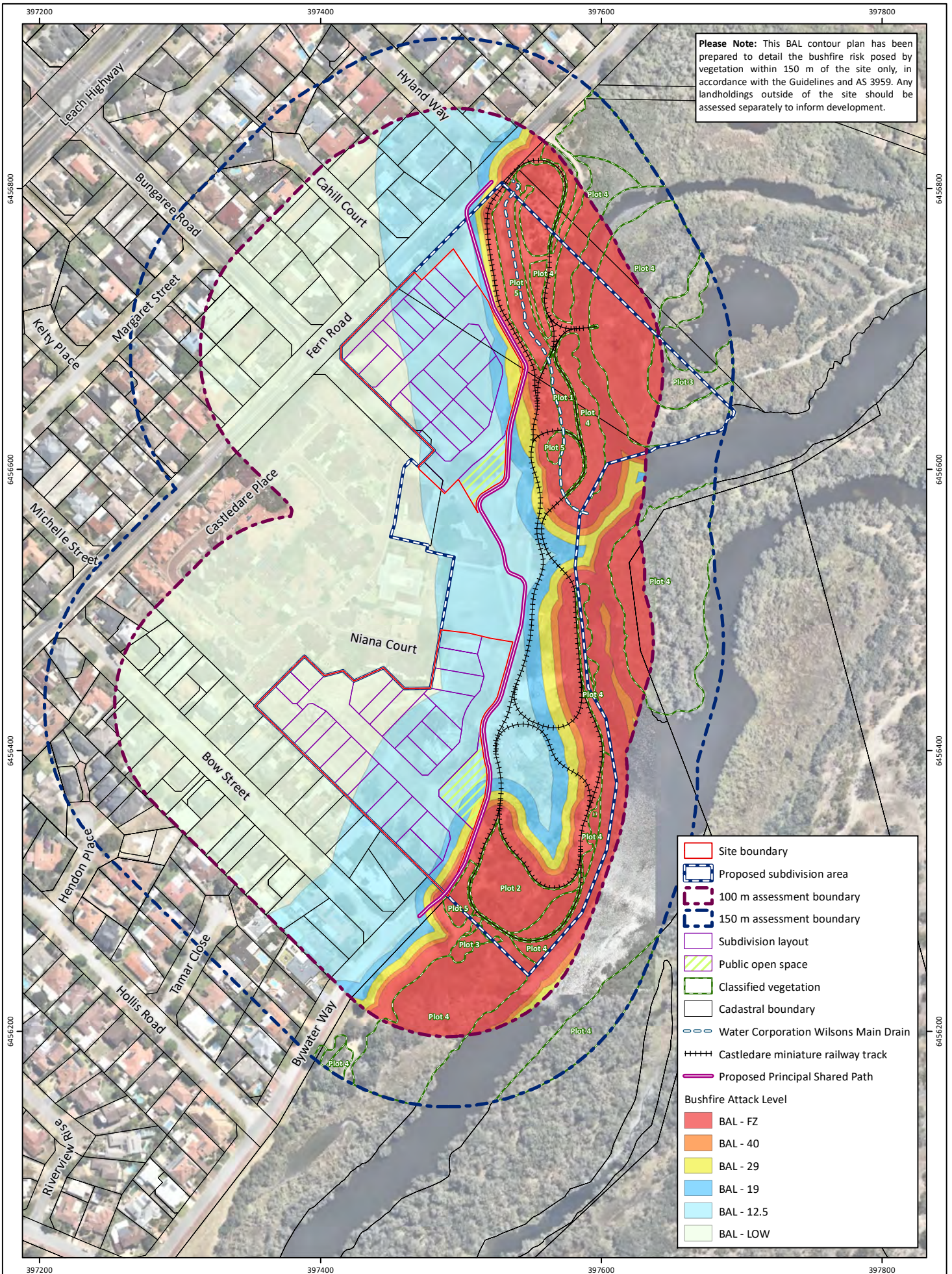
**Project:** Bushfire Management Plan  
 Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers

**Plan Number:** EP21-006(03)-F06b  
**Drawn:** GAR  
**Date:** 27/01/2023  
**Checked:** LSW  
**Approved:** KK  
**Date:** 08/02/2023



While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used.  
 ©Landgate (2020). Nearmap Imagery date: 03/01/2021





**Figure 6: Bushfire Attack Level Contour Plan**

Plan Number:  
EP21-006(03)-F07b  
Drawn: GAR  
Date: 27/01/2023  
Checked: LSW  
Approved: KK  
Date: 30/01/2023

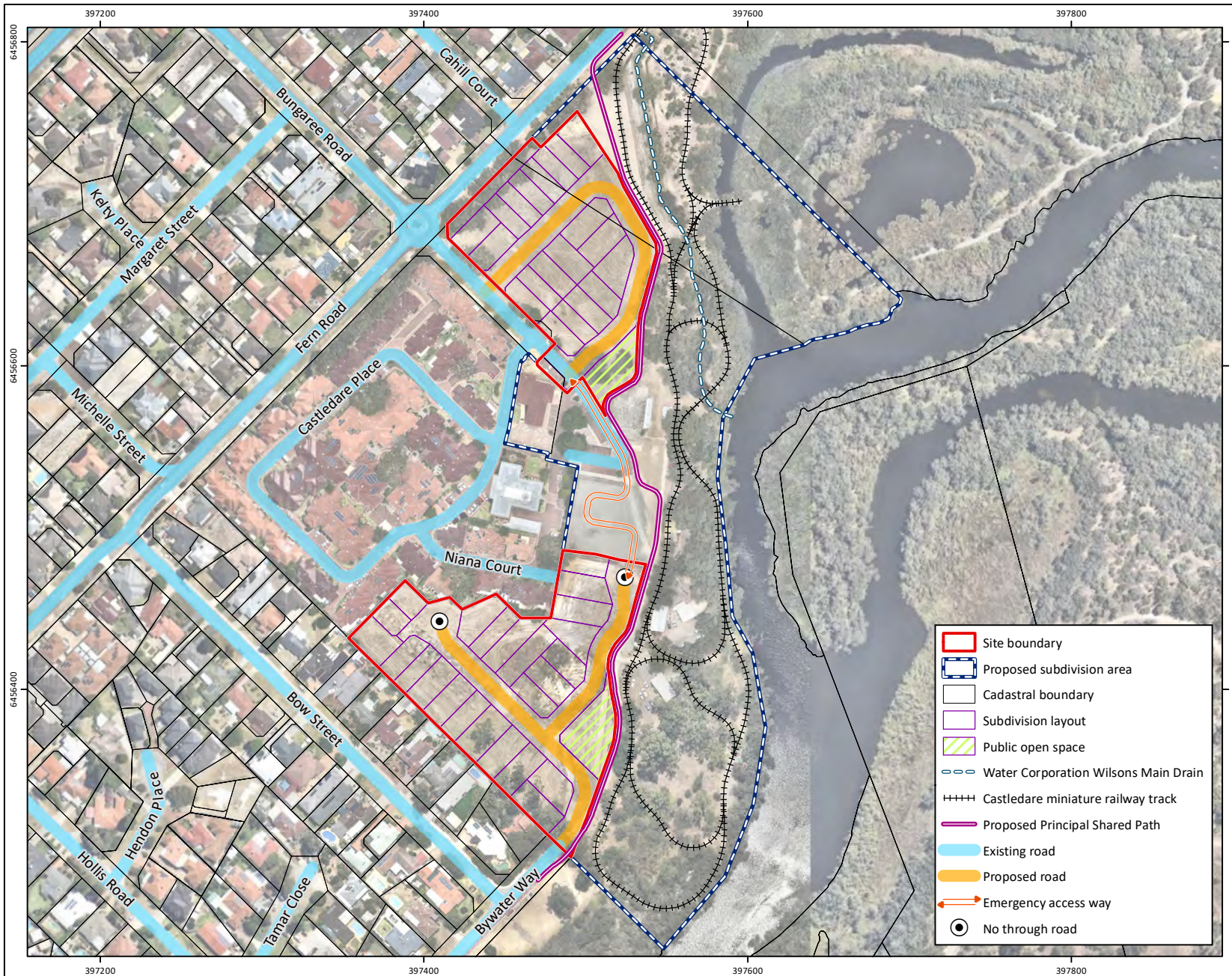


0 50 100  
Metres  
Scale: 1:3,500@A4  
GDA 1994 MGA Zone 50



**Project:** Bushfire Management Plan  
Lot 4 Fern Road and Lot 102 Castledare Place, Wilson  
**Client:** Trustees of the Christian Brothers





	Site boundary
	Proposed subdivision area
	Cadastral boundary
	Subdivision layout
	Public open space
	Water Corporation Wilsons Main Drain
	Castledare miniature railway track
	Proposed Principal Shared Path
	Existing road
	Proposed road
	Emergency access way
	No through road

**Public open space**  
 The public open space areas within the site will be designed, implemented and managed to achieve low threat in accordance with Section 2.2.3.2 of AS 3959. This will be managed by the proponent, and following handover the City of Canning.

**Asset protection zones (APZs)**  
 All habitable buildings should achieve BAL-29 or less. Each lot is required to be managed as an asset protection zone and achieve low threat in accordance with Section 2.2.3.2 of AS 3959. The asset protection zone can include areas of managed public open space and/or road reserve.

**Building construction requirements**  
 Where designated bushfire prone, future class 1, 2, 3 and associated buildings will need to be constructed in accordance with BAL ratings determined in accordance with AS 3959.

**Access**

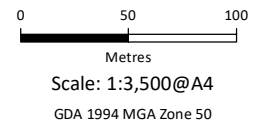
- All future lots will achieve a minimum two different access routes based on the outlined road layout.
- All roads will achieve the public road requirements as per A3.2 of Appendix Four of the Guidelines, unless agreed otherwise with the City of Canning.
- All no-through roads will be provided with a suitable turnaround area, as per Appendix Four of the Guidelines, unless agreed otherwise with the City of Canning.
- An emergency access way will be provided between the northern and southern development cells, as indicated on this figure. It will achieve the requirements of Table 6 in Appendix Four of the Guidelines or as agreed with the City of Canning. The alignment may vary, and the if it is not provided on public land under management by the City of Canning, an easement or right-of-way is to be provided with the emergency access way.

**Water supply**  
 The development will be serviced by a network of reticulated water hydrants.

**Figure 7: Spatial Representation of Bushfire Management Features**

<b>Project:</b>	Bushfire Management Plan Lot 4 Fern Road and Lot 102 Castledare Place, Wilson
<b>Client:</b>	Trustees of the Christian Brothers

<b>Plan Number:</b>	EP21-006(03)-F08b
<b>Drawn:</b>	GAR
<b>Date:</b>	27/01/2023
<b>Checked:</b>	LSW
<b>Approved:</b>	KK
<b>Date:</b>	08/02/2023



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used ©Landgate (2023). Nearmap Imagery date: 03/01/2021







# Appendix A

Local Structure Plan - Lot 4 Fern Rd & Lot 102 Castledare Place,  
Wilson





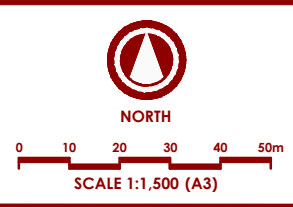




**LEGEND**

	LOCAL STRUCTURE PLAN AREA	(2.9897ha)
	MRS RESERVES (OUTSIDE OF LSP AREA)	
	PARKS & RECREATION	(12.4825ha)
<b>LOCAL SCHEME</b>		
	RESIDENTIAL (R25)	(1.8717ha)
	PUBLIC OPEN SPACE	(0.1921ha)
	PRIVATE COMMUNITY PURPOSES	(0.0004ha)
	ROAD RESERVE	(0.9255ha)
<b>OTHER</b>		
	EXISTING CASTLEDARE MINIATURE RAILWAY (TO BE RETAINED)	
	EXISTING STRUCTURES (TO BE RETAINED)	
	PROPOSED DUAL-USE PATH	
	PROPOSED EMERGENCY ACCESSWAY	

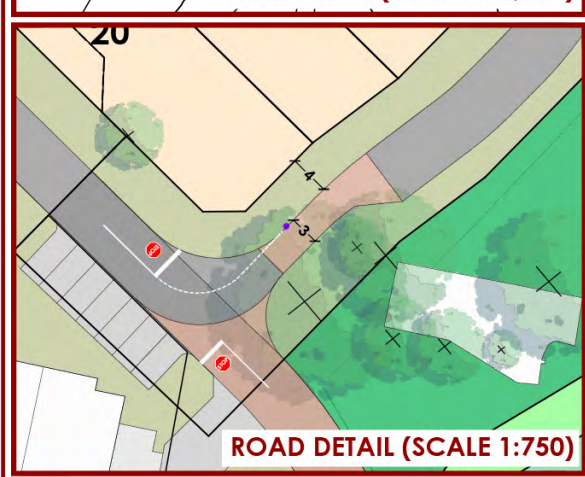
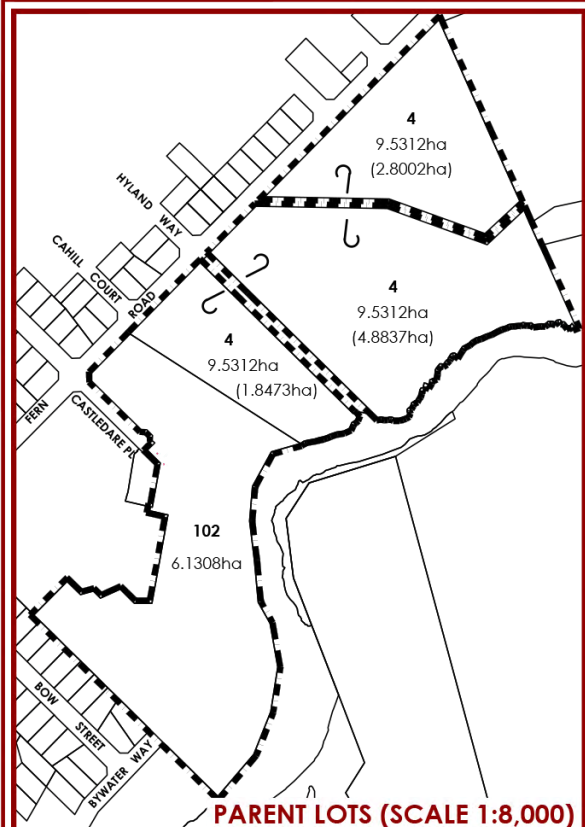
All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.



**PLAN 1: STRUCTURE PLAN MAP**  
**CASTLEDARE LOCAL STRUCTURE PLAN**  
**LOT 4 FERN RD & LOTS 100 & 102**  
**CASTLEDARE PL, WILSON**

**CITY OF CANNING**





SUBJECT SITE  
 TREES TO BE RETAINED  
 SHARED PATH CORRIDOR (BY OTHERS)  
 INDICATIVE WATER CORPORATION DRAIN

All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.



0 10 20 30 40 50m  
SCALE 1:1,500 (A3)

**FIGURE 6: CONCEPT PLAN**  
**LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE**  
**WILSON**  
**CITY OF CANNING**



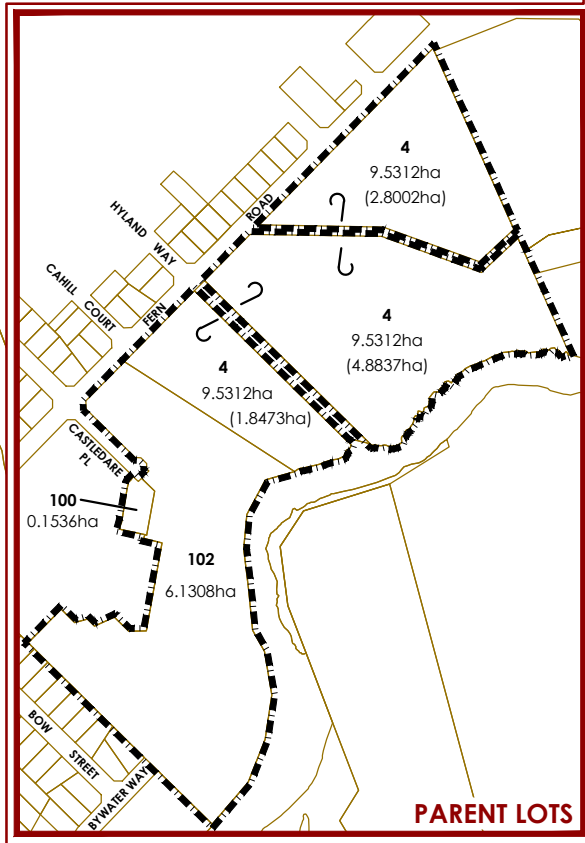
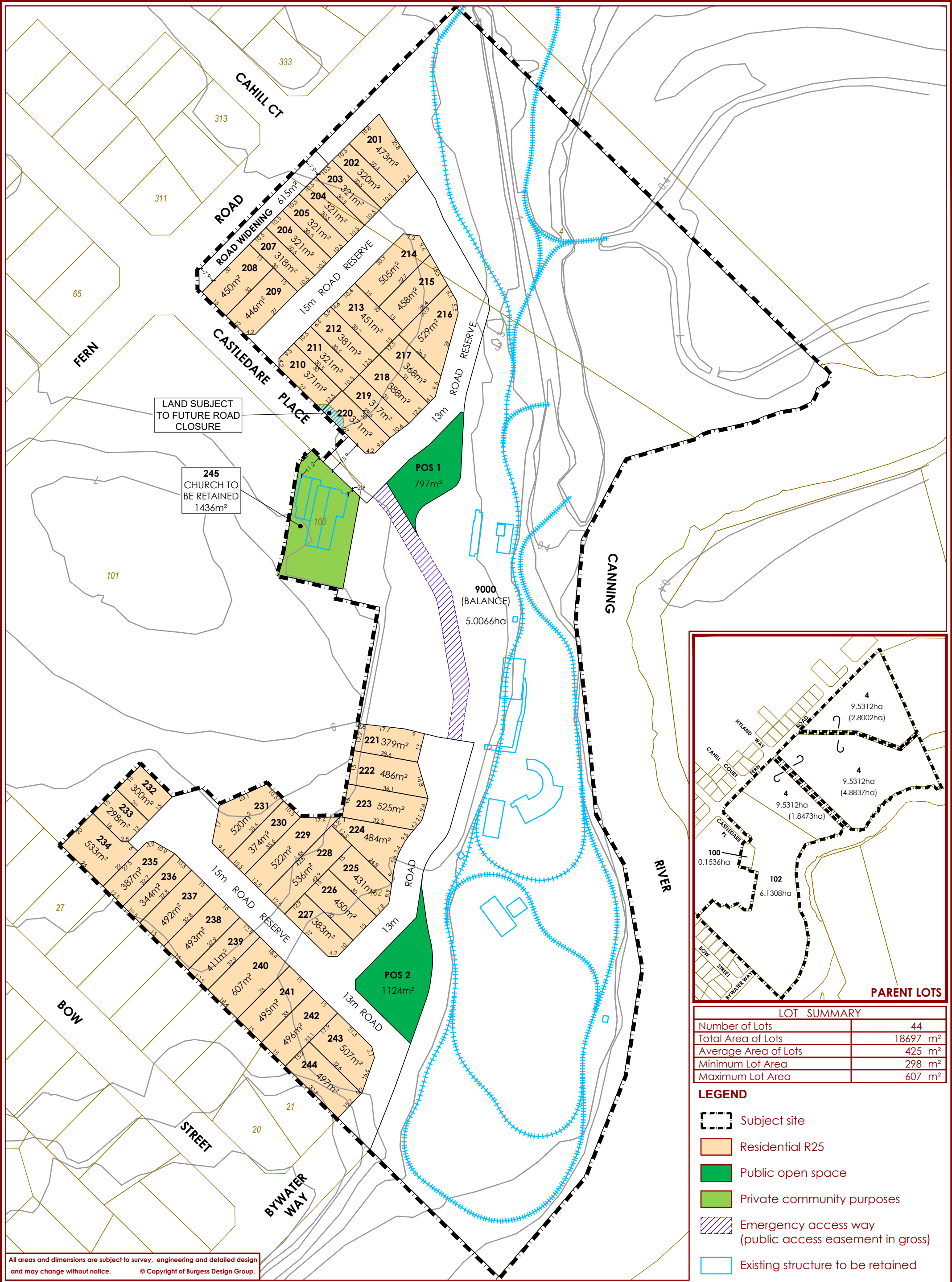
# Appendix B

Proposed Subdivision Layout Lot 102 Castledare Place and Lot  
4 Fern Road, Wilson









LOT SUMMARY	
Number of Lots	44
Total Area of Lots	18697 m <sup>2</sup>
Average Area of Lots	425 m <sup>2</sup>
Minimum Lot Area	298 m <sup>2</sup>
Maximum Lot Area	607 m <sup>2</sup>

- LEGEND**
- Subject site
  - Residential R25
  - Public open space
  - Private community purposes
  - Emergency access way (public access easement in gross)
  - Existing structure to be retained

All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.





Appendix Five

**Long Term Asbestos Management  
Plan**





2 Bulwer Street  
PERTH WA 6000  
T: (+61) 8 9227 2600  
F (+61) 8 9227 2699  
[www.auroraenvironmental.com.au](http://www.auroraenvironmental.com.au)

# Long Term Asbestos Management Plan Lot 4 and Lot 102 Fern Road, Wilson, Western Australia

Prepared For: Trustees of the Christian  
Brothers  
c/o Richard Noble & Co.  
Level 1, 189 Hay Street  
SUBIACO WA 6008

Report Number: AP2016-118

Report Version: V1

Report Date: 6 June 2017

## DISCLAIMER

This document has been produced in accordance with and subject to an agreement between Aurora Environmental (Perth) Pty Ltd (“Aurora Environmental”) and the Trustees of the Christian Brothers (“Client”) for whom it has been prepared. It is restricted to those issues that have been raised by the Client in its engagement of Aurora Environmental and prepared using the standard of skill and care ordinarily exercised by Environmental/Occupational Health and Safety consultants in the preparation of such documents.

Any person or organisation that relies on or uses the document for purposes or reasons other than those agreed by Aurora Environmental and the Client without first obtaining the prior written consent of Aurora Environmental, does so entirely at their own risk and should not alter their position or refrain from doing so in reliance of this document. Aurora Environmental denies all liability in tort, contract or otherwise for any loss, damage or injury of any kind whatsoever (whether in negligence or otherwise) that may be suffered as a consequence of relying on this document for any purpose other than that agreed by Aurora Environmental.

## QUALITY ASSURANCE

Aurora Environmental has implemented a comprehensive range of quality control measures on all aspects of the company’s operation.


An internal quality review process has been applied to each project task undertaken by us. Each document is carefully reviewed and signed off by senior members of the consultancy team prior to issue to the client.

Document No: RNC2015-001\_LTMP\_046\_PL\_V1

Report No: AP2016-118


Version No.: V1

Author: Pamela Lee  
Senior Environmental  
Scientist

  
\_\_\_\_\_  
Signature

6 June 2017  
\_\_\_\_\_  
Date

Approved by: Greg Milner  
Manager - Contaminated Sites

  
\_\_\_\_\_  
Signature

6 June 2017  
\_\_\_\_\_  
Date



## DISTRIBUTION

NO. OF COPIES	REPORT FILE NAME	REPORT STATUS	DATE	PREPARED FOR
1	RNC2015-001_LTMP_046_PL_V0.1	Draft	28 September 2016	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V0.2	Draft	4 November 2016	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V0.3	Draft	27 February 2017	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V0.3	Draft For Preliminary review and comment	26 April 2017	City of Canning
1	RNC2015-001_LTMP_046_PL_V1	Final	6 June 2017	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V1	Final	6 June 2017	Water Corporation
1	RNC2015-001_LTMP_046_PL_V1	Final	6 June 2017	Department of Health
1	RNC2015-001_LTMP_046_PL_V1	Final	6 June 2017	Department of Environment Regulation

## TABLE OF CONTENTS

<b>ATTACHMENTS</b>	<b>5</b>
<b>LIST OF ABBREVIATIONS</b>	<b>6</b>
<b>KEY DEFINITIONS</b>	<b>7</b>
<b>1 INTRODUCTION</b>	<b>8</b>
1.1 SITE IDENTIFICATION	9
1.1.1 Lot 4	9
1.1.2 Lot 102	10
1.2 OBJECTIVES	11
1.3 SCOPE OF THIS PLAN	12
1.4 CONTENT OF PLAN	13
<b>2 ENVIRONMENTAL SETTING</b>	<b>14</b>
2.1 GEOLOGY	14
2.1.1 Published Geological Conditions	14
2.1.2 Generalised Ground Conditions Encountered	14
2.2 HYDROLOGY	14
2.3 GROUNDWATER	14
2.4 ENVIRONMENTAL SENSITIVITY	15
<b>3 MANAGEMENT INFORMATION</b>	<b>16</b>
3.1 STAKEHOLDERS AND RESPONSIBILITIES	17
3.2 REVIEW PROGRAM	19
<b>4 REFERENCES</b>	<b>20</b>

### TABLES IN TEXT

Table A. Current Lot Identification Information

Table B. Site Identification, Ownership and Management

Table C. Stakeholder Titles and Responsibilities

## **ATTACHMENTS**

### **LIST OF FIGURES**

- Figure 1. Regional Location
- Figure 2. Site Identification
- Figure 3. Draft Contamination Classification Status (Pending Interest Only Deposited Plan)
- Figure 4. Key Site Features

### **LIST OF APPENDICES**

- Appendix 1. Current Certificates of Title
- Appendix 2. Asbestos Management Information - Government of Western Australia
- Appendix 3. Asbestos Management Information - Water Corporation



## LIST OF ABBREVIATIONS

ACM	Asbestos Containing Material
AF	Asbestos Fines
DER	Department of Environment Regulation
DoH	Department of Health
DPaW	Department of Parks and Wildlife
FA	Fibrous Asbestos
LTAMP	Long Term Asbestos Management Plan
m bgl	meters below ground level
RVR	Remediation and Validation Report

## KEY DEFINITIONS

<b>ACM</b>	<b>Asbestos Containing Material</b> which is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos fencing or vinyl tiles. This is also restricted to material that cannot pass through a 7mm x 7mm sieve. This sieve size is selected because it approximates the thickness of common asbestos cement sheeting and for fragments to be smaller than this would involve extreme mechanical action probably also associated with asbestos fibre release. The smaller fragments are covered by the third category described below. ACM usually represents a low human health risk. (Department of Health, 2009)
<b>FA</b>	<b>Fibrous asbestos</b> encompassing friable asbestos material, such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Both ACM and FA can often be detected visually. (Department of Health, 2009)
<b>AF</b>	<b>Asbestos fines</b> includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7mm x 7mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibres, which can pose a considerable inhalation risk if made airborne. (Department of Health, 2009)

## 1 INTRODUCTION

Aurora Environmental was engaged by Richard Noble and Company (RNC) ('the Clients Representative') on behalf of the Trustees of the Christian Brothers (the current Site owner and 'Client') to prepare this Long Term Asbestos Management Plan (LTAMP) for Portions of Lot 4 and Lot 102, Fern Road, Wilson, Western Australia (WA) (the 'Site') as identified in Figures 1 and 2.

<b>NOTE</b>	<p>This LTAMP has been prepared in advance of any subdivision being formalised and as a consequence it is expected the LTAMP will be updated upon agreement of the subdivided boundaries and lot ownership to reflect those administrative changes.</p> <p>Until the land is subdivided via an interest only deposit plan (IODP) and is formally transferred with the certificates of title amended, the current Site owner will be responsible for the ongoing management of the Site.</p>
-------------	---



## 1.1 SITE IDENTIFICATION

The Site comprises the eastern portions of Lot 4 and Lot 102 which are expected to be reclassified 'Remediated for Restricted Use' as identified in Figure 3.

<b>NOTE</b>	Figure 3 is draft and subject to the preparation of an Interest Only Deposited Plan (IODP).
-------------	---

Current lot information is summarised in Table A and current certificate of titles (CoTs) are provided in Appendix 1.

**TABLE A: CURRENT LOT IDENTIFICATION INFORMATION**

LOT ID	VOLUME / FOLIO	PARCEL IDENTIFIER (PI)	PARCEL IDENTIFIER NUMBER (PIN)	AREA
4	2140/818	P002461	255510	48,835m <sup>2</sup>
			255548	18,482m <sup>2</sup>
			250552	28,017m <sup>2</sup>
102	2713/531	P0060726	11766513	62,052m <sup>2</sup>

<b>NOTE</b>	This LTAMP has been prepared in advance of any subdivision being formalised and as a consequence it is expected the LTAMP will be updated upon agreement of the subdivided boundaries and lot ownership to reflect those administrative changes.
-------------	--

### 1.1.1 Lot 4

Lot 4, in its entirety as per the current certificate of title (see Table A) occupies an area of 95,334m<sup>2</sup> and is currently zoned 'Parks and Recreation' under the City of Canning's Town Planning Scheme 40.

Lot 4 currently comprises (see Figure 4):

- Conservation Category Wetland (CCW) (ID 13316) which sits within Bush Forever area 224 which includes the Canning River Regional Park;
- vacant land which is currently utilised for recreation (primarily by dog walkers);
- a section of a tributary which discharges to the Canning River;
- railway tracks associated with the Miniature Railway (from the Niana Station at Castledare to the Kent Street Weir Station); and
- a large open stormwater drain (Wilson Main Drain) which collects surface run off from north of Fern Road and discharges to the Canning River via a compensation basin (which is situated in Lot 102). This drain alignment is currently actively managed by the Water Corporation.

### 1.1.2 Lot 102

Lot 102, in its entirety as per the current certificate of title (see Table A), occupies an area of 62,052m<sup>2</sup>. The western portion of Lot 102 Private Clubs and Institutions whilst the eastern portion is zoned 'Parks and Recreation' under the City of Canning's Town Planning Scheme 40. Lot 102 can be accessed from Bywater Way in the South or Castledare Place in the northwest and currently comprises (see Figure 4):

- Conservation Category Wetland (CCW) (ID 13316 / 7151) which sits within Bush Forever area 224 which includes the Canning River Regional Park;
- a section of a tributary which discharges to the Canning River;
- Castledare Miniature Railway which includes the railway tracks and facilities associated with the operation of the railway including the station, workshops, ticket sales booth, toilet facilities and public open space which lies within the areas occupied by these facilities;
- a section of the Wilson Main Drain which discharges to the Canning River via a compensation;
- a car park associated with the Wilson Catholic Church which is situated adjacent to the west of Lot 102 (in Lot 100, see Figure 2).
- internal road way which connects to Fern Road via Castledare Place.
- vacant land which is currently utilised primarily by dog walkers and the Miniature Railway Group.

## 1.2 OBJECTIVES

Previous investigations within Lot 4 and Lot 102 identified areas of fill material which contained asbestos. The presence of asbestos impacted material was attributed to historical fill being sourced from an asbestos manufacturing plant (ATA Environmental, 2001). Extensive remedial works have been undertaken to address asbestos contaminated fill material. A detailed summary of the Site history, previous remediation activities and the most recent extensive remediation exercise completed within Lots 4 and 102 is documented in the 'Remediation and Validation Report' prepared by Aurora Environmental (2017).

The remediation strategy adopted for the eastern portion of Lots 4 and 102 i.e. areas expected to be reclassified 'Remediated for Restricted Use' in accordance with the *Contaminated Sites Act 2003*, was to cap and contain asbestos contaminated fill material. In addition, some asbestos contaminated fill material was excavated and placed in a dedicated containment cell which was subsequently capped (see Figures 2, 3 and 4). The remediation strategies adopted were consistent with Department of Health (DoH) (2009) guidelines.

The reclassification was pending at the time of writing however restrictions are expected to include:

1. Restricted to non-residential land uses, unless further assessment and remediation is undertaken to the satisfaction of the Department of Environment Regulation.
2. Ongoing use of the Site is subject to the preparation and implementation of a management plan.

On this basis, the preparation of this LTAMP is a fundamental part of the reclassification process. The overarching objective of this LTAMP is to document management and maintenance requirements for the Site in order to minimise the risk that buried asbestos impacted fill material at the Site is inadvertently accessed without appropriate planning.

The purpose of the management activities is to detail the measures to be implemented to ensure that the risk from asbestos impacts at the Site remain at an acceptable level during both subsurface disturbance works and in perpetuity for the Site.



### 1.3 SCOPE OF THIS PLAN

This plan has been prepared in consideration of the expected future landowners and management authorities as identified in Table B.

This LTAMP will be required to be updated to reflect the final agreed administrative details including future management authorities and zoning following the formal subdivision.

**TABLE B: SITE IDENTIFICATION, OWNERSHIP AND MANAGEMENT**

AREA	WILSON MAIN DRAIN AND COMPENSATION BASIN	CASTLEDARE MINIATURE RAILWAY	PUBLIC OPEN SPACE / PUBLIC INFRASTRUCTURE
<b>Original Lot ID (including CoT)</b>	Part Lot 4, Part Lot 102 Deposited Plan 60726	Part Lot 4, Part Lot 102 Deposited Plan 60726	Lot 4 Deposited Plan 60726
<b>Current Land Use</b>	Stormwater Drain which collects runoff from north of Fern Road and discharges to the Canning River via the compensation basin	Parks and Recreation	Public Infrastructure, Parks and Recreation
<b>Current Site Owner</b>	Subject land currently sits within Part Lot 4 and Part Lot 102 which is owned by the Trustees of the Christian Brothers.		
<b>Current Management Entity</b>	Water Corporation	Trustees of the Christian Brothers c/o Miniature Railway Group	Trustees of the Christian Brothers
<b>Future Site Owner</b>	Government of Western Australia		
<b>Future Management Authority</b>	Water Corporation under an easement arrangement formally established via CoTs with the Government of Western Australia	Miniature Railway Group under a lease arrangement with the City of Canning on behalf of the Government of Western Australia	City of Canning on behalf of the Government of Western Australia
<b>Amended Lot ID</b>	To be confirmed and LTAMP to be updated accordingly.		
<b>Future Land Use</b>	Stormwater Drain which collects water from north of Fern Road and discharges to the Canning River via the compensation basin	Parks and Recreation	Public Infrastructure, Parks and Recreation
<b>Future Zoning</b>	Easements for public infrastructure	Private clubs and institution	Parks and Recreation

## 1.4 CONTENT OF PLAN

The general content of this plan comprises:

1. Outline of the legal responsibilities of the Site owners / management authorities.
2. Information to allow suitable planning and management for any disturbance of contaminated soils that is necessary and unavoidable, to ultimately provide protection of the health and safety of future Site users and workers.
3. Information to guide future subsurface works in the affected area:
  - Survey information showing the location of asbestos contaminated fill material and warning barriers.
  - Construction details / schematic presentation of the location and depth of asbestos-impacted materials and the design of capping system in the containment areas.
  - Photographs of the warning barrier such that it can be recognised by future subsurface workers if encountered.
  - Product specifications of the warning barrier.
4. Management measures to minimise the likelihood of asbestos-impacted soils being inadvertently disturbed in the future. Management information is outlined in Section 3 and has been prepared with reference to:
  - Assessment and Management of Contaminated Sites' (Department of Environment Regulation (DER) (2014); and
  - Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' (DoH, 2009)

This document has also been prepared in a manner which is complete but relatively simple to follow and adhere to so that it is readily implementable by key stakeholders.

## **2 ENVIRONMENTAL SETTING**

### **2.1 GEOLOGY**

#### **2.1.1 Published Geological Conditions**

According to the Geological Survey of Western Australia (GSWA, 1986), the geological profile beneath the site generally consists of the Pleistocene aged Guildford Formation comprising alluvium (clay, loam, sand, gravel) that is variably lateritised and podsolised, with some sections of the Pleistocene aged Bassendean Sand comprising pale very light grey to yellow at depth, fine to medium grained, sub rounded quartz, moderately well sorted of aeolian origin.

A review of the geological references (Ref. Perth, Sheet 2034 II and Part of 2034 III and 2134 III) for the area suggests the Site is underlain by Bassendean Sand. Immediately adjacent to the Canning River (to the east) alluvial deposits comprising clayey sandy silt may be encountered.

The Site rises from less than 1m above Australian Height Datum (AHD) at the edge of the Water Corporation Wilson Main Drain (see Figure 2), to a maximum of 5m AHD in the west (Department of Environment (DoE) 2004). The Site slopes down to the Canning River to the east and suggests a degree of filling given the relatively steep gradient present.

#### **2.1.2 Generalised Ground Conditions Encountered**

Historical investigations in the southern end of the Site found fill comprising grey and brown silty sand to approximately 1.2m, underlain by dark grey clayey silt (Coffey Environments, 2013). Investigations completed by Aurora between 2015 and 2016, found natural ground in the southwest of Lot 102 comprised yellow, fine to medium, well sorted sand to a depth of approximately 2m bgl. This was underlain by cream / white, coarse, well sorted sand.

### **2.2 HYDROLOGY**

The Site borders the Canning River, and contains a small branch of the Canning River and associated wetlands (see Figure 2). Due to the close proximity to the Canning River and the presence of wetlands (largely in the eastern portion of Lot 4 and southeastern portion of Lot 102), the Site is considered to have a high flood risk.

### **2.3 GROUNDWATER**

The regional groundwater flow direction is inferred to be towards the south-west (Davidson, 1995; WRC, 2004), however, the proximity of the Canning River suggests that groundwater beneath the Site is likely to discharge to this surface water receptor adjacent to the east of the Site and an easterly groundwater flow direction was reported by ATA (ATA, 2002). The regional hydraulic gradient is approximately 0.0015 (Davidson, 1995).

The Perth Groundwater Atlas which indicates that likely maximum groundwater levels may be at approximately 2.5m AHD in the east and 5m AHD in the west. The groundwater table in the



superficial aquifer is unconfined and fluctuates seasonally by approximately 1 to 2m, and is directly influenced by the level of the Canning River (Davidson, 1995; WRC, 2004).

Groundwater quality beneath the Site is expected to be brackish (salinity ranging between 1,000mg/L and 10,000mg/L) given that the section of the Canning River adjacent to the Site (downstream of Kent Street Weir) is tidally influenced<sup>1</sup>. Potential beneficial uses of groundwater are estuarine and aquatic ecosystems associated with the Canning River.

## 2.4 ENVIRONMENTAL SENSITIVITY

Lot 4 and the eastern portion of Lot 102 sit within Bush Forever area 224 which also covers the wider Canning River Regional Park which is listed as a heritage site on the Register of the National Estate.

The Bush Forever 'Site Description' (from 'Bush Forever Volume 2' [Government of WA 2000]), indicates that vegetation within area 224 ranges from excellent to completely degraded; no significant flora has been recorded, however significant bird and mammal species have been recorded. The survey information is not specific to the Site and based on observations during previous inspections and discussions with the Wilson Wetland Action Group (a local rehabilitation volunteer organisation), the vegetation along the eastern portion of Lot 102 is heavily disturbed and degraded to completely degraded. This particularly true where the Castledare Miniature Railway tracks run through and where the station operates from including the Canning River foreshore along the eastern perimeter of the Site. These observations do not constitute a formal vegetation survey, however Muir Environmental (1998) noted:

- On the riverine clays exposed on the river margin there is mainly Swamp She-oak (*Casuarina obesa*) with Swamp Paperback (*Melaleuca raphiophylla*) closer to the edge of the water. The understory is largely degraded and is mainly Kikuyu Grass (*Pennisetum clandestinum*) and Couch Grass (*Cynodon dactylon*) with many weeds. There are some remnant sedges (mainly *Gahnia* sp and *Juncus pallidus*).
- On the fill in the picnic area and around the Castledare Miniature Railway, there are a few Flooded Gum (*Eucalyptus rudis*) which are considered likely to have been planted following filling but some may have survived the filling process also given the size and extent to which they are established.

Muir Environmental (1998) also noted that 'the current boundary of the Regional Park which extends into the Site does not include any land of conservation value' (although the riverine edge is likely an exception to this).

---

<sup>1</sup> Refer to Department of Parks and Wildlife and Department of Water weekly monitoring program of the Swan Canning River Park <https://www.dpaw.wa.gov.au/management/swan-canning-riverpark/ecosystem-health-and-management/monitoring-evaluation-and-reporting?showall=&start=1>.

### 3 MANAGEMENT INFORMATION

Site management information is provided in the following appendices based on the expected future Site ownership and / or management authority arrangements as per Table B in Section 1.3:

**Appendix 2.** Management Information for Government of Western Australia

**Appendix 3.** Management Information for Water Corporation

<b>NOTE</b>	<p>At the time of writing, both Water Corporation and the City of Canning (as the anticipated management authority on behalf of the Government of Western Australia) had been provided the opportunity to review draft versions of the LTAMP. This version is based on input provided by both of these stakeholders. However, as previously indicated, this LTAMP has been prepared in advance of any subdivision being formalised and as a consequence it is expected the LTAMP will be updated upon agreement of the sub-divided boundaries and lot ownership to reflect those administrative changes.</p> <p>Until the land is subdivided via an interest only deposit plan (IODP) and the land is formally transferred, the current Site owner will be responsible for the ongoing management of the Site.</p>
-------------	--

The land owner / managing authority for each of the identified areas is required to review the applicable package of information to ensure each party is aware of its responsibilities and oversee the implementation of this LTAMP in perpetuity unless further remedial works are undertaken such that management requirements are no longer applicable.

### 3.1 STAKEHOLDERS AND RESPONSIBILITIES

Stakeholder responsibilities are summarised in Table C below and detailed in Appendices 2 and 3.

**TABLE C: STAKEHOLDER TITLES AND RESPONSIBILITIES**

Stakeholder Title	Summary of Responsibilities	Comments
Site Owner(s) / approved Management Authority	<ul style="list-style-type: none"> <li>• Maintain and update the LTAMP as necessary to ensure it accurately reflects Site conditions, or when there is any change to the details or the jurisdiction of any stakeholders.</li> <li>• In the event that a management measure prescribed in this LTAMP is found to be ineffective to control possible exposure to asbestos the Site owner(s) or approved Management Authorities should amend the LTAMP in consultation with a qualified environmental representative and the DoH/DER.</li> <li>• Ensure all stakeholders are aware of and using the current version of the LTAMP.</li> <li>• Maintain all necessary documents and keep all records relating to the Site risk and the LTAMP.</li> <li>• Ensure that Site occupants, Site workers or any party involved with the management or maintenance of the Site including any future development activities are aware of the LTAMP, Site conditions and management controls required to be implemented.</li> <li>• Comply with requirements of the <i>Contaminated Sites Act (2003)</i> with regard to land transactions involving the property.</li> </ul>	The Site Owner / approved Management Authority will seek advice from the appropriate experts as necessary.
Site Occupier(s) / Site users e.g. volunteer organisations undertaking rehabilitation works	<ul style="list-style-type: none"> <li>• Be aware of, agree to and adhere to the LTAMP.</li> <li>• Do not undertake any act to increase risk from asbestos impacts at the Site.</li> <li>• Ensure that all Site workers or contractors are aware of and adhere to the LTAMP.</li> <li>• Report any incidents where asbestos contaminated soils have been inadvertently exposed, measures taken to address the incident and requirements to update the LTAMP.</li> <li>• Report any incidents where contaminated fill is unexpectedly identified, measures taken to address the incident and requirements to update the LTAMP.</li> <li>• Advise if the LTAMP is required to be updated to reflect any changes to Site conditions in the context of asbestos contaminated fill and the documented capping strategy (e.g. use of an alternative warning barrier product, use of alternative capping material).</li> </ul>	The Site Owner(s) / Approved Management Authorities shall ensure that all Site occupiers are aware of and agree to the LTAMP prior to granting access to an Occupier.



**TABLE C: STAKEHOLDER TITLES AND RESPONSIBILITIES**

Stakeholder Title	Summary of Responsibilities	Comments
Owners of Infrastructure or Assets on or below the Site bounds (Third-party Site Asset Owners)	<ul style="list-style-type: none"> <li>• Be aware of, agree to and adhere to the LTAMP.</li> <li>• Do not undertake any act to increase risk from asbestos impacts at the Site.</li> <li>• Ensure that all Asset Site workers, visitors or contractors are aware of and adhere to the LTAMP.</li> </ul>	<p>The Site Owner(s) shall ensure that all Asset Providers are aware of and agree to the LTAMP prior to granting access to the Site.</p> <p>Any future additional Site development may require asset owners to install services, including but not limited to provision of communications, stormwater, power, water supply and road works.</p>
<p><b>NOTE</b></p>	<p><b>Undertaking activities in non-compliance of this LTAMP which leads to inappropriate handling of asbestos-impacted fill materials may cause contamination of land and possible risks to human health. A person or body corporate which causes contamination may be prosecuted under the <i>Contaminated Sites Act 2003</i> and its accompanying regulations and be responsible for any subsequent remediation works required.</b></p>	

### **3.2 REVIEW PROGRAM**

- This LTAMP is expected to be attached to the Site in perpetuity, unless further remedial works are undertaken such that management requirements are no longer applicable.
- The Site owner(s) is responsible to ensure the LTAMP is updated on an as needed basis, such as when any change to the Site conditions may affect management of the asbestos impacts, or when there is any change to the details or the jurisdiction of any Stakeholder.
- It is recommended that the LTAMP is reviewed at least annually and updated or revised at intervals no greater than 5 years apart.

## 4 REFERENCES

**Aurora Environmental (2017)** Remediation and Validation Report, Lot 4 and Lot 102, Fern Road, Wilson, WA.

**ATA Environmental (2001)** Sampling and Analysis Plan, Castledare Asbestos Contamination, Report No.2000/159, March 2001.

**Coffey Environments (2013)** Preliminary (Contaminated) Site Investigation (PSI) (Non-Intrusive) – Castledare Miniature Railway, Lot 4 and Part of Lot 102, Fern Road, Wilson, WA, March 2013.

**Davidson, WA (1995)** Hydrogeology and Groundwater Resources of the Perth Region, Western Australia. Geological Survey of Western Australia - Department of Minerals and Energy. Bulletin 142.

**Department of Health (2009)** Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

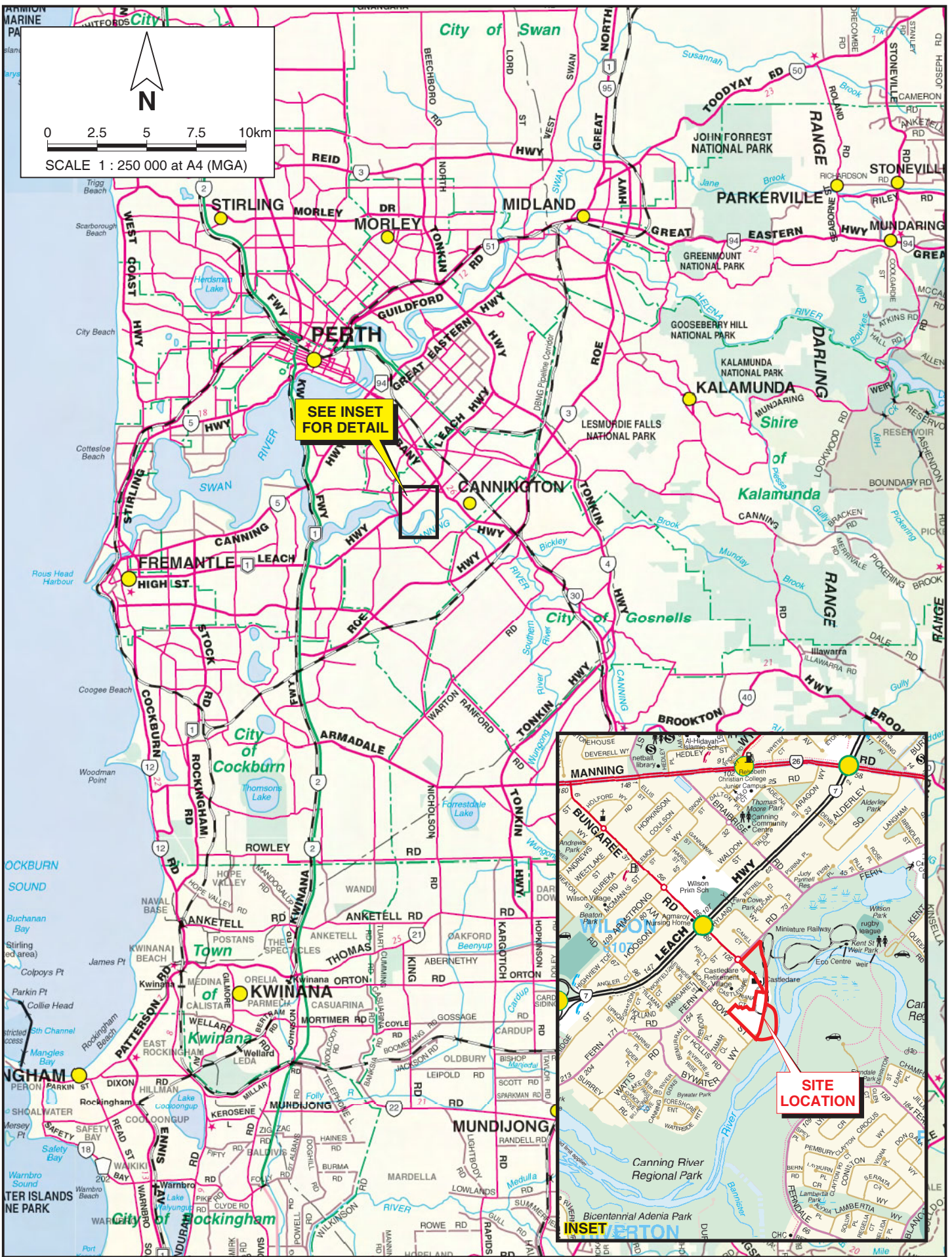
**Department of Environment Regulation (DER) (2014)** Assessment and Management of Contaminated Sites.

**Geological Survey of Western Australia (GSWA) (1986)** Perth 1:50,000 Environmental Geology Map Series, Sheets 2033 I and IV, Geological Survey of Western Australia, Department of Mines, 1986.

**Water and Rivers Commission (2004)** Perth Groundwater Atlas, Second Edition. Perth: Department of Environment, December 2004.



## **FIGURES**



RNC2015-001-Phase1&2\_LTMP\_046\_ph01.dgn  
PINPOINT CARTOGRAPHICS (08) 9562 7136



Trustees of the Christian Brothers  
LONG TERM ASBESTOS MANAGEMENT PLAN  
LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 1**


**SITE LOCATION**

Drawn: P. Lee      Date: 4 Jun 2017

Job: RNC2015-001





  
 0 25 50 75 100m  
 SCALE 1 : 2 500 at A3 (MGA)  
**Legend**  
 - - - Site Boundary  
 — Cadastral Boundary  
 - - - Easement Boundary



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 2**

Drawn: P. Lee      Date: 4 Jun 2017

**SITE IDENTIFICATION**

Job: RNC2015-001

CADASTRAL SOURCE: Landgate, May 2017.  
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2017.





0 25 50 75 100m

SCALE 1 : 2 500 at A3 (MGA)

**Legend**

- Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Site Features
- Railway



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 3**

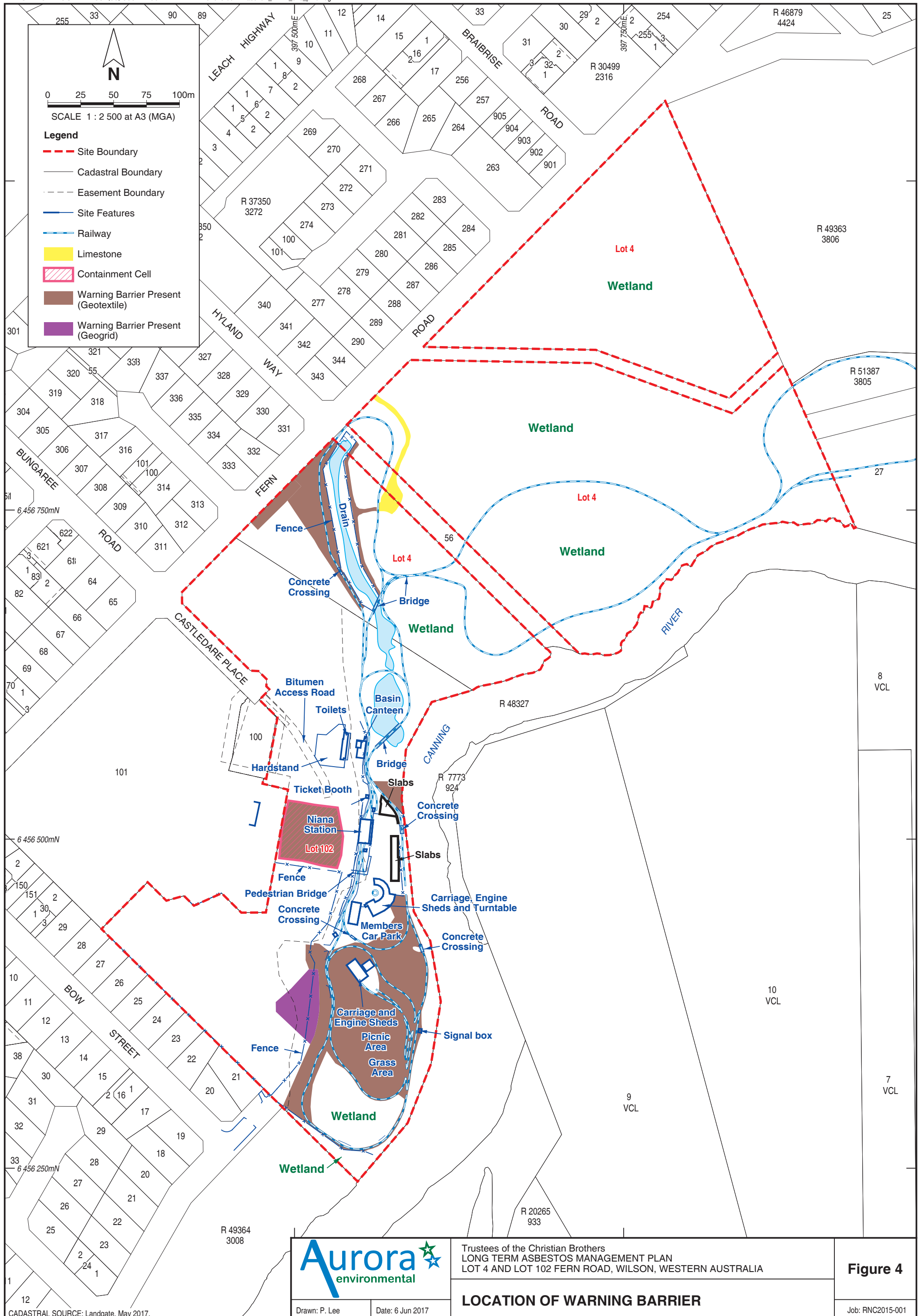
Drawn: P. Lee Date: 4 Jun 2017

**KEY SITE FEATURES**

Job: RNC2015-001

CADASTRAL SOURCE: Landgate, May 2017.  
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2017.





Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

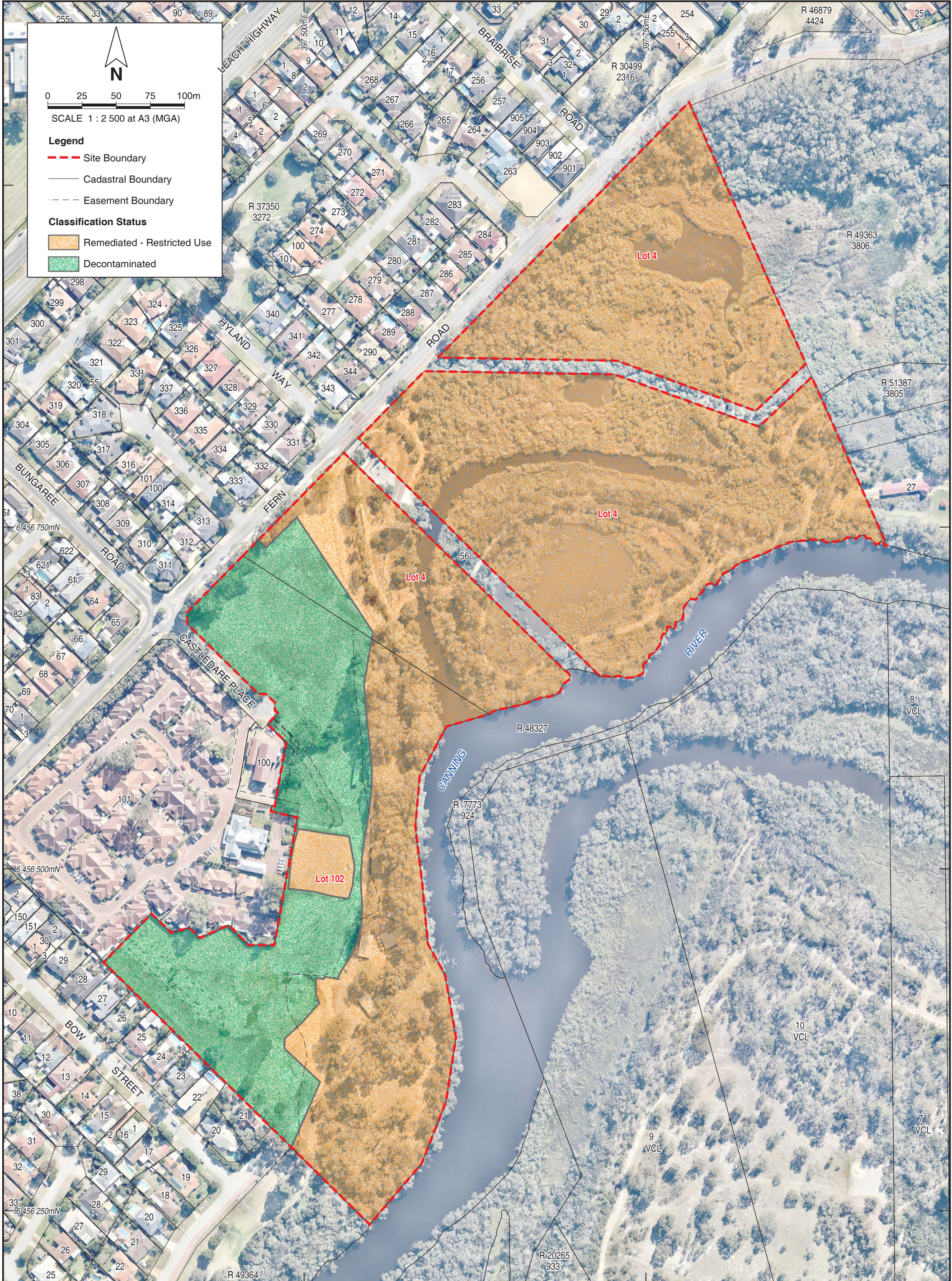
**Figure 4**

**LOCATION OF WARNING BARRIER**

Drawn: P. Lee Date: 6 Jun 2017

Job: RNC2015-001





CADASTRAL SOURCE: Landgate, May 2017.  
AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2017.



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**DRAFT CONTAMINATION CLASSIFICATION STATUS  
 PENDING INTEREST ONLY DEPOSITED PLAN**

Drawn: P. Lee

Date: 6 Jun 2017

**Figure 5**

Job: RNC2015-001



## **APPENDIX 1**

Current Certificates of Title



WESTERN



AUSTRALIA

REGISTER NUMBER <b>4/P2461</b>	
DUPLICATE EDITION <b>N/A</b>	DATE DUPLICATE ISSUED <b>N/A</b>

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

VOLUME  
**2140**

FOLIO  
**818**

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



**LAND DESCRIPTION:**

LOT 4 ON PLAN 2461

**REGISTERED PROPRIETOR:**  
(FIRST SCHEDULE)

TRUSTEES OF THE CHRISTIAN BROTHERS IN WESTERN AUSTRALIA INC OF 53 REDMOND STREET,  
MANNING

(A G885326 ) REGISTERED 25 AUGUST 1998

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

1. THE LAND THE SUBJECT OF THIS CERTIFICATE OF TITLE EXCLUDES ALL PORTIONS OF THE LOT DESCRIBED ABOVE EXCEPT THAT PORTION SHOWN IN THE SKETCH OF THE SUPERSEDED PAPER VERSION OF THIS TITLE. VOL 2140 FOL 818.

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: 2140-818 (4/P2461).  
PREVIOUS TITLE: 1302-898.  
PROPERTY STREET ADDRESS: LOT 4 FERN RD, WILSON.  
LOCAL GOVERNMENT AREA: CITY OF CANNING.

LANDGATE COPY OF ORIGINAL, NOT TO SCALE. Wed Dec 16 09:33:46 2009 JOB 33521821

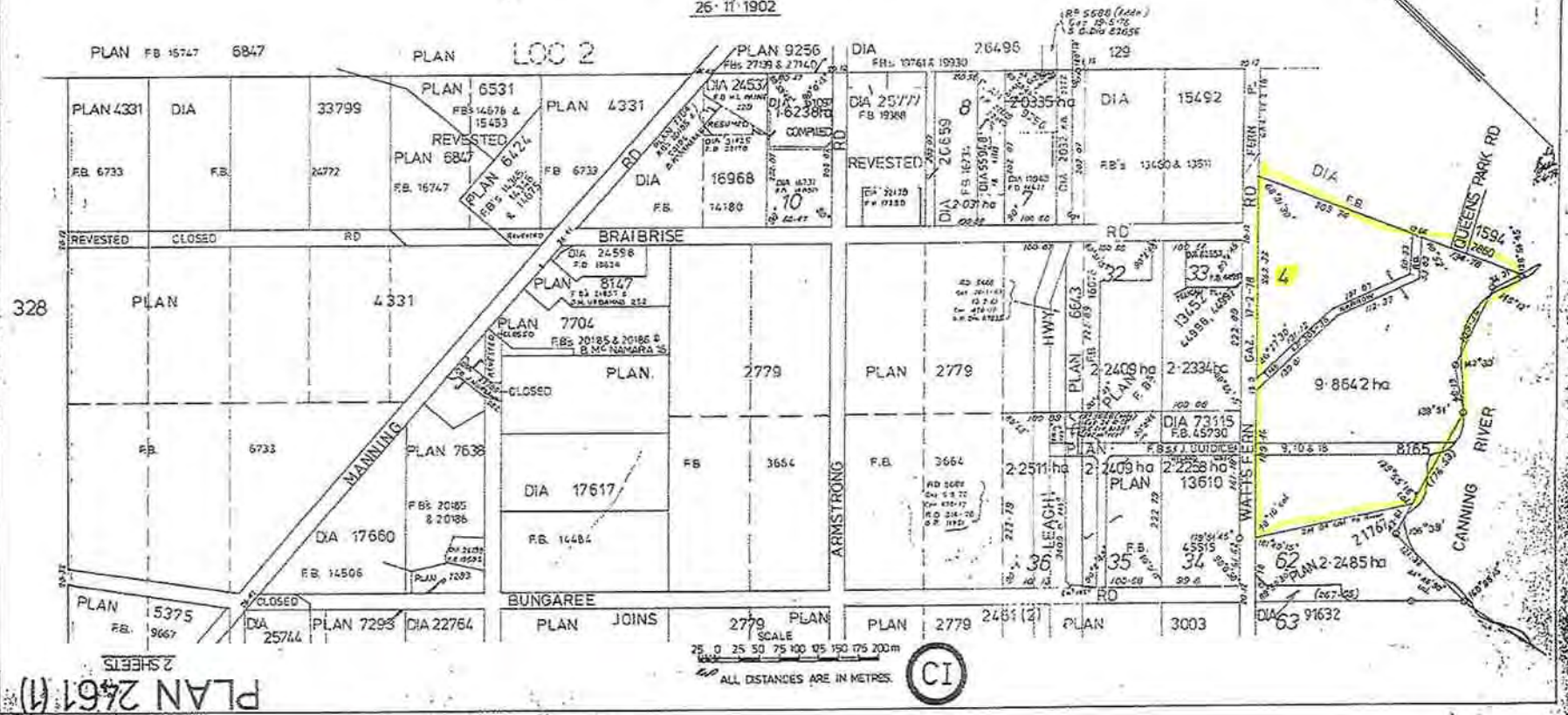


PLAN 2461 (1)  
2 SHEETS

### PT CANNING LOC 1

CORR 432-97  
FBs 2921 & 13688  
PLAN 1674  
INDEX PLANS 3888 (3&4), 9647, 7647 - PERTH 2000 17:17  
C/T 194-40 . 15:17  
NOW 264-50 . 15:16

APPROVED  
26.11.1902



PLAN 2461 (1)  
2 SHEETS

SCALE  
0 25 50 75 100 125 150 175 200m  
ALL DISTANCES ARE IN METRES.





# PLAN 2461 (2)

2 SHEETS

## PT CANNING LOC 1

CORR 432-97

FB's 2921 & 13688

PLAN 1674

INDEX PLANS

PERTH 2000 16 16, 15 18

C/T 194-40

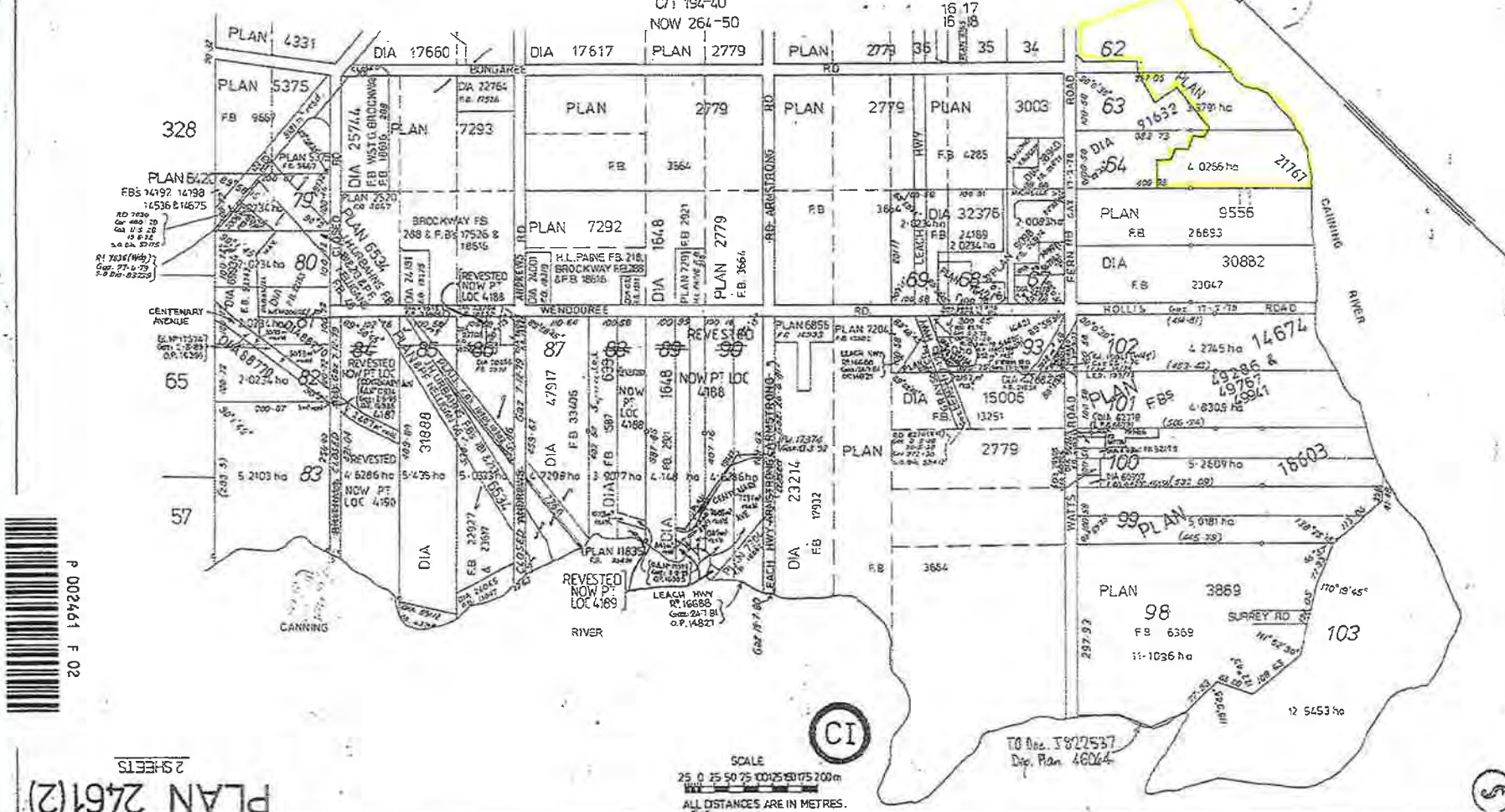
15 17

NOW 264-50

16 17

15 18

APPROVED  
26-11-1902



P 002461 F 02

PLAN 2461(2)  
2 SHEETS

SCALE  
25 0 25 50 75 100 125 150 175 200m  
ALL DISTANCES ARE IN METRES.

To Dec. 18 22537  
Dip. Plan 4604

LANDGATE COPY OF ORIGINAL NOT TO SCALE Wed Dec 16 09:33:46 2009 JOB 33521821



# P2461

<i>Lot Number</i>	<i>Part Register Number</i>	<i>Section Sheet Number</i>	<i>Lot Number</i>	<i>Part Register Number</i>	<i>Section Sheet Number</i>
4	2140/818	1	1939	LR 3149/164	1

**P2461**

<u>Lot Number</u>	<u>Part Register Number</u>	<u>Section Sheet Number</u>	<u>Lot Number</u>	<u>Part Register Number</u>	<u>Section Sheet Number</u>
83	2048/181	2			

WESTERN



AUSTRALIA

REGISTER NUMBER <b>102/DP60726</b>	
DUPLICATE EDITION <b>1</b>	DATE DUPLICATE ISSUED <b>27/3/2009</b>

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

VOLUME **2713** FOLIO **531**

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 102 ON DEPOSITED PLAN 60726

**REGISTERED PROPRIETOR:**  
(FIRST SCHEDULE)

TRUSTEES OF THE CHRISTIAN BROTHERS IN WESTERN AUSTRALIA INC OF 53 REDMOND STREET,  
MANNING

(AF K842133 ) REGISTERED 3 FEBRUARY 2009

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

1. \*G600314 MEMORIAL. HERITAGE OF WESTERN AUSTRALIA ACT 1990. LODGED 3.10.1997.
2. G618190 EASEMENT TO CITY OF CANNING. SEE DEPOSITED PLAN 60726. REGISTERED 24.10.1997.
3. \*G667942 MEMORIAL. HERITAGE OF WESTERN AUSTRALIA ACT 1990. LODGED 18.12.1997.
4. \*I298566 MEMORIAL. RETIREMENT VILLAGES ACT 1992. LODGED 18.11.2002.
5. \*I307013 NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 26.11.2002.
6. EASEMENT BURDEN CREATED UNDER SECTION 167 P. & D. ACT FOR SEWERAGE PURPOSES TO WATER CORPORATION - SEE DEPOSITED PLAN 60726.
7. EASEMENT BURDEN CREATED UNDER SECTION 136C T.L.A. FOR RIGHT OF CARRIAGEWAY PURPOSES TO CITY OF CANNING - SEE DEPOSITED PLAN 60726.
8. \*L199649 MEMORIAL. CONTAMINATED SITES ACT 2003 REGISTERED 13.1.2010.

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: DP60726 [SHEET 1,2,3].  
PREVIOUS TITLE: 2140-817, 2140-816.  
PROPERTY STREET ADDRESS: 14 CASTLEDARE PL, WILSON.  
LOCAL GOVERNMENT AREA: CITY OF CANNING.



## **APPENDIX 2**

Asbestos Management Information  
Government of Western Australia

## Appendix 2

### Asbestos Management Information

#### Part Lot 4 & Part Lot 102

#### Fern Road, Wilson, WA



Prepared For: Trustees of the Christian Brothers  
c/o Richard Noble & Co.  
Level 1, 189 Hay Street  
SUBIACO WA 6008

Report Number: AP2016-118-Appendix 3

Report Version: V1

Report Date: 6 June 2017

Document No: RNC2015\_001\_Phase1&2\_LTMP\_046\_pl\_V1-Appendix 2

Report No: AP2016-118-Apendix 2

Version: V1

Author: Pamela Lee  
Senior Environmental Scientist



Signature

6 June 2017

Date

Approved by: Greg Milner  
Director - Contaminated Sites



Signature

6 June 2017

Date



## DISTRIBUTION

NO. OF COPIES	REPORT FILE NAME	VERSION	DATE	PREPARED FOR
1	RNC2015-001_LTMP_046_PL_V0.1	V0.1	28 September 2016	Aurora Environmental
1	RNC2015-001_LTMP_046_PL_V0.2	V0.2	18 October 2016	Water Corporation
1	RNC2015-001_LTMP_046_PL_V0.3	V0.3	27 February 2017	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Water Corporation
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Department of Environment Regulation
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Department of Health

## TABLE OF CONTENTS

<b>ATTACHMENTS</b>	<b>6</b>
<b>LIST OF ABBREVIATIONS</b>	<b>7</b>
<b>KEY DEFINITIONS</b>	<b>8</b>
<b>1 SITE IDENTIFICATION</b>	<b>9</b>
<b>2 PURPOSE OF THIS PLAN</b>	<b>10</b>
2.1 APPLICABILITY OF THIS MANAGEMENT PLAN	10
2.2 CONTROL AND UPDATE OF DOCUMENTS	10
2.3 ROLES AND RESPONSIBILITIES	12
<b>3 HAZARD IDENTIFICATION</b>	<b>14</b>
3.1 OTHER POTENTIAL CONTAMINANTS	19
3.2 OTHER CONSTRAINTS	19
3.3 POTENTIAL EXPOSURE PATHWAYS	19
<b>4 ASBESTOS MANAGEMENT FRAMEWORK</b>	<b>21</b>
4.1 HEALTH AND SAFETY PLAN	21
4.2 PERSONAL PROTECTIVE EQUIPMENT	22
4.3 LICENCE REQUIREMENTS	22
4.4 QUALIFICATIONS REQUIRED TO MANAGE ASBESTOS IN SOILS	23
4.5 INDUCTION, TRAINING AND SAFETY DOCUMENTATION MATRIX	23
4.6 COMMUNITY CONSULTATION	25
4.7 SUMMARY OF KEY MANAGEMENT CONTROLS	25
<b>5 CONTINGENCIES</b>	<b>30</b>
5.1 INCIDENT AND EMERGENCY PROCEDURES	30
<b>6 KEY MANAGEMENT REQUIREMENTS, TIMEFRAMES AND KEY PERFORMANCE INDICATORS</b>	<b>32</b>
<b>7 DOCUMENTATION, REPORTING AND COMMUNICATION</b>	<b>34</b>
7.1 DOCUMENTATION REQUIRED FOR SITE WORKS	34
7.2 COMPLAINTS, INCIDENTS AND EXCEEDENCES	35
<b>8 REFERENCES</b>	<b>36</b>

**TABLES IN TEXT**

Table A.	Roles and Responsibilities
Table B.	Hazard Identification
Table C.	Potential Asbestos Exposure Scenarios
Table D.	Minimum PPE Requirements
Table E.	Licence Requirements
Table F.	Training-Induction-Safety Documentation Requirements
Table G.	Activities, Potential Sources of Asbestos and Site Specific Control Measures
Table H.	Environmental Incident Response Measures
Table I.	Management Requirements, Timeframes and Key Performance Indicators
Table J.	Site Works Documentation Checklist
Table K.	Incident Reporting Checklist



## **ATTACHMENTS**

### **FIGURES**

- Figure 1. Site Location
- Figure 2. Site Identification
- Figure 3. Key Site Features
- Figure 4. Location of Warning Barrier

### **APPENDICES**

- Attachment 1. Regulatory Framework
- Attachment 2. Asbestos Management Procedure
- Attachment 3. Waste and Transport Management Procedure

## LIST OF ABBREVIATIONS

DCA	Development Control Area
DEC	Department of Environment and Conservation
DER	Department of Environment Regulation
DoH	Department of Health
DPaW	Department of Parks and Wildlife
JSA	Job Safety Assessment
LTAMP	Long Term Asbestos Management Plan
m bgl	meters below ground level
OHS	Occupational Health and Safety

## KEY DEFINITIONS

<b>ACM</b>	<b>Asbestos Containing Material</b> which is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos fencing or vinyl tiles. This is also restricted to material that cannot pass through a 7mm x 7mm sieve. Can be detected visually.
<b>FA</b>	<b>Fibrous Asbestos</b> material such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Can be detected visually.
<b>AF</b>	<b>Asbestos Fines</b> includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7mm x 7mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibres, which can pose a considerable inhalation risk if made airborne.



## 1 SITE IDENTIFICATION

This management information relates specifically to the portion of Lot 4 and Lot 102, Fern Road, Wilson, Western Australia as identified in Figure 1 and 2. Key Site features are identified in Figure 3.

<b>NOTE</b>	<p>In order for stakeholders to understand the roles and responsibilities associated with acquiring the eastern portions of Lot 4 and Lot 102 which are proposed to be transferred to the Government of Western Australia, this version of the LTAMP has been prepared as if that formal land transaction has occurred and the stakeholders expected to be responsible for future management and maintenance are identified.</p> <p>Until the land is subdivided via an interest only deposit plan (IODP) and is formally transferred with the certificates of title amended, the current Site owner will be responsible for the ongoing management of the Site.</p> <p>It is expected the LTAMP will be updated upon agreement of the subdivision boundaries and lot ownership to reflect those administrative changes.</p>
-------------	--

## 2 PURPOSE OF THIS PLAN

The purpose of this plan is to provide a framework for the ongoing management of asbestos contaminated soils so that the health and safety of the City of Canning’s employees and subcontractors, surrounding receptors including users of the Canning River Regional Park, Castledare Miniature Railway and nearby residents and the general environment are protected from adverse impacts that could eventuate from uncontrolled disturbance of soils within the Site.

Specific objectives of the plan include:

1. Compliance with regulatory requirements for the preparation and implementation of an asbestos management plan.
2. Prevent uncontrolled exposure to asbestos.
3. Ensure that any works which have the potential to disturb asbestos contaminated soils; are planned for and managed appropriately.

### 2.1 APPLICABILITY OF THIS MANAGEMENT PLAN

This plan is applicable in perpetuity to the Site unless further remedial works are undertaken such that management requirements are no longer applicable.

This plan shall also be implemented where one or more of the following scenarios apply:

1. Where works are required to be undertaken within the Site.
2. Where subsurface contamination either will or has the potential to become incidentally exposed.

Undertaking activities in non-compliance of this plan which lead to inappropriate handling of asbestos contaminated soils may cause contamination of land and possible risks to human health. A person or body corporate which causes contamination may be prosecuted under the *Contaminated Sites Act 2003* and its accompanying regulations and be responsible for any subsequent remediation works required.

### 2.2 CONTROL AND UPDATE OF DOCUMENTS

The overarching Long Term Asbestos Management Plan (LTAMP) and accompanying ‘Asbestos Management Information’ plan (i.e. this document) are:

- considered to be live documents;
- should reflect Site conditions; and
- are required to be updated if additional information, relevant to the scope of the plan, becomes available, e.g. additional remediation works that changes the footprint of the contamination.

<b>NOTE</b>	It is expected that the City of Canning will formally manage the Site on behalf of the Government of Western Australia. This plan has been prepared in advance of any subdivision being formalised and as a consequence it is expected the LTAMP will be updated upon agreement of the sub-divided boundaries and lot ownership to reflect those administrative changes.
-------------	--

- An appropriate representative from the City of Canning is required to:
  - be aware of the City of Canning’s responsibilities as outlined within this plan;
  - oversee the implementation of this document; and
  - undertake reviews and updates of this document.
- It is recommended that the overarching LTAMP and this ‘Asbestos Management Information Plan’ are reviewed at intervals no greater than 5 years apart and updated as and when required.
- It is recommended that the review is undertaken by an appropriately qualified person, defined by the Department of Health (DoH) (2009) as having a minimum of 3 years continuous experience with asbestos soil contamination and relevant tertiary qualifications in environmental science, science or engineering.
- In the event that a management measure prescribed in this plan is found to be ineffective to control possible exposure to asbestos, the City of Canning should implement the necessary amendments in consultation with the Government of Western Australia and the DoH / Department of Environment Regulation (DER).
- All stakeholders are required to hold an electronic copy of the most up to date version of the LTAMP and supporting documentation at all times.



## 2.3 ROLES AND RESPONSIBILITIES

- Roles and responsibilities for the City of Canning and other stakeholders are presented in Table A.
- It is the responsibility of the City of Canning to ensure these responsibilities are fulfilled.
- The responsibilities listed in Table A relate specifically to the management of asbestos contaminated fill material do not replace other regulatory responsibilities as outlined in other Acts and Regulations, e.g. Occupational Health and Safety Act 1994 (the OHS Act) and the Occupational Safety and Health Regulations 1996 (the OSH regulations) supported by codes of practice and guidance notes.

**TABLE A: ROLES AND RESPONSIBILITIES**

ROLE	RESPONSIBILITIES
Site Owner / Management Authority (City of Canning)	<ol style="list-style-type: none"> <li>1. Maintain control over access to the Site.</li> <li>2. Maintain records and documentation relevant to the plan.</li> <li>3. Duty to take reasonable care for their own safety and that of others who may be affected by their acts or omissions.</li> <li>4. Ensure that the hazards onsite are made clear to all City of Canning personnel attending the Site and they are familiar with this plan for their work area as necessary.</li> <li>5. Ensure any party required to access the Site are provided with the current version of the LTAMP and this Asbestos Management Information Plan and are appropriately briefed.</li> <li>6. All City of Canning personnel authorised to engage subcontractors must be made aware of their responsibilities under this plan.</li> <li>7. If subcontractors work will involve potential disturbance of asbestos contaminated fill material, ensure that the subcontractor is informed and competent to carry out the work and, where relevant holds the relevant licenses and competencies for asbestos removal work (see Section 4.3 and 4.4 for additional information).</li> <li>8. Ensure that the scope of work and the hazards to be encountered are made clear to all subcontractors. Ensure the subcontractors job safety assessment (JSA) or similar acknowledges the identified and potential hazards on Site by reviewing and approving their documentation prior to commencing work.</li> <li>9. Ensure management tasks and timeframes outlined in Section 6 are adhered to.</li> <li>10. Seek expert advice where required, e.g. competent persons as described by the DoH (2009) (see Section 4.4).</li> <li>11. Comply with City of Canning policies, procedures and instructions, and support facilitated activities relating to asbestos risk management.</li> <li>12. Report any incident involving the <u>uncontrolled</u> disturbance of ACM or potential exposure to asbestos fibres to the responsible person for the area in accordance with City of Canning procedures.</li> </ol>

**TABLE A: ROLES AND RESPONSIBILITIES**

ROLE	RESPONSIBILITIES
Subcontractor Manager / Supervisor engaged by City of Canning (directly or indirectly)	<ol style="list-style-type: none"><li>1. Obtain approval from City of Canning for consultants and contractors undertaking works.</li><li>2. Comply with policies, procedures and instructions provided by City of Canning.</li><li>3. Refrain from any act which could put them or any other Site users or occupants at risk of exposure to asbestos.</li><li>4. Provide task-specific JSA documents (or equivalent) which acknowledges the information provided in this Asbestos Management Information plan and incorporate appropriate control procedures based on the information provided and conditions expected onsite.</li><li>5. Exercise due diligence in managing works such that the works are carried out in accordance with protocols outlined in this Asbestos Management Information plan.</li><li>6. Report any incident involving the <u>uncontrolled</u> disturbance of ACM or potential exposure to asbestos fibres to the responsible person in the City of Canning in accordance with City of Canning procedures.</li><li>7. Seek expert advice where required.</li></ol>



### **3 HAZARD IDENTIFICATION**

Table B identifies potential hazards associated with asbestos within the Site.

The presence of a warning barrier serves as the one of the key management tools as it is both a visual and physical indicator that underlying soils are impacted by asbestos. The location of the warning barrier (installed in 2016) is identified in Figure 4.



**TABLE B: HAZARD IDENTIFICATION**

AREA	ASBESTOS CONTAMINATION	KEY MANAGEMENT FEATURES PRESENT	PHOTOGRAPHS
<p>Areas with warning barrier and clean fill cover or hardstand</p>	<p>ACM and AF present in soils below warning barrier and capping layers or hardstand</p>	<ul style="list-style-type: none"> <li>• High risk areas have been capped with:                             <ul style="list-style-type: none"> <li>- warning barrier, clean fill (0.2-0.5m) and vegetated to stabilise the surface cover; or</li> <li>- hardstand.</li> </ul> </li> <li>• Warning barrier comprises:                             <ul style="list-style-type: none"> <li>a) Geotextile (see Note 1); or</li> <li>b) Geogrid (see Note 2)</li> </ul> </li> <li>• The extent of the warning barrier is identified in Figure 4 along with areas of hardstand (new and pre-existing).</li> </ul> <p><i>High risk areas are those which are frequently utilised by the Miniature Railway Group or heavily trafficked by Site users (the public).</i></p>	 <p>Photograph 1. Open space south of Lot 102: sand and topsoil over warning barrier</p>
		<p><b>KEY MANAGEMENT ACTIONS REQUIRED</b></p> <ul style="list-style-type: none"> <li>• Surface cover remains undisturbed</li> <li>• Site is managed through periodic inspections</li> <li>• Any erosion is addressed to prevent reduction in the capping layer thickness (where present)</li> <li>• Opportunities to extend the coverage of the warning barrier and clean fill capping material to be considered when undertaking development works.</li> <li>• Site works are subject to approval by City of Canning and Subcontractors are informed of Site conditions via this Asbestos Management Information plan</li> <li>• See Section 4 for additional information</li> </ul>	 <p>Photograph 2. East of Niana Station: Paving slabs over clean fill</p>



Photograph 3. Containment Cell: Road base over warning barrier Containment Cell



Photograph 4. Open space by Fern Road: Limestone and much over warning barrier



Photograph 5. Open space east of Drain: Limestone over warning barrier

#### NOTES

1. Geotextile (non-woven): water permeable; high visibility against background soils; high resistance against biological and chemical degradation.
2. Geogrid: water permeable; high strength at low strains; low creep characteristics; high resistance against installation damage; high resistance against biological and chemical degradation.



Photograph 6. Geotextile warning barrier



Photograph 7. Geogrid warning barrier





**TABLE B: HAZARD IDENTIFICATION**

AREA	ASBESTOS CONTAMINATION	KEY MANAGEMENT FEATURES PRESENT	PHOTOGRAPHS
Remainder of Site	<ul style="list-style-type: none"> <li>ACM and AF expected in shallow soils below hardstand or vegetative surface cover.</li> <li>From a preliminary inspection, the culverts appear to be constructed of concrete; however the potential for buried and likely redundant infrastructure within the Site which contains ACM cannot be discounted.</li> </ul>	<ul style="list-style-type: none"> <li>Paving, footpaths, railway tracks, road base dense and limestone aggregate together with planting schemes and wetland areas across the remainder of the Site are such that they provide a physical barrier or sufficient vegetative cover which if undisturbed and maintained will provide adequate separation between underlying soils and Site users</li> <li>Road base associated with miniature railway train tracks is retained with plastic edging. This prevents ongoing erosion at the top of the embankment</li> </ul>	 <p>Photograph 8. Open space East of Drain: surface previously capped but recently 'topped up' with mulch, road base and limestone.</p>
		<p><b>KEY MANAGEMENT FEATURES REQUIRED</b></p> <ul style="list-style-type: none"> <li>Surface cover remains undisturbed</li> <li>Site is managed through periodic inspections</li> <li>Any erosion is addressed to prevent reduction in the capping layer thickness (where present) or surface cover</li> <li>Opportunities to extend the coverage of the warning barrier and clean fill capping material to be considered when undertaking development works</li> <li>Site works are subject to approval by City of Canning and Subcontractors are informed of Site conditions via this Asbestos Management Information plan</li> <li>Any material which is excavated and cannot be retained onsite beneath a</li> </ul>	 <p>Photograph 9. South of Basin, Canning River to east (left of photograph). Well established vegetative surface over.</p>



**TABLE B: HAZARD IDENTIFICATION**

AREA	ASBESTOS CONTAMINATION	KEY MANAGEMENT FEATURES PRESENT	PHOTOGRAPHS
		warning barrier and capping layer is required to be characterised <sup>1</sup> and disposed of appropriately to a licensed landfill. <ul style="list-style-type: none"> <li>• See Section 4 for additional information</li> </ul>	
 <p>Photograph 10. Niana Station: Hardstand and road base across station area.</p>	 <p>Photograph 11. Hardstand around buildings associated with Niana Station.</p>	 <p>Photograph 12. East of Niana Station: picnic area underlain by paving</p>	

<sup>1</sup> Soils are required to be characterised in accordance with ‘Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009)’ (Department of Environment and Conservation (DEC) (2009).

### 3.1 OTHER POTENTIAL CONTAMINANTS

This plan relates specifically to asbestos in soil, however other contaminants may also potentially be present e.g. use of herbicides for control of invasive plant species, use of insecticides to manage for example mosquitos. Appropriate management measures to ensure people accessing the Site are informed of the potential hazards associated with other potential contaminants.

### 3.2 OTHER CONSTRAINTS

The location of the Site presents a number of issues which need to be considered and managed appropriately when undertaking any works within the Site. These constraints include:

- The Site is located within a Development Control Area (DCA) as defined by the Department of Parks and Wildlife (DPaW). DCAs include the waters of the Swan and Canning rivers and adjoining parks and recreation reserves. Works within the DCA may require approval from the DPaW and enquiries should be made to determine the process for development approvals applicable to any proposed works.
- Wetlands within Lot 4 and Lot 102 are classified as Conservation Management Category. Unauthorised development or clearing is not appropriate and consultation with DPaW and DER should be undertaken if any works are proposed.
- Clearing native vegetation is an offence, unless done under a clearing permit, or the clearing is for an exempt purpose. The Department of Environment Regulation is responsible for administering the clearing provisions of the *Environmental Protection Act 1986* (EP Act).
- The City of Canning and / DPaW should be consulted to obtain guidance on the management of *Phytophthora* Dieback to ensure that Dieback is not spread when works are undertaken.
- Aboriginal Heritage is required to be considered and managed when planning / undertaking subsurface disturbance works within Site.

### 3.3 POTENTIAL EXPOSURE PATHWAYS

An 'exposure pathway' is a means by which a population or individual ('receptor') may be exposed to site-derived contaminants. Whenever one or more of the exposure pathway elements are missing, the exposure pathway is incomplete i.e. there is no exposure and therefore no risk to human health and/or the environment. The relationship between source, receptor and pathway in the context of asbestos contamination and uncontrolled subsurface disturbance related hazards are summarised in Table C.

**TABLE C: POTENTIAL ASBESTOS EXPOSURE SCENARIOS**

SOURCE	RELEASE MECHANISM	EXPOSURE ROUTE	RECEPTOR
Disturbance of asbestos contaminated soils	<ul style="list-style-type: none"> <li>Retention in soil.</li> <li>Migration in soil and dust.</li> <li>Windblown dust during soil disturbance works.</li> <li>Movement through erosion of soil or surface water runoff.</li> </ul>	Inhalation (particulates)	<ul style="list-style-type: none"> <li>Site workers onsite.</li> <li>Site workers / subcontractors undertaking activities that disturb contaminated soil.</li> <li>Off-site communities where generated dust extends beyond the Site boundary.</li> </ul>



## **4 ASBESTOS MANAGEMENT FRAMEWORK**

A summary of the key asbestos management controls for the Site are provided below. This section is supported by the following standards, guides and procedures:

- Regulatory Framework ( Attachment 1)
- Asbestos Management Procedure (Attachment 2)
- Waste and Transport Management Procedure (Attachment 3)

### **4.1 HEALTH AND SAFETY PLAN**

This Asbestos Management Information plan will be used by the City of Canning, other Site users / occupiers and any appointed subcontractors to develop their Job Safety Analysis (JSA) or equivalent.

This plan does not negate the requirement to prepare other occupation-specific Job Safety Analysis (JSA) e.g. hot work, electrical work, plant and equipment operation, driving onsite, noise, working with dangerous goods, excavation management, manual handling, fatigue, working in hot weather etc.

Site Managers, Site Supervisors and personnel preparing safety documentation for works within the Site are required to be familiar with the asbestos management controls specified in this Asbestos Management Information plan and the supporting appendices. Minimum requirements for the JSA (or equivalent) are summarised below:

- Shall be in accordance with regulatory and industry institutional standards including but not limited to those standards contained under the Australian Standard series and International Organisation for Standardisation (ISO), as applicable to specific occupations / tasks.
- Shall discuss the objectives and order of the works, the equipment and procedures to be adopted and the potential for exposure.
- Shall take into consideration the health risks associated with the hazard and will include as a minimum the supply of appropriate personal protective equipment (PPE) for personnel undertaking the work.
- Be consistent with the requirements outlined in this Asbestos Management Information plan and supporting attachments:
  - Attachment 2: Asbestos Management Procedure
  - Attachment 3: Waste and Transport Management Procedure
- JSAs (or equivalent) are required to be reviewed and approved by the City of Canning to ensure the risks associated with working within the Site are adequately addressed.

All personnel undertaking works that would disturb soils within the Site are required to be familiar with this Asbestos Information plan and their own (City of Canning approved) safety documentation.

## 4.2 PERSONAL PROTECTIVE EQUIPMENT

PPE selection is based on risk assessment (risk of fibre release and inhalation) and the nature of the work to be undertaken. Table D summarises the minimum PPE recommended when potentially disturbing asbestos impacted soils (see Table B).

All PPE that cannot be decontaminated shall be stored in sealed (double) bags before being disposed of as asbestos waste (see Attachments 2 and 3).

Additional occupation / task-specific PPE beyond that required in Table D may also be required and should be identified in the JSA.

**TABLE D: MINIMUM PPE REQUIREMENTS**

SOURCES	MINIMUM PPE
Disturbance of potentially asbestos contaminated soils	<ul style="list-style-type: none"> <li>• P2 level disposable mask</li> <li>• Disposable gloves.</li> <li>• Disposable boot covers (otherwise boots should be decontaminated when leaving controlled areas).</li> <li>• Disposable coveralls rated type 5, category 3 (prEN ISO 13982–1) or equivalent would meet this standard<sup>1</sup>.</li> </ul>

<sup>1</sup>Special attention needs to be paid to the risk of heat stress when working in hot environments. A person competent in assessing heat stress e.g. occupational hygienist should review this risk and determine the most suitable protective clothing and decontamination procedures for employees in these situations. Wherever possible engineering controls should be put in place such that the level of PPE is minimised.

## 4.3 LICENCE REQUIREMENTS

With respect to asbestos infrastructure or asbestos in buildings, the removal of any asbestos infrastructure requires a licenced asbestos removalist. There are two types of licences:

- Unrestricted asbestos removal licence.
- Restricted asbestos removal licence.

Whilst this type of licensing is generally not applicable to the management of asbestos in soil (see Section 4.4), the potential for asbestos infrastructure to be present within the Site e.g. in the existing buildings associated with the Miniature Railway or buried (and likely redundant) infrastructure cannot be ruled out. The type of licence required depends on the type and quantity of asbestos that is being removed from the Site as summarised in Table E and is provided for completeness.

**TABLE E: LICENCE REQUIREMENTS**

TYPE OF LICENCE	WHAT ASBESTOS CAN BE REMOVED
Unrestricted Asbestos Removal Licence	Can remove any amount or quantity of asbestos or ACM, including: <ul style="list-style-type: none"> <li>• Any amount of friable asbestos or ACM.</li> <li>• Any amount of ACM.</li> <li>• Any amount of non-friable asbestos or ACM.</li> </ul>
Restricted Asbestos Removal Licence	Can remove: <ul style="list-style-type: none"> <li>• Any amount of non-friable asbestos or ACM (up to and exceeding 10m<sup>2</sup>) if work is supervised by a person who holds a Restricted Asbestos Removal Licence qualification.</li> </ul>
No licence required	Can remove up to 10m <sup>2</sup> of non-friable asbestos or ACM.

#### 4.4 QUALIFICATIONS REQUIRED TO MANAGE ASBESTOS IN SOILS

The 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' (Department of Health (DoH), 2009) indicate that licensed asbestos removalists are not always adequately trained in the management of asbestos impacted soils. It is DoHs preference that remediation works to manage asbestos in soil are overseen by an appropriately qualified Environmental Scientist (minimum of 3 years continuous experience with asbestos soil contamination and relevant tertiary qualifications in environmental science, science or engineering) i.e. City of Canings Environmental Health Department with expert support as required.

#### 4.5 INDUCTION, TRAINING AND SAFETY DOCUMENTATION MATRIX

Table F presents induction, training and safety documentation requirements which have been summarised from the previous sections.



**TABLE F: TRAINING-INDUCTION-SAFETY DOCUMENTATION REQUIREMENTS**

ACTIVITY	TRAINING-INDUCTION-SAFETY DOCUMENTATION REQUIREMENTS				
	JSA / STEP BACK	HSEP	THIS ASBESTOS MANAGEMENT INFORMATION PLAN *	ASBESTOS CONTROL PAN	OTHER
Site Inspection	✓	NR	NR	NR	As Requested by City of Canning
Site Management / Maintenance Works <u>excluding intrusive earthworks</u>	✓	✓	✓	NR	As Requested by City of Canning
Intrusive earthworks	✓	✓	✓	✓	As Requested by City of Canning

NR – Not Required

\*Including Asbestos Management Procedure (Attachment 2); and Waste and Transport Management Procedure (Attachment 3).

#### **4.6 COMMUNITY CONSULTATION**

Any future works within the Site have the potential to disrupt / concern the surrounding community and therefore the following consultation measures shall be implemented in accordance with DER guideline '*Assessment and Management of Contaminated Sites*' (DER, 2014):

- Works shall be implemented in a manner that minimises disruption to the community.
- Property owners / occupants on land immediately adjacent to the Site shall be made aware of the works and any particular precautions that are in place. Effort in relation to this aspect of the consultation process should be considered in the context of the particular scale and risks associated of the works proposed.
- Adequate information shall be made available by the City of Canning to concerned parties about the nature of works, the presence of contamination, and measures in place to complete the works safely.
- Community complaints shall be formally documented in accordance with City of Canning's procedures and policies and responded to in a timely fashion.

#### **4.7 SUMMARY OF KEY MANAGEMENT CONTROLS**

Table G outlines the potential sources of asbestos contamination, the possible causes of disturbance and Site specific control measures to be implemented in conjunction with:

- Asbestos Management Procedure (Attachment 2);
- Waste and Transport Management Procedure (Appendix 3); and
- Community Consultation (Section 4.6).

**TABLE G: ACTIVITIES, POTENTIAL SOURCES OF ASBESTOS AND SITE SPECIFIC CONTROL MEASURES**

NO.	ACTIVITY	POTENTIAL ASBESTOS EXPOSURE SCENARIOS	RISK RANKING	KEY MANAGEMENT TOOLS	SITE SPECIFIC CONTROL MEASURES / ACTIONS
1.	Natural Areas Management: - Visual Inspection of wetlands and river bank - Weed spraying and mosquito control - Feral pest control - Litter control	No exposure expected during these activities on the basis that these activities can be undertaken without disturbing the surface cover or vegetation.	Low	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Erosion Management</li> <li>• Surface Inspections</li> <li>• Collection and removal of ACM Fragments</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSAs and work permits, as required.</li> <li>• Avoid uncontrolled disturbance of the capping layer and stabilisation methods along the embankments.</li> <li>• Avoid 'scrambling' up / down the embankments which could deteriorate the surface cover.</li> <li>• Undertake surface inspections to ensure surface cover of embankments are maintained particularly after heavy rainfall events to ensure the stability / compaction and vegetative surface cover remains intact / competent and are not subject to surface erosion.</li> </ul>
2.	Natural Areas Management: - Termite Control  Ongoing stabilisation / erosion management of embankments	Exposure to contaminants (asbestos) if material or vegetation in areas which have not formally been capped are disturbed or soils below the warning barrier and capping material are disturbed.	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Erosion Management</li> <li>• Surface Inspections</li> <li>• Collection and removal of any ACM Fragments</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSAs and work permits, as required.</li> <li>• Avoid 'scrambling' up / down the embankments which could deteriorate the surface cover.</li> <li>• Demarcate and contain work zone with barriers and signage.</li> <li>• Minimise disturbance of existing vegetation and soils where possible.</li> <li>• Dampen down work area (water for dust suppression)</li> <li>• Implement soil stabilisation.</li> <li>• Undertake surface inspections to ensure surface cover of embankments are maintained particularly after heavy rainfall events to ensure the stability / compaction and vegetative surface cover remains intact / competent and are not subject to surface erosion.</li> </ul>



**TABLE G: ACTIVITIES, POTENTIAL SOURCES OF ASBESTOS AND SITE SPECIFIC CONTROL MEASURES**

NO.	ACTIVITY	POTENTIAL ASBESTOS EXPOSURE SCENARIOS	RISK RANKING	KEY MANAGEMENT TOOLS	SITE SPECIFIC CONTROL MEASURES / ACTIONS
3.	<p>Construction of new infrastructure (e.g. installation of signage, benches, paths, bins and other facilities which may be planned for the public open space)</p> <p>Upgrade of existing infrastructure (e.g. culverts / bridges)</p> <p>Foreshore Restoration / Rehabilitation</p>	<p>Exposure to contaminants (asbestos) if material or vegetation in areas which have not formally been capped are disturbed or soils below the warning barrier and capping material are disturbed.</p> <p>Exposure to contaminants (asbestos) if sediments along the base of the drain, compensation basins or wetlands adjacent to the railway embankments are disturbed.</p>	Medium to High	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Surface Inspection</li> <li>• Asbestos Management Procedure</li> <li>• Waste and Transport Management Procedure</li> <li>• Air Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSAs and work permits, as required.</li> <li>• Undertake surface inspection prior to commencing works.</li> <li>• Demarcate and contain work zone with barriers and signage.</li> <li>• Establish 'Decontamination Area' at a designated entry/exit point to the work area.</li> <li>• Dampen down excavation area.</li> <li>• Ensure vehicles (including excavators) have closed cabs, appropriate ventilation.</li> <li>• Handle asbestos contaminated soils separate from all other materials.</li> <li>• Implement airborne fibre monitoring program where disturbance is for more than 1 day.</li> <li>• Reinstate clean fill cover and vegetation as applicable.</li> <li>• Wash and clean all machinery used to excavate / transport asbestos contaminated waste at the completion of works.</li> <li>• Monitor meteorological conditions and halt works if adverse weather conditions are predicted.</li> <li>• Stop work if dust cannot be controlled</li> </ul>
4.	Transport of ACM or asbestos contaminated soils	<p>Loading and unloading</p> <p>Dislodgement during transport.</p>	<p>Medium</p> <p>Medium</p>	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Waste and Transport Management Procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Wrap ACM in polyethylene sheeting or place in bags (0.2mm minimum thickness) which are subsequently sealed (see Waste and Transport Management Procedure, Appendix 4).</li> <li>• Minor amounts of asbestos contaminated soil can be disposed of in bags (0.2mm minimum thickness) which are subsequently sealed (see Waste and Transport Management Procedure, Appendix 4).</li> <li>• Dampen down soils during excavation and loading.</li> <li>• Reduce drop heights of soils.</li> <li>• All trucks used to transport asbestos contaminated soil are to be fitted with a retractable blind / cover over the truck bed.</li> </ul>

**TABLE G: ACTIVITIES, POTENTIAL SOURCES OF ASBESTOS AND SITE SPECIFIC CONTROL MEASURES**

NO.	ACTIVITY	POTENTIAL ASBESTOS EXPOSURE SCENARIOS	RISK RANKING	KEY MANAGEMENT TOOLS	SITE SPECIFIC CONTROL MEASURES / ACTIONS
5.	Stockpiling asbestos impacted soils	Weather: Heavy Rainfall	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Removal of Asbestos Infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Capture runoff if there is excessive rainfall by constructing bunds around the stockpile.</li> <li>• Minimise length of time stockpile is on Site by being prepared i.e. having transport available to dispose of off-site as soon as material is excavated.</li> </ul>
		Weather: Wind	High	<ul style="list-style-type: none"> <li>• Waste and Transport Management Procedure (Appendix 4)</li> <li>• Air Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain stockpile under damp conditions.</li> <li>• Minimise length of time stockpile is on Site by being prepared i.e. having transport available to dispose of off-site as soon as material is excavated.</li> <li>• Stabilisation (hydromulched or dustex) of stockpiles is required to be undertaken if the material is intended to remain exposed for an extended period of time (&gt;30 days) or if there is limited dust suppression (e.g. water cart access).</li> <li>• Demarcate and contain work zone including stockpile with barriers and signage.</li> <li>• Air monitoring is required where the above controls cannot be maintained.</li> </ul>

**Risk Matrix (AS/NZS 4360:2004)**

Likelihood	Consequences				
	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
A – Almost certain	H	H	E	E	E
B – Likely	M	H	H	E	E
C – Possible	L	M	H	E	E
D – Unlikely	L	L	M	H	E
E – Rare	L	L	M	H	H

**E:** Extreme risk, immediate action required

**H:** High risk, senior management action required

**M:** Moderate risk, management responsibility must be specified

**L:** Low risk, manage by routine procedures



## 5 CONTINGENCIES

The following sections outline procedures and contingency measures to be implemented in case of incident or emergency.

### 5.1 INCIDENT AND EMERGENCY PROCEDURES

- With respect to asbestos, the following constitute an incident, whereby actions may be required to prevent exposure and information can be obtained through the process of reporting and investigation, and then used to reduce future risk.
- Incidents involving asbestos must be reported in accordance with City of Canning’s procedures and timeframes.
- The minimum environmental incident response measures are summarised in Table H.
- Additional corrective actions may be necessary depending on the exact nature of the incident.

**TABLE H: ENVIRONMENTAL INCIDENT RESPONSE MEASURES**

INCIDENT	RESPONSE
Uncontrolled damage or disturbance of the capping layer and / or warning barrier.	<ol style="list-style-type: none"> <li>1. Stop work.</li> <li>2. Notify City of Canning’s Site Manager / Representative.</li> <li>3. Proceed as below whilst following advice from the City of Canning Environmental Health Department.                             <ul style="list-style-type: none"> <li>• Isolate and contain the area, where necessary, to prevent dust being generated and exposure to airborne asbestos fibres.</li> <li>• Conduct an investigation into the causes.</li> <li>• Determine what immediate actions are necessary.</li> <li>• Make recommendations for improvements to prevent similar or related incidents.</li> </ul> </li> </ol>
Uncontrolled disturbance asbestos contaminated soils.	<ol style="list-style-type: none"> <li>1. Stop work.</li> <li>2. Notify City of Canning’s Site Manager / Representative.</li> <li>3. Proceed as below whilst following advice from the City of Canning Environmental Health Department.                             <ul style="list-style-type: none"> <li>• Isolate and contain the area, where necessary, to prevent dust being generated and exposure to airborne asbestos fibres.</li> <li>• Conduct an investigation into the causes.</li> <li>• Determine what immediate actions are necessary.</li> <li>• Make recommendations for improvements to prevent similar or related incidents.</li> </ul> </li> </ol>

**TABLE H: ENVIRONMENTAL INCIDENT RESPONSE MEASURES**

INCIDENT	RESPONSE
<p>Identification of unexpected asbestos infrastructure, ACM fragments, FA or AF.</p>	<ol style="list-style-type: none"> <li>1. Stop work and establish exclusion zone.</li> <li>2. Notify City of Canning’s Site Manager / Representative.</li> <li>3. Document the subsurface inconsistency by reporting in accordance with the appropriate procedures. Assess if the LTAMP needs to be updated and do so as required.</li> <li>4. Proceed as below whilst following advice from the City of Canning Environmental Health Department. <ul style="list-style-type: none"> <li>• Isolate and contain the area, where necessary, to prevent dust being generated and exposure to airborne asbestos fibres.</li> <li>• Determine what actions are necessary to manage the area in the short and long term.</li> <li>• Make recommendations for improvements to prevent similar or related incidents.</li> </ul> </li> </ol>
<p>Identification of unexpected contamination (other than asbestos)</p>	<ol style="list-style-type: none"> <li>1. Stop work.</li> <li>2. Document the subsurface inconsistency by reporting in accordance with the appropriate procedures.</li> <li>3. Notify City of Canning’s Site Manager / Representative and Environmental Health Department who will provide further instruction.</li> </ol>
<p>Unacceptable emission/discharge event*</p>	<p>*Examples of an unacceptable discharge or emission at this site may include entrainment of contaminated soil into the stormwater network, visible dust extending beyond site boundaries, uncontrolled off-site disposal of contaminated soil, or an unacceptable discharge or emission determined by other qualitative and/or quantitative means.</p> <ol style="list-style-type: none"> <li>1. Stop work and contain Site discharge or emission where possible.</li> <li>2. Where the Site emission or discharge represents an immediate and significant environmental hazard, immediately notify the relevant emergency departments.</li> <li>3. Document the unacceptable emissions / discharges by reporting in accordance with City of Canning procedures and notify the relevant City of Canning personnel.</li> <li>4. An assessment should be undertaken to identify why the unacceptable emission/discharge occurred, identify whether a revision to the LTAMP and / or this Asbestos Management Information Plan is warranted.</li> </ol>
<p>This Asbestos Management Information Package does not appear to address the type of work proposed (and associated contamination risks) or other subsurface restrictions that may arise.</p>	<ol style="list-style-type: none"> <li>1. Notify the relevant personnel for advice prior to completing the works.</li> <li>2. Task-specific procedures may need to be developed and the LTAMP and / or this Asbestos Management Information Plan may need to be revised.</li> </ol>
<p>Community complaint</p>	<ol style="list-style-type: none"> <li>1. Document the community complaint by reporting in accordance with applicable procedures and notify the relevant personnel.</li> <li>2. Investigate the community complaint and whether works are being completed in accordance with this Asbestos Management Information Plan.</li> <li>3. An assessment should be undertaken to identify why the community member(s) was distressed, depending on which, identify whether a revision to the LTAMP and / or this Asbestos Management Information Plan is warranted.</li> </ol>

## **6 KEY MANAGEMENT REQUIREMENTS, TIMEFRAMES AND KEY PERFORMANCE INDICATORS**

Table I outlines key management requirements, timeframes to be adhered to and key performance indicators that shall be integrated into asbestos management control processes at the Site.

Consistent with roles and responsibilities outlined in Section 2.3, it is the responsibility of City of Canning to ensure LTAMP performance is monitored against the nominated KPIs.



**TABLE I: MANAGEMENT REQUIREMENTS, TIMEFRAMES AND KEY PERFORMANCE INDICATORS**

REQUIREMENT	FREQUENCY	PERFORMANCE INDICATOR	VERIFICATION	RESPONSIBLE PARTY
Review Plan	Review annually OR as required if: a) Site conditions change; or b) if additional information, relevant to the scope of the plan, becomes available.	LTAMP and Asbestos Management Information Plan remain suitable to the needs of the works and Site conditions.	<ul style="list-style-type: none"> <li>Works are implemented in accordance with the LTAMP and this Asbestos Management Information Package.</li> <li>LTAMP and Asbestos Management Information Plan are updated as necessary.</li> </ul>	City of Canning
Update Plan	Review at least every five years OR as required if: a) Site conditions change; or b) if additional information, relevant to the scope of the plan, becomes available.	LTAMP and Asbestos Management Information Plan remain suitable to the needs of the works and Site conditions.	<ul style="list-style-type: none"> <li>Works are implemented in accordance with the LTAMP and this Asbestos Management Information Package.</li> <li>LTAMP and Asbestos Management Information Plan are updated as necessary.</li> </ul>	City of Canning
Periodic Inspections and Emu-Picking	Undertake Site inspections biannually (twice per year, end of winter and end of summer).	No visible ACM.	<ul style="list-style-type: none"> <li>Site inspection records including photographs.</li> <li>ACM disposal documentation.</li> </ul>	City of Canning
Erosion Management	Undertake Site inspections biannually (twice per year, end of winter and end of summer). Implement erosion control as required based on findings of Site inspection.	Surface cover across the Site and particularly along the River edge is stable and well vegetated and asbestos contaminated soils are not exposed.	<ul style="list-style-type: none"> <li>Site inspection records including photographs.</li> </ul>	City of Canning
Community Consultation	Undertake consultation with key stakeholders in accordance with Section 4.6 prior to commencing soil disturbance works.	Key stakeholders are aware of works prior to commencing. No complaints received from the community.	<ul style="list-style-type: none"> <li>Record of notification provided to stakeholders.</li> <li>Daily site records.</li> </ul>	City of Canning
Appropriate implementation of this Asbestos Management Information Plan	Ongoing	All site workers are aware of this Asbestos Management Information Plan and associated policies and procedures.	<ul style="list-style-type: none"> <li>Maintain record of notifications provided to staff and subcontractors.</li> <li>No incidents of uncontrolled exposure.</li> </ul>	City of Canning
		No unregistered subsurface disturbances.	<ul style="list-style-type: none"> <li>Maintain subsurface disturbance register.</li> <li>No incidents or uncontrolled exposure.</li> </ul>	City of Canning
		No visible dust emissions from any materials.	<ul style="list-style-type: none"> <li>Daily site records.</li> <li>Record any community complaints.</li> </ul>	City of Canning / Approved Subcontractor
		Appropriate health and safety precautions are taken in performing works.	<ul style="list-style-type: none"> <li>HSEP, Task-specific JSEA and Asbestos Removal Control Plan are prepared and incorporate AMP control procedures.</li> <li>Appropriate PPE is being worn.</li> </ul>	City of Canning / Approved Subcontractor
		Appropriate environmental management precautions are taken in performing works.	<ul style="list-style-type: none"> <li>No environmental incidents (see below).</li> </ul>	City of Canning / Approved Subcontractor
		Areas of disturbance are appropriately reinstated (compacted) and a 'clean' surface cover is maintained.	<ul style="list-style-type: none"> <li>Recorded inspection of surface cover reinstatement / compaction.</li> <li>Inspection of surface cover by Site Owner / Representative and spot treatments as required.</li> </ul>	City of Canning / Approved Subcontractor
		No unacceptable discharges or emissions or other environmental incidents*.	<ul style="list-style-type: none"> <li>Qualitatively verified through an inspection of the works during and at the completion of works.</li> <li>In some cases environmental monitoring e.g. airborne asbestos fibre may be used to evaluate the performance of this KPI.</li> <li>Record any community complaints.</li> </ul>	City of Canning / Approved Subcontractor
		All ACM and asbestos contaminated soils arising from subsurface works that cannot be retained onsite beneath an appropriate warning barrier and capping layer is disposed of at an appropriately licenced landfill.	<ul style="list-style-type: none"> <li>Provision of waste transfer and disposal docket (MTS).</li> </ul>	City of Canning / Approved Subcontractor

\*Examples of an unacceptable discharge or emission at this site may include entrainment of contaminated soil into the stormwater network or movement offsite via erosion, visible dust extending beyond site boundaries, uncontrolled off-site disposal of contaminated soil, or an unacceptable discharge or emission determined by other qualitative and/or quantitative means. Expert advice shall be sought where environmental monitoring is required.

## 7 DOCUMENTATION, REPORTING AND COMMUNICATION

### 7.1 DOCUMENTATION REQUIRED FOR SITE WORKS

All City of Canning personnel / approved subcontractors are required to document the information listed in Table J when undertaking works within the Site.

**TABLE J: SITE WORKS DOCUMENTATION CHECKLIST**

NO.	DESCRIPTION	CHECKLIST ✓
1.	Record of visitor notifications, registration/induction of workers conducting subsurface works and any subsurface disturbance works that take place.	<input type="checkbox"/>
2.	Daily Site Records including (but not limited to): <ul style="list-style-type: none"> <li>• weather conditions;</li> <li>• observations of dust;</li> <li>• any control actions undertaken;</li> <li>• summary of works areas;</li> <li>• details of extent of excavations;</li> <li>• material handling processes;</li> <li>• soil or infrastructure removed and associated waste management procedures undertaken;</li> <li>• photographs;</li> <li>• reinstatement of any warning barrier and clean fill cover.</li> </ul>	<input type="checkbox"/>
3.	Materials tracking information for <u>all onsite</u> and <u>off-site</u> movements of material within the Site including importation of Clean Fill, temporary stockpiling, trucking and landfill docket for material disposed of off-site.	<input type="checkbox"/>
4.	Evidence of compliance with environmental management measures and plans during the course of works.	<input type="checkbox"/>
4.	All environmental sampling and monitoring works, as applicable: <ul style="list-style-type: none"> <li>• Earthworks / excavation plans and sample location plans (where applicable).</li> <li>• Chain of Custody laboratory analysis documentation; tabulated analytical results and detailed review of QA/QC results (where applicable).</li> <li>• Air monitoring records (where applicable).</li> </ul>	<input type="checkbox"/>
5.	Survey ('as cons') information.	<input type="checkbox"/>
6.	Safety or environmental incidents.	<input type="checkbox"/>
7.	Complaints / enquiries records (see Section 7.2)	<input type="checkbox"/>

## 7.2 COMPLAINTS, INCIDENTS AND EXCEEDENCES

City of Canning personnel are required to document complaints, incidents and exceedences in accordance with the City of Canning’s procedures and policies.

Approved Subcontractors are required to report complaints, environmental incidents and exceedences direct to the City of Canning in the time frame specified by the City of Canning.

Where an environmental incident occurs, an incident investigation report shall be completed and retained. Each incident should be investigated and where the control measures defined in this Asbestos Management Information Plan are found to be inadequate or no longer appropriate, this Asbestos Management Information Package shall be revised by the relevant City of Canning personnel and the overarching LTAMP updated and reissued to the DoH / DER and other stakeholders.

The information in Table K should be recorded for the purposes of reporting.

**TABLE K: INCIDENT REPORTING CHECKLIST**

NO.	DESCRIPTION	CHECKLIST ✓
1.	The source of off-site impacts or discharges, including a description of the details of the operations that were being undertaken that resulted in the discharge or impact.	<input type="checkbox"/>
2.	The duration of the environmental incident if it results in, or had the potential to result in, unacceptable off-site impacts.	<input type="checkbox"/>
3.	A description of equipment or machinery being operated at the time that caused the discharge or impact.	<input type="checkbox"/>
4.	A description of the impact management measures that were in place and being used when the discharge or impact occurred.	<input type="checkbox"/>
5.	An assessment of the urgency and immediate impacts of the incident.	<input type="checkbox"/>
6.	A description of the actions to be taken to rectify the discharges or impacts.	<input type="checkbox"/>
7.	Proposed management actions, which include: <ul style="list-style-type: none"> <li>• details of the actions taken to immediately remedy the incident;</li> <li>• a brief report on the success of those actions; and</li> <li>• a description of changes to work practices or operations that are required to ensure that the incident will not re-occur together with a timetable for implementation of those changes.</li> </ul>	<input type="checkbox"/>



## 8 REFERENCES

**Department of Environment and Conservation (DEC) (2009)** Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009).

**Department of Environment and Conservation (DEC) (2011)** A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities, March 2011.

**Department of Environment Regulation (DER) (2014)** Assessment and Management of Contaminated Sites, Contaminated Sites Guidelines, December 2014.

**Department of Health (DoH) (2009)** Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia.

**National Environment Protection Council (NEPC) (1999)** National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) 1999 (as amended 2013).

**National Occupational Health and Safety Commission (NOHSC) (2005a)** Code of Practice for the Management and Control of Asbestos in Workplaces [(NOHSC: 2018 (April 2005)].

**National Occupational Health and Safety Commission (NOHSC) (2005b)** Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (2<sup>nd</sup> Edition) [NOHSC: 3003 (2005)].

**Standards Australia (1994)** AS 1319: Safety Signs for the Occupational Environment.

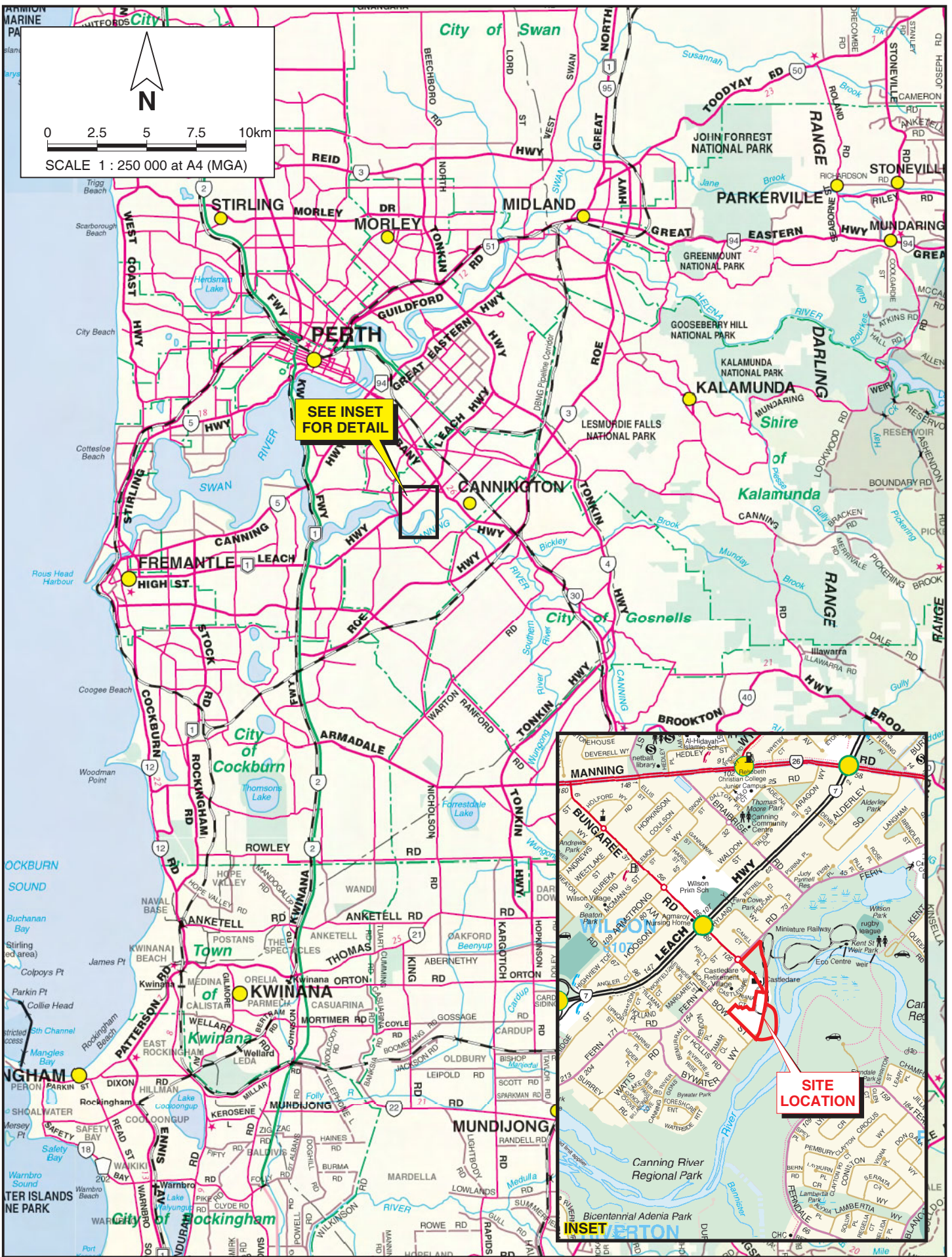
**Standards Australia (2003)** AS/NZS 1716: Respiratory Protective Devices (Standards Australia, 2003)

**Standards Australia (2004)** AS / NZS 4360:2004: Risk Management.

**Standards Australia (2004)** AS 4964: Method for the qualitative identification of asbestos in bulk samples.

**Standards Australia (2009)** AS/NZS 1715: Selection Use and Maintenance of Respiratory Protective Equipment.

## FIGURES



RNC2015-001-Phase1&2\_LTMP\_046\_ph01.dgn  
PINPOINT CARTOGRAPHICS (08) 9562 7136



Trustees of the Christian Brothers  
LONG TERM ASBESTOS MANAGEMENT PLAN  
LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 1**


Drawn: P. Lee  
Date: 4 Jun 2017

**SITE LOCATION**

Job: RNC2015-001





  
 N  
 0 25 50 75 100m  
 SCALE 1 : 2 500 at A3 (MGA)  
**Legend**  
 - - - Site Boundary  
 — Cadastral Boundary  
 - - - Easement Boundary



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 2**

Drawn: P. Lee Date: 4 Jun 2017

**SITE IDENTIFICATION**

Job: RNC2015-001

CADASTRAL SOURCE: Landgate, May 2017.  
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2017.





**Legend**

- Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Site Features
- Railway

0 25 50 75 100m

SCALE 1 : 2 500 at A3 (MGA)



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 3**

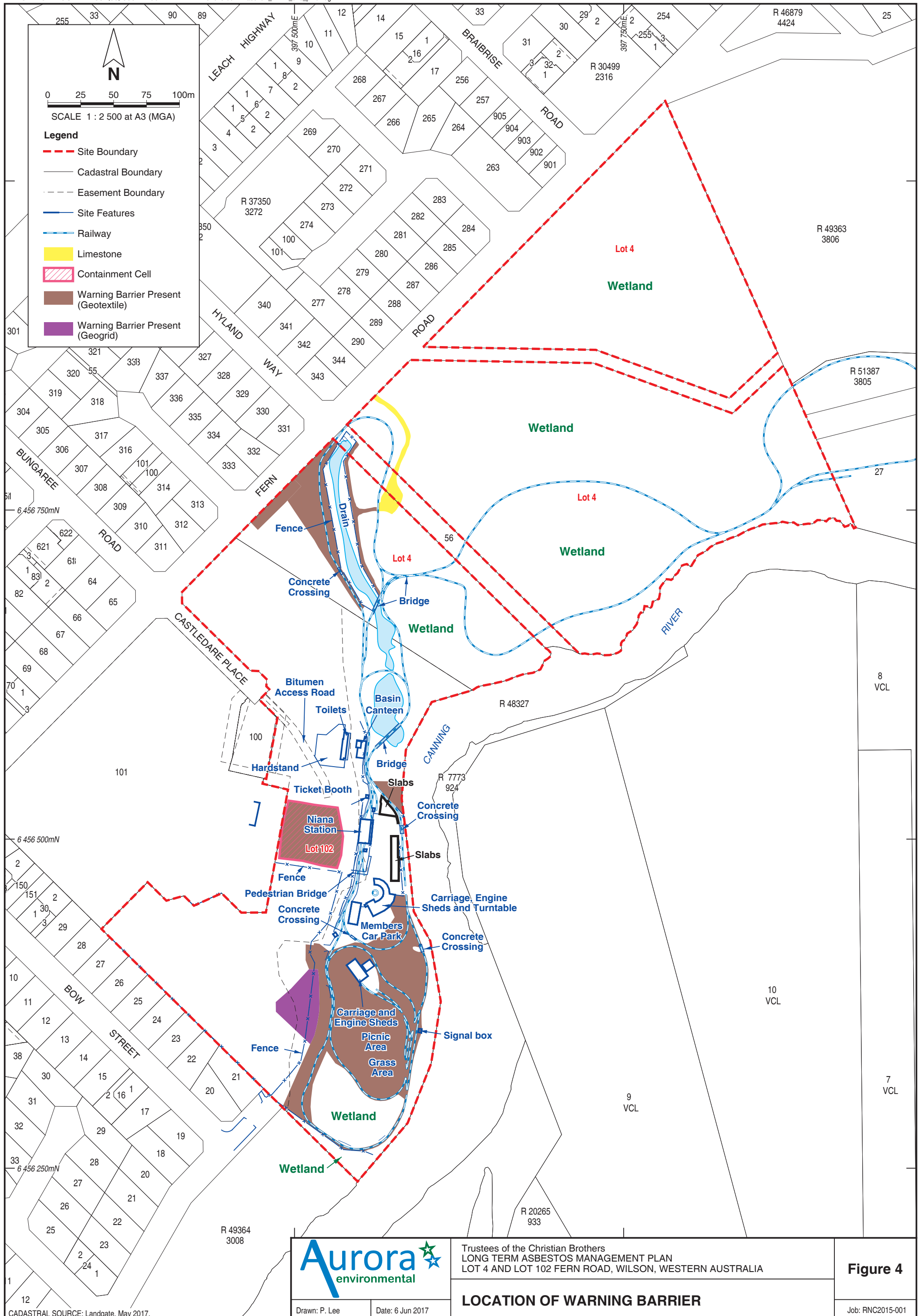
Drawn: P. Lee Date: 4 Jun 2017

**KEY SITE FEATURES**

Job: RNC2015-001

CADASTRAL SOURCE: Landgate, May 2017.  
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2017.





Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 4**

**LOCATION OF WARNING BARRIER**

Drawn: P. Lee Date: 6 Jun 2017

Job: RNC2015-001



# **ATTACHMENT 1**

## Regulatory Framework

# REGULATORY FRAMEWORK FOR ASBESTOS

## 1 BACKGROUND

In Australia, asbestos containing material (ACM) cannot be imported used or sold in any form in any product. All three of the common forms of asbestos (chrysotile – white asbestos, amosite – brown asbestos and crocidolite – blue asbestos) are, however, present in many materials used historically in buildings, structures and machinery throughout Australia.

For ACM already present in-situ, legislation requires that a responsible person at the workplace must ensure that the risk arising from the presence of asbestos in the workplace is assessed and that measures are implemented to manage the risk of exposure to airborne asbestos fibres. Responsible persons at a site include:

- An employer.
- The main contractor.
- A self-employed person; or
- Any person having control of the workplace.

The National Occupational Health and Safety Commission (NOHSC) *Code of Practice for the Management and Control of Asbestos in Workplaces [National Code of Practice for the Control of Workplace Hazardous Substances (NOHSC): 2018 (2005)]* relates specifically to managing and controlling risks from ACM in buildings, structures, friction materials, plant and equipment.

The methodology and controls outlined in the Code are generally also considered to be applicable to managing asbestos in soils also and have therefore been adopted where considered appropriate within this management plan.

The Code states that *'...in-situ asbestos containing materials must be appropriately managed to ensure that the risks of exposure to airborne fibres are minimised. The main elements of managing the risks of ACM in workplaces are to:*

- *Identify all ACM in the workplace, as far as practicable;*
- *Assess the risks associated with all ACM; and*
- *Introduce control measures to prevent, as far as practicable, the generation of airborne asbestos fibres and any exposure to airborne asbestos fibres'.*

# REGULATORY FRAMEWORK FOR ASBESTOS

## 2 LEGISLATION, CODES AND STANDARDS

In brief, legislation defines asbestos (ACM, AF and FA) as a hazardous substance and bans any new use (or re-use) or import of ACM as of 31st December 2003.

For ACM within building structures, legislation requires that those employers, main contractors, self-employed persons or persons having control of the workplace identify ACM in workplaces and assess the risk that arises from its presence (in accordance with the NOHSC Asbestos Management Code<sup>1</sup>) and implement measures to manage the risk so that people are not exposed to airborne asbestos fibres. It is also an offence to do any work with ACM without taking reasonable measures to prevent asbestos fibres entering the atmosphere and to carry out demolition work without first removing ACM.

Asbestos waste disposal is also covered through a number of legislative requirements from general occupational safety legislation to the controlled waste<sup>2</sup> regulations. Where it is necessary to assess exposure to airborne asbestos fibres, this must be carried out in accordance with the Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres<sup>3</sup>.

Contaminated sites guidelines comprising Department of Health (DoH) (2009)<sup>4</sup>, National Environment Protection Council (NEPC) (1999)<sup>5</sup> and Department of Environment Regulation (DER) Contaminated Sites Management Series<sup>6</sup> set out how sites suspected or deemed to be contaminated with asbestos are to be managed, in addition to the disposal requirements.

In Western Australia legislation, codes and standards presented in Sections 3.1 to 3.4 are applicable to this AMP. The detail of these requirements are numerous and varied and cannot be represented fully in this document, however the following sections list the applicable legislation, standards and guidance to promote further reference as necessary.

### 2.1 ACTS AND REGULATIONS

- *Occupational Safety and Health Act 1984*, Government of Western Australia.
- *Environmental Protection Act 1986*, Government of Western Australia.
- *Contaminated Sites Act 2003*, Government of Western Australia.
- *Health Act 1911*, Government of Western Australia.
- Health (Asbestos) Regulations 1992, Government of Western Australia.
- Occupational Safety and Health Regulations 1996, Government of Western Australia.
- Contaminated Sites Regulations 2006, Government of Western Australia.

---

<sup>1</sup> Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018(2005)]

<sup>2</sup> The Environmental Protection (Controlled Waste) Regulations 2004

<sup>3</sup> Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2<sup>nd</sup> Edition [NOHSC:3003(2005)]

<sup>4</sup> Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (2009)

<sup>5</sup> National Environment Protection (Assessment of Site Contamination) Amendment Measure (NEPM) 2013 (No. 1) 1999 (as amended 2013).

<sup>6</sup> Development of Sampling and Analysis Programs (Department of Environmental Protection, 2001); Reporting of Site Assessments (Department of Environmental Protection, 2001b).



## **REGULATORY FRAMEWORK FOR ASBESTOS**

### **2.2 NATIONAL BAN ON THE USE OF ASBESTOS**

- The National Model Regulations for the Control of Workplace Hazardous Substances [NOHSC:1005 (1994)] – Schedule 2, Amendments.

### **2.3 CODES OF PRACTICE AND GUIDANCE NOTES**

- Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (DoH, 2009).
- Landfill Waste Classification and Definitions 1996 (as amended) (DEC, 2009).
- National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) 1999 (as amended 2013).
- The Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018(2005)], National Occupational Health and Safety Commission, Canberra (now Safe Work Australia).
- The Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002(2005)], National Occupational Health and Safety Commission, Canberra.
- The Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)], National Occupational Health and Safety Commission, Canberra.

### **2.4 STANDARDS**

- AS 1319: Safety Signs for the Occupational Environment (Standards Australia, 1994).
- AS 4964: Method for the qualitative identification of asbestos in bulk samples (Standards Australia, 2004).
- AS/NZS 1715: Selection Use and Maintenance of Respiratory Protective Equipment (Standards Australia, 2009).
- AS/NZS 1716: Respiratory Protective Devices (Standards Australia, 2003).

## **ATTACHMENT 2**

### Asbestos Management Procedure

# ASBESTOS REMOVAL MANAGEMENT PROCEDURE

## 1 PURPOSE

The purpose of this procedure is to manage risks related to the disturbance of asbestos and to minimise potential health impacts to employees, subcontractors and members of the public.

## 2 ASBESTOS MANAGEMENT CONTROLS

### 2.1 GENERAL SITE SAFETY PROCEDURES

To minimise the exposure of workers to contamination, the following should be adhered to:

- Avoid handling of potentially contaminated soil.
- Wash hands before eating, drinking or smoking.
- Avoid activities that may introduce soil to the mouth, such as nail biting.
- Store and consume food and drink in a designated clean area.
- Remove soiled clothing and footwear before entering a designated clean area and before leaving the Exclusion Zone (see Section 2.2).
- Use PPE as specified in Section 2.4.
- Replace gloves and masks regularly throughout the day, and other equipment as required.

### 2.2 ACCESS

- Exclusion Zones around the area where asbestos impacted soils are being disturbed should be clearly demarcated as such. All persons entering the site should be made aware of the location of the Exclusion Zones.
- When disturbing works are being undertaken the fencing surrounding the Site will be signposted with warning signs to prevent unauthorized entry and disturbance. Signage is required to comply with NOHSC:2018 (2005) and Australian Standard 1319 Safety Signs for the Occupational Environment ("Danger Asbestos" signs or yellow caution tape clearly marked "Asbestos" - see Figure 1 and 2).



Figure 1 – "Danger Asbestos" signage example.



Figure 2 – "Danger Asbestos Removal In Progress" signage example.

### 2.3 LICENCE REQUIREMENT FOR ASBESTOS REMOVAL WORK

- There are two type of licences:
  - Unrestricted asbestos removal licence.
  - Restricted asbestos removal licence.



## ASBESTOS REMOVAL MANAGEMENT PROCEDURE

- The type of licence required depends on the type and quantity of asbestos or ACM that is being removed from the Site.

**TABLE A: LICENCE REQUIREMENTS**

TYPE OF LICENCE	WHAT ASBESTOS CAN BE REMOVED?
Unrestricted Asbestos Removal Licence	Can remove any amount or quantity of asbestos or ACM, including: <ul style="list-style-type: none"> <li>• Any amount of friable asbestos or ACM.</li> <li>• Any amount of ACM.</li> <li>• Any amount of non-friable asbestos or ACM</li> </ul>
Restricted Asbestos Removal Licence	Can remove: <ul style="list-style-type: none"> <li>• Any amount of non-friable asbestos or ACM (up to and exceeding 10m<sup>2</sup>) if work is supervised by a person who holds a Restricted Asbestos Removal Licence qualification.</li> </ul>
No licence required	Can remove up to 10m <sup>2</sup> of non-friable asbestos or ACM.

- Licensed asbestos removalists are not always adequately trained in the management of asbestos impacted soils. It is the DoHs preference that remediation works to manage asbestos in soil are overseen by an appropriately qualified Environmental Scientist (minimum of 3 years continuous experience with asbestos soil contamination and relevant tertiary qualifications in environmental science, science or engineering) i.e. City of Canning’s Environmental Health Department with expert support as required.

### 2.4 PERSONAL PROTECTIVE EQUIPMENT

- PPE selection is based on risk assessment (risk of fibre release and inhalation) and the nature of the work to be undertaken and the task. Table B summarises the minimum PPE recommended for various scenarios when managing asbestos.
- Additional occupation / task-specific PPE beyond that required in Table B may also be required and should be identified in the JSA.

**TABLE B: MINIMUM PPE REQUIREMENTS**

SOURCES	MINIMUM PPE
Disturbance of soils within an Exclusion Zone (only below the clean soil cover and warning barrier within the Asbestos Burial Area)	<ul style="list-style-type: none"> <li>• P2 level disposable mask.</li> <li>• Disposable gloves.</li> <li>• Disposable boot covers (otherwise boots should be decontaminated when leaving controlled areas).</li> <li>• Disposable coveralls rated type 5, category 3 (prEN ISO 13982-1) or equivalent would meet this standard.<sup>1</sup></li> </ul>

<sup>1</sup> Special attention needs to be paid to the risk of heat stress when working in hot environments. A person competent in assessing heat stress e.g. occupational hygienist should review this risk and determine the most suitable protective clothing and decontamination procedures for employees in these situations. The factors that can lead to heat stress should be considered, including temperature, humidity, air movement, exposure to a heat source, work activities and demands, how long the PPE must be worn and individual physical factors. Control measures may include:

- Selection of appropriate PPE fitted to reduce the build-up of heat.
- Adequate number of extraction units in enclosures.

## ASBESTOS REMOVAL MANAGEMENT PROCEDURE

- Cool cotton underclothing, ice vests.
- Scheduling appropriate work breaks.
- Job rotation.
- Cool drinks readily available.
- Providing a cool, shaded rest area.
- Educating subcontractors about heat stress risks and controls.

As indicated above, this procedure is not intended to outline all safety measures to be implemented onsite. Heat stress management should be assessed on a case by case basis by a person competent in assessing heat stress e.g. occupational hygienist.

- Earthworks machinery involved in disturbance of asbestos contaminated soils must have either re-circulated air or air-conditioning and fans switched off whilst working with asbestos contaminated soils. High Efficiency Particulate Air (HEPA) filters are required in all cabins of mobile plant working in asbestos impacted areas. Personnel in mobile plant, trucks or other vehicles will be responsible for the windows being closed whilst working within the asbestos impacted zone.

### 2.5 EXCAVATION METHODOLOGY

- Prior to disturbance, the work area will be dampened, either through natural rainfall or light application of water. It is important to not apply excessive moisture to the soil as this will impede excavation (and increase the weight of material to be transported off site, where applicable).
- Excavated/stockpiled material will be handled in a manner which minimises potential release and spread of asbestos by not dropping loads from heights, controlling speed of onsite mobile plant, minimising the number and surface area of any temporary stockpiles.

### 2.6 DECONTAMINATION

- A dedicated decontamination area will be established at the entry/exit point of the Exclusion Zone.
- All contaminated materials, including plastic sheeting and PPE etc. must be disposed of as asbestos waste [NOHSC:2018(2005)] within heavy duty (0.2mm thick) polyethylene bags marked as asbestos waste. The bags will be sealed with string or tape at the end of each day and transferred to a dedicated asbestos disposal container, clearly labelled as such.
- The following procedures have been written utilising the decontamination procedures outlined in the '*Code of Practice for the Safe Removal of Asbestos*' NOHSC:2002 (2005).

#### ***Tools and Equipment***

All tools should be decontaminated in the following manner:

- decontaminated using wet or dry decontamination methods as outlined in the NOHSC Code of Practice for the Safe Removal of Asbestos NOHSC:2002 (2005) i.e. fully dismantled and cleaned under controlled conditions;
- placed in sealed containers (and used for only asbestos removal work); or

## **ASBESTOS REMOVAL MANAGEMENT PROCEDURE**

- disposed of as asbestos waste.

If tools cannot be decontaminated within the asbestos work area, or are to be re-used on another project, they should be tagged to indicate possible contamination and double bagged in asbestos waste bags before being removed from the work area and disposed of in accordance with the **Waste and Transport Management Procedure**.

### ***Personal Decontamination***

- Personal decontamination must be undertaken each time employees leave the Exclusion Zone (NOHSC:2002 (2005)). This should occur within the asbestos work area so as to not transport material off site, but should be located within an area where re-contamination is minimised.
- Asbestos contaminated PPE should not be transported outside the asbestos work area except for disposal purposes.
- Disposable coveralls should be carefully peeled off inside out and then placed in an asbestos-waste container. Footwear needs to be wet-wiped. Waste shall be disposed of in accordance with the Waste and Transport Management Procedure.
- Personal respiratory protective equipment should continue to be worn until all contaminated disposable coveralls and clothing has been removed and bagged for disposal.

### ***Vehicle Decontamination***

- To prevent the spread of contaminated, a vehicle wash-down area will be provided on the exit route from the Exclusion Zone to remove any soil adhering to vehicle tyres/tracks and undercarriage.
- If required, vehicles leaving the Exclusion Zone will be cleaned by low pressure water sprays and brushing where necessary.
- Any sediments which accumulate in the wash-down area will be considered asbestos contaminated waste (unless analysed and proven otherwise) and should be managed in accordance with the Waste and Transport Management Procedure.
- The wash down area will be validated in accordance with DoH (2009) guidelines to confirm no residual asbestos is present in shallow soils.

## **2.7 STOCKPILE MANAGEMENT**

- Temporary stockpile locations for contaminated material will be agreed with a City of Canning Representative prior to implementation. Where contaminated material has been placed on natural ground (and not on an impermeable base or marker layer e.g. limestone / yellow sand pad), the underlying 0.1m of ground beneath the fill will need to be removed with the waste. Guidance on how to progress any validation sampling should be sought from an appropriate qualified person (e.g. environmental scientist).
- All stockpiles will be bunded to contain soil or surface run-off. Material used for bunding will be incorporated into the stockpile prior to burial/offsite disposal.
- Stockpiles are to be maintained under damp conditions.
- Minimise length of time stockpile is on site by being prepared i.e. having transport available to dispose of off-site as soon as material is excavated.



## ASBESTOS REMOVAL MANAGEMENT PROCEDURE

- Stabilisation (hydromulched or dustex) of stockpiles will also be undertaken if the material is intended to remain exposed for an extended period of time (>30 days) or if there is limited dust suppression (e.g. water cart access) or dust controls are inadequate.
- Cover stockpile during high winds if tie downs can be maintained practicably.
- All temporary stockpile locations are to be inspected daily by the Site Manager / Supervisor and at regular intervals.

### 3 REFERENCES

Department of Health (DoH) (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*.

International Standard Organisation (ISO) 13982-1:2004 *Protective Clothing For Use Against Solid Particulates -- Part 1: Performance Requirements for Chemical Protective Clothing Providing Protection to the Full Body Against Airborne Solid Particulates (Type 5 Clothing)*.

National Occupational Health and Safety Commission (NOHSC):2002 (2005) *Code of Practice for the Safe Removal of Asbestos*, 2<sup>nd</sup> Edition, April 2005.

National Occupational Health and Safety Commission (NOHSC):2018 (2005) *Code of Practice for the Management and Control of Asbestos in the Workplaces*, April 2005.

### 4 DEFINITIONS OF ACRONYMS OR TERMS

ACRONYM OR TERM	DEFINITION
Asbestos	The asbestiform variety of any mineral silicate belonging to the serpentine or amphibole group of rock-forming minerals and includes the asbestiform variety of the following: a) actinolite; b) grunerite or amosite (known as brown asbestos); c) anthophyllite; d) chrysotile (known as white asbestos); e) crocidolite (known as blue asbestos); and f) tremolite. Asbestos is a Class 1 carcinogen (known to cause cancer) with the main risk to health being through inhalation of respirable fibres.
Asbestos Containing Material (ACM)	Asbestos Containing Material (ACM) is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos cement fencing. This is also restricted to material that cannot pass through a 7mm x 7mm sieve. ACM usually represents a low human health risk if it has not been weathered or crushed/ abraded and is handled intact.
Asbestos Fines (AF)	Asbestos fines (AF) includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7mm x 7mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibre bundle, which can pose a considerable inhalation risk if made airborne.
Asbestos Impacted Soils	Soils that are impacted by asbestos containing material, asbestos fines and fibrous asbestos.
DoH	Department of Health
Fibrous Asbestos (FA)	Severely weathered ACM and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined by the DoH as asbestos

## ASBESTOS REMOVAL MANAGEMENT PROCEDURE

ACRONYM OR TERM	DEFINITION
	material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Examples of friable asbestos include, but are not limited to, asbestos lagging, sprayed insulation, millboard, felt and woven asbestos matting. Both ACM and FA can often be detected visually.
HEPA	High Efficiency Particulate Air
ISO	International Standard Organisation
LEV	Local exhaust ventilation
mm	Millimetre
NOHSC	National Occupational Health & Safety Commission
PPE	Personal Protective Equipment

## **ATTACHMENT 3**

### Waste and Transport Management Procedure



# ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE

## 1 PURPOSE

The purpose of this procedure is to manage risks related to the management and disposal of asbestos containing material and asbestos contaminated soils to minimise potential health impacts to employees, subcontractors, members of the public and the environment.

## 2 WASTE MANAGEMENT

### 2.1 WASTE HANDLING AND STORAGE

Asbestos waste is required to be managed and disposed of in a manner that complies with relevant regulatory requirements, prevents unacceptable environmental impacts and which permits the reduction, recycling, or re-use of materials where appropriate. The following measures apply to the management of any known or suspected asbestos containing waste.

- Depending on volumes the following options are available if asbestos material is required to be disposed of off-site.
  - For contaminated soils removed from the Site, trucks are required to be fitted with a tarpaulin to cover the load to prevent drying of the soil or dust lift-off from the soil during transport.
  - Asbestos waste, such as friable ACM, small pieces of non-friable ACM, disposable PPE and equipment, needs to be contained in heavy-duty 0.2mm (minimum thickness) polyethylene bags that are no more than 1200mm-long and 900mm-wide for ease of handling. The bags must be labelled with an appropriate warning, clearly indicating that they contain asbestos, that dust creation and inhalation should be avoided (see Figure 1). The bags will be sealed with tape at the end of each day and transferred to a dedicated asbestos disposal container.
  - Non-friable asbestos (such as ACM or infrastructure) can be:
    - a) Wrapped in the polyethylene sheeting (0.2mm minimum thickness) and may be placed directly into a skip or vehicle tray. Adhesive tape needs to be used to secure the entire length of every overlapped wrapping. Wrapped bundles of asbestos sheeting and redundant asbestos lagged pipes and equipment need to be of a size that minimises the risk of the polyethylene sheeting tearing or splitting and/or a manual handling injury occurring.
    - b) Placed directly into waste skip bins that are double lined with polyethylene sheeting (0.2mm minimum thickness).



Figure 1 – heavy duty, polyethylene, 0.2mm thick, labelled, asbestos disposal bag

## **ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE**

- Waste skip bins are required to be covered and contained within an exclusion zone (within the Exclusion Zone) until transported off site. The bins shall be dedicated for asbestos waste (i.e. not to be used for general waste), labelled as containing asbestos, and secured (locked) to prevent accidental exposure to bins contents.
- All waste should be disposed of in a timely manner.
- Any accidental misplacement of waste fill or spillages will be corrected immediately with the incident logged as an environmental incident.
- See section 3.3 for the Waste Classification process.

### **2.2 WASTE TRACKING SYSTEM PROCEDURE**

A Materials Tracking System (MTS) is required to be implemented for any subsurface works in an Exclusion Zone to account for the management of all excavated contaminated material and to ensure that all soils and waste are tracked from cradle-to-grave. The MTS will be used to manage and monitor the movement of contaminated material and will:

- Record and document the handling of clean and contaminated material using a logging sheet of estimated volumes leaving the excavations and a notation of the destination.
- Provide corrective actions to rectify any accidental misplacement or spillage of waste.
- Landfill disposal dockets (where applicable).

Management controls for the movement of a clean and contaminated materials include:

- An initial site induction for all personnel involved with site works in an Exclusion Zone.
- A Materials Tracking Log Sheet (MTLS) will be provided at the completion of earth works to document the movement of all excavated and backfilled material at the Site.
- Documentation for waste or materials tracking should include (but not be limited to) daily site records, stratigraphy of excavations, soil type observations and any waste material present, photographs, excavation surveys, management of stockpiles, records of off-site trucking movements and collection of landfill dockets.

Key performance indicators for the effective performance of the MTS are:

- Unbroken chain of documentation that tracks material from cradle-to-grave.
- All loads are identified and accounted for.
- All waste moved off-site is disposed to the appropriate class of landfill.
- Reasonable agreement between quantities calculated from survey excavations and also trucking/landfill dockets (as applicable).

Monitoring and reporting will include:

- All MTLS, trucking and landfill dockets to be summarised at the completion of each subsurface works for inclusion into future environmental reporting.
- A check of the MTS will be undertaken by the Environmental Management Team to ensure all details are being completed correctly and that material is being relocated in conformance to the MTS.
- Photographic records.

# ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE

- Copies of daily site records.

## 2.3 WASTE CHARACTERISATION

- Asbestos and asbestos cement products are classified as Special Waste - Type 1 and should be disposed of at a landfill licensed to receive this type of material.
- Excavated contaminated soil shall be disposed off-site at a facility licensed to receive Special Waste - Type 1 and in accordance with the chemical classification of the soil as determined by laboratory analytical results and 'Landfill Waste Classification and Definitions' (DEC, 1996 as amended 2009). The chemical classification of the soils should be based on the identified contaminants of concern.
- It is recommended that the advice of a competent person such as an environmental consultant be sought when considering and undertaking soil sampling and laboratory analysis. Sufficient time should be allowed to complete this task in the program.

## 2.4 TRANSPORTATION OF WASTE

The transportation and handling of all contaminated material is required to be undertaken in a safe and environmentally responsible manner, and also to minimise the volume of waste generated by excavation works requiring off-site disposal.

- All movement of material (clean and contaminated) is to be recorded using the MTS.
- Trucks are to be roadworthy and operated in accordance with transport regulations.
- All truck loads are to be within legal weight limits.
- Trucks are to use the major arterial road networks.
- Trucks will enter and exit the Site via the designated entrance.
- Trucks are to be kept to dedicated clean tracks. If trucks have entered Exclusion Zones, they must exit through a vehicle wash-down area prior to exiting the Exclusion Zone to remove any contaminated material that may be adhering to tyres and wheels.
- The road condition at the entrance/exit to the work Site will be monitored and regularly sweep/wash as necessary and particularly during periods of busy truck movements.
- Contaminated material that is required to be transported off-site can be done so once approval has been provided by the landfill operator. The landfill operator will be supplied with the necessary documentation to arrange for approval to transport the material to their facility prior to commencing. Clarification should also be sought as to whether the landfill will accept asbestos contaminated soil loose in the haulage truck or whether it is required to be bagged.

## 3 REFERENCES

Department of Environment and Conservation (DEC) (1996) *Landfill Waste Classifications and Waste Definitions*, 1996 as amended 2009.

Department of Health (DoH) (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*.



# ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE

## 4 DEFINITIONS OF ACRONYMS OR TERMS

ACRONYM OR TERM	DEFINITION
Asbestos	<p>The asbestiform variety of any mineral silicate belonging to the serpentine or amphibole group of rock-forming minerals and includes the asbestiform variety of the following:</p> <ul style="list-style-type: none"> <li>a) actinolite;</li> <li>b) grunerite or amosite (known as brown asbestos);</li> <li>c) anthophyllite;</li> <li>d) chrysotile (known as white asbestos);</li> <li>e) crocidolite (known as blue asbestos); and</li> <li>f) tremolite.</li> </ul> <p>Asbestos is a Class 1 carcinogen (known to cause cancer) with the main risk to health being through inhalation of respirable fibres</p>
Asbestos Containing Material (ACM)	<p>Asbestos Containing Material (ACM) is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos cement fencing. This is also restricted to material that cannot pass through a 7mm x 7mm sieve. ACM usually represents a low human health risk if it has not been weathered or crushed/ abraded and is handled intact</p>
Asbestos Fines (AF)	<p>Asbestos fines (AF) includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7mm x 7mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibund, which can pose a considerable inhalation risk if made airborne.</p>
Asbestos Impacted Soils	<p>Soils that are impacted by asbestos containing materials, asbestos fines and fibrous asbestos.</p>
DoH	<p>Department of Health</p>
Fibrous Asbestos (FA)	<p>Severely weathered ACM and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined by the DoH as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Examples of friable asbestos include, but are not limited to, asbestos lagging, sprayed insulation, millboard, felt and woven asbestos matting. Both ACM and FA can often be detected visually.</p>
Mm	<p>Millimetre</p>
MTLS	<p>Materials Tracking Log Sheet</p>
MTS	<p>Materials tRacking System</p>
NOHSC	<p>National Occupational Health and Safety Commission</p>
PPE	<p>Personal Protective Equipment</p>

## **APPENDIX 3**

Asbestos Management Information  
Water Corporation

## Appendix 3

### Asbestos Management Information - Wilson Main Drain Water Corporation



Prepared For: Water Corporation  
629 Newcastle Street  
Leederville  
Western Australia 6007

Report Number: AP2016-118-Appendix 3

Report Version: V1

Report Date: 6 June 2017



Document No: RNC2015\_001\_Phase1&2\_LTMP\_046\_pl\_V1-Appendix 3

Report No: AP2016-118-Appendix 3

Version: V1

Author: Pamela Lee  
Senior Environmental Scientist



Signature

6 June 2017

Date

Approved by: Greg Milner  
Director - Contaminated Sites



Signature

6 June 2017

Date

## DISTRIBUTION

NO. OF COPIES	REPORT FILE NAME	VERSION	DATE	PREPARED FOR
1	RNC2015-001_LTMP_046_PL_V0.1	V0.1	28 September 2016	Aurora Environmental
1	RNC2015-001_LTMP_046_PL_V0.2	V0.2	18 October 2016	Water Corporation
1	RNC2015-001_LTMP_046_PL_V0.3	V0.3	27 February 2017	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Water Corporation
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Trustees of the Christian Brothers c/o Richard Noble & Co.
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Department of Environment Regulation
1	RNC2015-001_LTMP_046_PL_V1	V1	6 June 2017	Department of Health

## TABLE OF CONTENTS

<b>ATTACHMENTS</b>	<b>6</b>
<b>LIST OF ABBREVIATIONS</b>	<b>7</b>
<b>KEY DEFINITIONS</b>	<b>8</b>
<b>1 SITE IDENTIFICATION</b>	<b>9</b>
<b>2 PURPOSE OF THIS PLAN</b>	<b>10</b>
2.1 APPLICABILITY OF THIS MANAGEMENT PLAN	10
2.2 CONTROL AND UPDATE OF DOCUMENTS	11
2.3 ROLES AND RESPONSIBILITIES	12
<b>3 HAZARD IDENTIFICATION</b>	<b>14</b>
3.1 OTHER POTENTIAL CONTAMINANTS	19
3.2 POTENTIAL EXPOSURE PATHWAYS	19
<b>4 OTHER CONSTRAINTS</b>	<b>20</b>
<b>5 ASBESTOS MANAGEMENT FRAMEWORK</b>	<b>21</b>
5.1 POLICIES AND PROCEDURES	21
5.2 QUALIFICATIONS REQUIRED TO MANAGE ASBESTOS IN SOILS	21
5.3 INDUCTION, TRAINING AND SAFETY DOCUMENTATION MATRIX	21
5.4 COMMUNITY CONSULTATION	23
5.5 SUMMARY OF KEY MANAGEMENT CONTROLS	23
<b>6 CONTINGENCIES</b>	<b>29</b>
6.1 INCIDENT AND EMERGENCY PROCEDURES	29
<b>7 KEY MANAGEMENT REQUIREMENTS, TIMEFRAMES AND KEY PERFORMANCE INDICATORS</b>	<b>31</b>
<b>8 DOCUMENTATION, REPORTING AND COMMUNICATION</b>	<b>33</b>
8.1 DOCUMENTATION REQUIRED FOR SITE WORKS	33
8.2 COMPLAINTS, INCIDENTS AND EXCEEDENCES	34
8.3 ASBESTOS EXPOSURE	35
<b>9 REFERENCES</b>	<b>36</b>



**TABLES IN TEXT**

Table A.	Roles and Responsibilities
Table B.	Hazard Identification
Table C.	Potential Asbestos Exposure Scenarios
Table D.	Training-Induction-Safety Documentation Requirements
Table E.	Activities, Potential Sources of Asbestos and Site Specific Control Measures
Table F.	Environmental Incident Response Measures
Table G.	Management Requirements, Timeframes and Key Performance Indicators
Table H.	Site Works Documentation Checklist
Table I.	Incident Reporting Checklist

## **ATTACHMENTS**

### **FIGURES**

- Figure 1. Site Location
- Figure 2. Site Identification
- Figure 3. Key Site Features

### **APPENDICES**

- Attachment 1. Site Survey Plan (Indicative Draft Subdivision Plan)
- Attachment 2. Water Corporation - Asbestos Policy (PCY382)
- Attachment 3. Water Corporation - Working With Asbestos Procedure (HSEAA-P-131)
- Attachment 4. Waste and Transport Management Procedure

### LIST OF ABBREVIATIONS

DCA	Development Control Area
DEC	Department of Environment and Conservation
DER	Department of Environment Regulation
DoH	Department of Health
DPaW	Department of Parks and Wildlife
JSEA	Job Safety and Environment Assessment
LTAMP	Long Term Asbestos Management Plan
m bgl	meters below ground level
OHS	Occupational Health and Safety
SEAA	Safety, Environmental and Aboriginal Affairs



## KEY DEFINITIONS

<b>ACM</b>	<b>Asbestos Containing Material</b> which is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos fencing or vinyl tiles. This is also restricted to material that cannot pass through a 7mm x 7mm sieve. Can be detected visually.
<b>FA</b>	<b>Fibrous Asbestos</b> material such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Can be detected visually.
<b>AF</b>	<b>Asbestos Fines</b> includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7mm x 7mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibres, which can pose a considerable inhalation risk if made airborne.

## 1 SITE IDENTIFICATION

This management information relates specifically to the portion of Lot 4 and Lot 102, Fern Road, Wilson, Western Australia as identified in Attachment 1.

<b>NOTE</b>	This LTAMP has been prepared in advance of any subdivision being formalised and as a consequence it is expected the LTAMP will be updated upon agreement of the subdivided boundaries and lot ownership to reflect those administrative changes.
-------------	--

## 2 PURPOSE OF THIS PLAN

The purpose of this plan is to provide a framework for the ongoing management of asbestos contaminated soils so that the health and safety of Water Corporations employees and subcontractors, surrounding receptors including users of the Canning River Regional Park, Castledare Miniature Railway and nearby residents and the general environment are protected from adverse impacts that could eventuate from uncontrolled disturbance of soils within the Site.

Specific objectives of the plan include:

1. Compliance with regulatory requirements for the preparation and implementation of an asbestos management plan.
2. Prevent uncontrolled exposure to asbestos.
3. Ensure that any works which have the potential to disturb asbestos contaminated soils; are planned for and managed appropriately.

### 2.1 APPLICABILITY OF THIS MANAGEMENT PLAN

- This plan is applicable in perpetuity to the Site unless further remedial works are undertaken such that management requirements are no longer applicable.
- This plan shall also be implemented where one or more of the following scenarios apply:
  - a) Where works are required to be undertaken within the Site (as per Attachment 1).
  - b) Where subsurface contamination either will or has the potential to become incidentally exposed.
- Undertaking activities in non-compliance of this plan which lead to inappropriate handling of asbestos contaminated soils may cause contamination of land and possible risks to human health. A person or body corporate which causes contamination may be prosecuted under the *Contaminated Sites Act 2003* and its accompanying regulations and be responsible for any subsequent remediation works required.



## 2.2 CONTROL AND UPDATE OF DOCUMENTS

The overarching Long Term Asbestos Management Plan (LTAMP) and accompanying 'Asbestos Management Information' are:

- considered to be live documents;
- should reflect Site conditions; and
- are required to be updated if additional information, relevant to the scope of the plan, becomes available, e.g. additional remediation works that changes the footprint of the contamination.

<b>NOTE</b>	It is expected that the Water Corporation will formally manage the Wilson Main Drain as identified in Attachment 1. This plan has been prepared in advance of any subdivision being formalised and as a consequence it is expected the LTAMP will be updated upon agreement of the sub-divided boundaries and lot ownership to reflect those administrative changes.
-------------	--

- An appropriate representative from the Water Corporation is required to:
  - be aware of Water Corporations responsibilities as outlined within this plan;
  - oversee the implementation of this document; and
  - undertake reviews and updates of this document.
- It is recommended that the overarching LTAMP and this 'Asbestos Management Information' are reviewed at intervals no greater than 5 years apart and updated as and when required.
- It is recommended that the review is undertaken by an appropriately qualified person, defined by the Department of Health (DoH) (2009) as having a minimum of 3 years continuous experience with asbestos soil contamination and relevant tertiary qualifications in environmental science, science or engineering.
- In the event that a management measure prescribed in this plan is found to be ineffective to control possible exposure to asbestos, the Water Corporation should implement the necessary amendments in consultation with the Government of Western Australia and the DoH / Department of Environment Regulation (DER).
- All stakeholders are required to hold an electronic copy of the most up to date version of the LTAMP and supporting documentation at all times.

## 2.3 ROLES AND RESPONSIBILITIES

- Roles and responsibilities for the Water Corporation and other stakeholders are presented in Table A.
- It is the responsibility of the Water Corporation to ensure these responsibilities are fulfilled.
- The responsibilities listed in Table A relate specifically to the management of asbestos contaminated fill material do not replace other regulatory responsibilities as outlined in other Acts and Regulations, e.g. Occupational Health and Safety Act 1994 (the OHS Act) and the Occupational Safety and Health Regulations 1996 (the OSH regulations) supported by codes of practice and guidance notes.

**TABLE A: ROLES AND RESPONSIBILITIES**

ROLE	RESPONSIBILITIES
Site Owner / Management Authority (Water Corporation)	<ol style="list-style-type: none"> <li>1. Maintain control over access to the Site.</li> <li>2. Maintain records and documentation relevant to the plan.</li> <li>3. Duty to take reasonable care for their own safety and that of others who may be affected by their acts or omissions.</li> <li>4. Ensure that the hazards onsite are made clear to all Water Corporation personnel (see Lupin) attending the Site and they are familiar with this plan for their work area as necessary.</li> <li>5. Ensure any party required to access the Site are provided with the current version of the LTAMP and this Asbestos Management Information applicable to the Wilson Main Drain and are appropriately briefed.</li> <li>6. All Water Corporation personnel authorised to engage subcontractors must be made aware of their responsibilities under this plan.</li> <li>7. If subcontractors work will involve potential disturbance of asbestos contaminated fill material, ensure that the subcontractor is informed and competent to carry out the work and, where relevant holds the relevant licenses and competencies for asbestos removal work (see Section 5 for additional information).</li> <li>8. Ensure that the scope of work and the hazards to be encountered are made clear to all subcontractors. Ensure the subcontractors job safety and environment assessment (JSEA), or similar, acknowledges the identified and potential hazards on Site by reviewing and approving their documentation prior to commencing work.</li> <li>9. Ensure management tasks and timeframes outlined in Section 7 are adhered to.</li> <li>10. Seek expert advice where required, e.g. competent persons as described by the DoH (2009) (see Section 5.2).</li> <li>11. Comply with Water Corporation policies, procedures and instructions, and support facilitated activities relating to asbestos risk management.</li> <li>12. Report any incident involving the <u>uncontrolled</u> disturbance of ACM or potential exposure to asbestos fibres to the responsible person for the area in accordance with Water Corporation procedures. See Section 8.3 regarding Water Corporations Health Surveillance Guidelines.</li> </ol>

**TABLE A: ROLES AND RESPONSIBILITIES**



ROLE	RESPONSIBILITIES
Subcontractor Manager / Supervisor engaged by Water Corporation (directly or indirectly)	<ol style="list-style-type: none"> <li>1. Obtain approval from Water Corporation for consultants and contractors undertaking works.</li> <li>2. Comply with policies, procedures and instructions provided by Water Corporation.</li> <li>3. Refrain from any act which could put them or any other Site users or occupants at risk of exposure to asbestos.</li> <li>4. Provide task-specific JSEA documents (or equivalent) which acknowledges the information provided in this 'Asbestos Management Information' plan and incorporate appropriate control procedures based on the information provided and conditions expected onsite.</li> <li>5. Exercise due diligence in managing works such that the works are carried out in accordance with protocols outlined in this Asbestos Management Information plan.</li> <li>6. Report any incident involving the <u>uncontrolled</u> disturbance of ACM or potential exposure to asbestos fibres to the responsible person in Water Corporation in accordance with Water Corporation procedures. See Section 7.3 regarding the Asbestos Exposure Register.</li> <li>7. Seek expert advice where required.</li> </ol>





### **3 HAZARD IDENTIFICATION**

This section of the plan identifies potential hazards associated with asbestos within the Site.

**TABLE B: HAZARD IDENTIFICATION**


AREA	ASBESTOS CONTAMINATION	KEY MANAGEMENT FEATURES PRESENT	PHOTOGRAPHS
<p>Eastern Embankment of Drain within Fenced Area</p>	<p>ACM and AF present in soils below warning barrier and capping layers.</p>	<ul style="list-style-type: none"> <li>• Capped with warning barrier (orange mesh)</li> <li>• Clean Fill</li> <li>• Jute matting</li> <li>• Vegetation (stolon / runner type) for stabilisation</li> <li>• Access to the embankment is restricted via fencing and signage</li> <li>• The base of the drain, close to the watermark, is well vegetated with riparian type plants including sedges and rushes</li> </ul>	 <p>Jute Matting Clean Fill Capping Material (orange sand) Orange mesh warning barrier</p>
		<p><b>KEY MANAGEMENT FEATURES REQUIRED</b></p> <ul style="list-style-type: none"> <li>• Fencing currently in place is maintained</li> <li>• Embankment remains undisturbed</li> <li>• Access continues to be restricted to Water Corporation or approved Subcontractor’s informed of Site conditions via this Asbestos Management Information plan</li> <li>• Embankment is managed through periodic inspections</li> <li>• Any erosion of the embankment is addressed to prevent reduction in the capping layer thickness</li> <li>• Embankment continues to be stabilised with vegetation</li> <li>• Roots of mature eucalypt and melaleuca trees along the embankments to be managed to ensure they do not uplift the capping layer and exposure underlying soils (see Section 5 regarding other constraints to be managed when working within the Site)</li> <li>• See Section 6 for additional information</li> </ul>	



**TABLE B: HAZARD IDENTIFICATION**

AREA	ASBESTOS CONTAMINATION	KEY MANAGEMENT FEATURES PRESENT	PHOTOGRAPHS
<p>Western Embankment of Drain within Fenced Area</p>	<ul style="list-style-type: none"> <li>• ACM co-located with construction and demolition material in northern end of drain (adjacent to Fern Road).</li> <li>• Occasional ACM fragments in good condition on the surface of the western bank.</li> <li>• Rare AF in shallow soils (0.0-0.5 meters below ground level bgl [m bgl]).</li> <li>• Deeper soils (&gt;0.5m below surface of embankment) not characterised</li> <li>• As portions of the stormwater drains embankments are not fully stabilised, there is the ongoing potential for asbestos to be exposed and mobilised via erosion and released into the waterway</li> </ul>	<ul style="list-style-type: none"> <li>• Jute matting being progressively placed to prevent erosion</li> <li>• Planting to stabilise embankment.</li> <li>• Access to the embankment is restricted via fencing and signage.</li> </ul>	
		<p><b>KEY MANAGEMENT ACTIONS REQUIRED</b></p> <ul style="list-style-type: none"> <li>• Fencing currently in place is maintained</li> <li>• Embankment remains undisturbed</li> <li>• Access continues to be restricted to Water Corporation or approved Subcontractor's informed of Site conditions via this Asbestos Management Information document</li> <li>• Embankment is managed through periodic inspections, emu-picking of any ACM identified on the surface and any erosion of the embankment is addressed to prevent exposure of uncharacterised soils (&gt;0.5m bgl)</li> <li>• Embankment is ultimately managed in a manner similar to the eastern bank i.e. stabilised with vegetation</li> <li>• See Sections 3.1, 4 and 5 for additional information.</li> </ul>	



**TABLE B: HAZARD IDENTIFICATION**

AREA	ASBESTOS CONTAMINATION	KEY MANAGEMENT FEATURES PRESENT	PHOTOGRAPHS
<p>Drain Embankments and Compensation Basin Outside of Fenced Area</p>	<ul style="list-style-type: none"> <li>• ACM and AF expected in shallow soils below vegetative surface cover.</li> <li>• As portions of the stormwater drains embankments are not fully stabilised, there is the ongoing potential for asbestos to be exposed and mobilised via erosion and released into the waterway.</li> <li>• From a preliminary inspection, the culverts appear to be constructed of concrete; however the potential for buried and likely redundant infrastructure within the Site which contains ACM cannot be discounted.</li> </ul>	<ul style="list-style-type: none"> <li>• Embankments largely established by well-established vegetation and thick mulch cover.</li> <li>• Ballast associated with adjacent miniature railway train tracks (outside of Water Corporations management control area) are retained with plastic edging. This prevents ongoing erosion at the top of the embankment</li> </ul>	

		KEY MANAGEMENT ACTIONS REQUIRED	
		<ul style="list-style-type: none"><li>• Embankments remain undisturbed</li><li>• Embankments are managed through periodic inspections, emu-picking of any ACM identified on the surface and any erosion of the embankment is addressed to prevent exposure of asbestos</li><li>• Embankments are ultimately managed in a manner similar to those further to the north along the drainage alignment i.e. warning barrier, clean fill capping layer and stabilised with vegetation</li><li>• Any material which is excavated and cannot be retained onsite beneath a warning barrier and capping layer is required to be characterised<sup>1</sup> and disposed of appropriately to a licensed landfill.</li><li>• See Sections 3.1, 4 and 5 for additional information.</li></ul>	 

<sup>1</sup> Soils are required to be characterised in accordance with ‘Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009)’ (Department of Environment and Conservation (DEC) (2009).

### 3.1 OTHER POTENTIAL CONTAMINANTS

This plan relates specifically to asbestos in soil, however other contaminants may also potentially be present in soils and groundwater as a result of the Sites use as a stormwater drain e.g. hydrocarbons and heavy metals may accumulate from surface runoff over time in sediments, use of herbicides for control of invasive plant species, use of insecticides to manage for example mosquitos. Appropriate management measures to ensure people accessing the Site are informed of the potential hazards associated with other potential contaminants.

### 3.2 POTENTIAL EXPOSURE PATHWAYS

An ‘exposure pathway’ is a means by which a population or individual (‘receptor’) may be exposed to site-derived contaminants. Whenever one or more of the exposure pathway elements are missing, the exposure pathway is incomplete i.e. there is no exposure and therefore no risk to human health and/or the environment. The relationship between source, receptor and pathway in the context of asbestos contamination and uncontrolled subsurface disturbance related hazards are summarised in Table C.

**TABLE C: POTENTIAL ASBESTOS EXPOSURE SCENARIOS**

SOURCE	RELEASE MECHANISM	EXPOSURE ROUTE	RECEPTOR
Disturbance of asbestos contaminated soils	<ul style="list-style-type: none"> <li>Retention in soil.</li> <li>Migration in soil and dust.</li> <li>Windblown dust during soil disturbance works.</li> <li>Movement through erosion of soil or surface water runoff.</li> </ul>	Inhalation (particulates)	<ul style="list-style-type: none"> <li>Site workers onsite.</li> <li>Site workers / subcontractors undertaking activities that disturb contaminated soil.</li> <li>Off-site communities where generated dust extends beyond the Site boundary.</li> </ul>
Disturbance of sediments in base of drain or compensation basin	<ul style="list-style-type: none"> <li>Retention in sediments.</li> <li>Migration in sediments and water.</li> </ul>	Inhalation (particulates) (if sediments dry out)	<ul style="list-style-type: none"> <li>Site workers onsite.</li> <li>Site workers / subcontractors undertaking activities that disturb contaminated sediments.</li> <li>Off-site communities where asbestos impacted sediments extend beyond the Site boundary i.e. discharged to the Canning River.</li> </ul>



## 4 OTHER CONSTRAINTS

The location of the Site presents a number of issues which need to be considered and managed appropriately when undertaking any works within the Site. These constraints include:

- The Site is located within a Development Control Area (DCA) as defined by the Department of Parks and Wildlife (DPaW). DCAs include the waters of the Swan and Canning rivers and adjoining parks and recreation reserves. Works within the DCA may require approval from the DPaW and enquiries should be made to determine the process for development approvals applicable to any proposed works.
- Wetlands within Lot 4 and Lot 102 are classified as Conservation Management Category. Unauthorised development or clearing is not appropriate and consultation with DPaW and DER should be undertaken if any works are proposed.
- Clearing native vegetation is an offence, unless done under a clearing permit, or the clearing is for an exempt purpose. The DER is responsible for administering the clearing provisions of the *Environmental Protection Act 1986* (EP Act).
- The City of Canning and / DPaW should be consulted to obtain guidance on the management of Phytophthora Dieback to ensure that Dieback is not spread when works are undertaken.
- Aboriginal Heritage is required to be considered and managed when planning / undertaking subsurface disturbance works within Site.

## **5 ASBESTOS MANAGEMENT FRAMEWORK**

### **5.1 POLICIES AND PROCEDURES**

Water Corporation is committed to ensuring that asbestos is appropriately managed and controlled to protect the health and well-being of employees, contractors, the community and the environment.

All personnel working with the Site are required to prepare a Health Safety Environmental Plan specific to the task being undertaken. The plan is required to be prepared in accordance with Water Corporations Safety and Asbestos Management Framework which include (as a minimum):

- Asbestos Policy (PSY382) (Attachment 2)
- Working with Asbestos Procedure (HSEAA-P-131) (Attachment 3)
- Identification, Assessment and Management of Asbestos Procedure (HSEAA-P-132)
- Health Surveillance Control

The plan is required to be approved by Water Corporation prior to commencement of the works.

### **5.2 QUALIFICATIONS REQUIRED TO MANAGE ASBESTOS IN SOILS**

The *'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia'* (Department of Health (DoH), 2009) indicate that licensed asbestos removalists are not always adequately trained in the management of asbestos impacted soils. It is DoHs preference that remediation works to manage asbestos in soil are overseen by an appropriately qualified Environmental Scientist (minimum of 3 years continuous experience with asbestos soil contamination and relevant tertiary qualifications in environmental science, science or engineering) i.e. Water Corporations SEAA with expert support as required.

### **5.3 INDUCTION, TRAINING AND SAFETY DOCUMENTATION MATRIX**

Table D presents induction, training and safety documentation requirements which have been summarised from the previous sections.

**TABLE D: TRAINING-INDUCTION-SAFETY DOCUMENTATION REQUIREMENTS**

ACTIVITY	TRAINING-INDUCTION-SAFETY DOCUMENTATION REQUIREMENTS						
	JSEA / STEP BACK	SITE INDUCTION	HSEP	ASBESTOS AWARENESS (#Q4768)	THIS ASBESTOS MANAGEMENT INFORMATION PLAN *	ASBESTOS REMOVAL CONTROL PAN	OTHER
Site Inspection	✓	✓	NR	NR	NR	NR	As Requested By Water Corporation
Site Management / Maintenance Works <u>excluding intrusive earthworks</u>	✓	✓	✓	✓	✓	NR	As Requested By Water Corporation
Intrusive earthworks	✓	✓	✓	✓	✓	✓	As Requested By Water Corporation

NR – Not Required

\*Including Waste and Transport Management Procedure and Water Corporations Asbestos Management Framework: Asbestos Policy (PSY382); Working with Asbestos Procedure (HSEAA-P-131); and Identification, Assessment and Management of Asbestos Procedure (HSEAA-P-132).



## **5.4 COMMUNITY CONSULTATION**

Any future works within the Site have the potential to disrupt / concern the surrounding community and therefore the following consultation measures shall be implemented in accordance with DER guideline '*Assessment and Management of Contaminated Sites*' (DER, 2014):

- Works shall be implemented in a manner that minimises disruption to the community.
- Property owners / occupants on land immediately adjacent to the Site shall be made aware of the works and any particular precautions that are in place. Effort in relation to this aspect of the consultation process should be considered in the context of the particular scale and risks associated of the works proposed.
- Adequate information shall be made available by the Water Corporation to concerned parties about the nature of works, the presence of contamination, and measures in place to complete the works safely.
- Community complaints shall be formally documented and responded to in a timely fashion.

## **5.5 SUMMARY OF KEY MANAGEMENT CONTROLS**

Table E outlines the potential sources of asbestos contamination, the possible causes of disturbance and Site specific control measures to be implemented in conjunction with:

- Water Corporations Asbestos Management Framework (as per Section 5.1 to 5.3);
- Community Consultation (Section 5.4); and
- Waste and Transport Management Procedure (Attachment 4).

**TABLE E: ACTIVITIES, POTENTIAL SOURCES OF ASBESTOS AND SITE SPECIFIC CONTROL MEASURES**

NO.	ACTIVITY	POTENTIAL ASBESTOS EXPOSURE SCENARIOS	RISK RANKING	KEY MANAGEMENT TOOLS	SITE SPECIFIC CONTROL MEASURES / ACTIONS
1.	Visual Inspection of stormwater drain, embankments and compensation basin Weed spraying and mosquito control	No exposure expected during these activities on the basis that these activities can be undertaken from the tops of the embankments.	Low	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Erosion Management</li> <li>• Surface Inspections</li> <li>• Collection and removal of ACM Fragments</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSEAs / SWMS and work permits, as required.</li> <li>• Avoid uncontrolled disturbance of the capping layer and stabilisation methods along the embankments.</li> <li>• Avoid ‘scrambling’ up / down the embankments which could deteriorate the surface cover.</li> <li>• Undertake surface inspections to ensure surface cover of embankments are maintained particularly after heavy rainfall events to ensure the stability / compaction and vegetative surface cover remains intact / competent and are not subject to surface erosion.</li> </ul>
2.	Stormwater / sediment sampling	Exposure to contaminants (asbestos) if embankment material which has not capped is disturbed or sections of embankment below the warning barrier and capping material are disturbed.	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Erosion Management</li> <li>• Surface Inspections</li> <li>• Collection and removal of any ACM Fragments</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSEAs / SWMS and work permits, as required.</li> <li>• Avoid uncontrolled disturbance of the capping layer and stabilisation methods along the embankments.</li> <li>• Avoid ‘scrambling’ up / down the embankment which could deteriorate the surface cover.</li> <li>• Store sediment samples in sealed containers.</li> </ul>
		Exposure to contaminants (asbestos) if sediments are disturbed.	Low- Medium *Low if sediments are damp or wet; Medium if sediments are dry		

**TABLE E: ACTIVITIES, POTENTIAL SOURCES OF ASBESTOS AND SITE SPECIFIC CONTROL MEASURES**

NO.	ACTIVITY	POTENTIAL ASBESTOS EXPOSURE SCENARIOS	RISK RANKING	KEY MANAGEMENT TOOLS	SITE SPECIFIC CONTROL MEASURES / ACTIONS
3.	Ongoing stabilisation / erosion management of embankments	Exposure to contaminants (asbestos) if embankment material which has not capped is disturbed or sections of embankment below the warning barrier and capping material are disturbed.	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Erosion Management</li> <li>• Surface Inspections</li> <li>• Collection and removal of any ACM Fragments</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSEAs / SWMS and work permits, as required.</li> <li>• Avoid ‘scrambling’ up / down the embankments which could deteriorate the surface cover.</li> <li>• Demarcate and contain work zone with barriers and signage.</li> <li>• Minimise disturbance of existing vegetation and soils where possible.</li> <li>• Dampen down work area (water for dust suppression)</li> <li>• Implement soil stabilisation.</li> <li>• Undertake surface inspections to ensure surface cover of embankments are maintained particularly after heavy rainfall events to ensure the stability / compaction and vegetative surface cover remains intact / competent and are not subject to surface erosion.</li> </ul>
4.	Clearing blockages in culverts  Clearing weeds	Exposure to contaminants (asbestos) if embankment material which has not capped is disturbed or sections of embankment below the warning barrier and capping material are disturbed.  Exposure to contaminants (asbestos) if sediments along the base of the drain or compensation basin are disturbed.	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Surface Inspections</li> <li>• Collection and Removal of ACM Fragments</li> <li>• Sediment Management</li> <li>• Transport Management</li> <li>• Air Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSEAs / SWMS and work permits, as required.</li> <li>• Undertake surface inspection prior to excavating and collect any ACM observed.</li> <li>• Demarcate and contain work zone with barriers and signage.</li> <li>• Establish ‘Decontamination Area’ at a designated entry/exit point to the work area.</li> <li>• Dampen down excavation area.</li> <li>• Ensure vehicles (including excavators) have closed cabs, appropriate ventilation.</li> <li>• Handle asbestos contaminated soils separate from all other materials.</li> <li>• Implement airborne fibre monitoring program where disturbance is for more than 1 day.</li> <li>• Reinstate clean fill cover and vegetation as applicable.</li> </ul>



**TABLE E: ACTIVITIES, POTENTIAL SOURCES OF ASBESTOS AND SITE SPECIFIC CONTROL MEASURES**

NO.	ACTIVITY	POTENTIAL ASBESTOS EXPOSURE SCENARIOS	RISK RANKING	KEY MANAGEMENT TOOLS	SITE SPECIFIC CONTROL MEASURES / ACTIONS
					<ul style="list-style-type: none"> <li>• Wash and clean all machinery used to excavate / transport asbestos contaminated waste at the completion of works.</li> <li>• Monitor meteorological conditions and halt works if adverse weather conditions are predicted.</li> <li>• Stop work if dust cannot be controlled</li> </ul>
5.	<p>Excavation within embankments of drain or compensation basin</p> <p>Upgrade of culverts / bridges</p>	<p>Exposure to contaminants (asbestos) if embankment material which has not capped is disturbed or sections of embankment below the warning barrier and capping material are disturbed.</p>	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Surface Inspection</li> <li>• Collection and Removal of ACM Fragments</li> <li>• Waste and Transport Management Procedure</li> <li>• Air Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Site induction, JSEAs / SWMS and work permits, as required.</li> <li>• Undertake surface inspection prior to excavating and collect any ACM observed.</li> <li>• Demarcate and contain work zone with barriers and signage.</li> <li>• Establish 'Decontamination Area' at a designated entry/exit point to the work area.</li> <li>• Dampen down excavation area.</li> <li>• Ensure vehicles (including excavators) have closed cabs, appropriate ventilation.</li> <li>• Handle asbestos contaminated soils separate from all other materials.</li> <li>• Implement airborne fibre monitoring program where disturbance is for more than 1 day.</li> <li>• Reinstate clean fill cover and vegetation as applicable.</li> <li>• Wash and clean all machinery used to excavate / transport asbestos contaminated waste at the completion of works.</li> <li>• Monitor meteorological conditions and halt works if adverse weather conditions are predicted.</li> <li>• Stop work if dust cannot be controlled</li> </ul>

**TABLE E: ACTIVITIES, POTENTIAL SOURCES OF ASBESTOS AND SITE SPECIFIC CONTROL MEASURES**

NO.	ACTIVITY	POTENTIAL ASBESTOS EXPOSURE SCENARIOS	RISK RANKING	KEY MANAGEMENT TOOLS	SITE SPECIFIC CONTROL MEASURES / ACTIONS
6.	Transport of ACM or asbestos contaminated soils	Loading and unloading	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Waste and Transport Management Procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Wrap ACM in polyethylene sheeting or place in bags (0.2mm minimum thickness) which are subsequently sealed (see Waste and Transport Management Procedure, Attachment 4).</li> <li>• Minor amounts of asbestos contaminated soil can be disposed of in bags (0.2mm minimum thickness) which are subsequently sealed (see Waste and Transport Management Procedure, Attachment 4).</li> <li>• Dampen down soils during excavation and loading.</li> <li>• Reduce drop heights of soils.</li> <li>• All trucks used to transport asbestos contaminated soil are to be fitted with a retractable blind / cover over the truck bed.</li> </ul>
		Dislodgement during transport.	Medium		
7.	Stockpiling asbestos impacted soils	Weather: Heavy Rainfall	Medium	<ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Removal of Asbestos Infrastructure</li> <li>• Waste and Transport Management Procedure (Attachment 4)</li> <li>• Air Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Capture runoff if there is excessive rainfall by constructing bunds around the stockpile.</li> <li>• Minimise length of time stockpile is on Site by being prepared i.e. having transport available to dispose of off-site as soon as material is excavated.</li> <li>• Maintain stockpile under damp conditions.</li> <li>• Minimise length of time stockpile is on Site by being prepared i.e. having transport available to dispose of off-site as soon as material is excavated.</li> <li>• Stabilisation (hydromulched or dustex) of stockpiles is required to be undertaken if the material is intended to remain exposed for an extended period of time (&gt;30 days) or if there is limited dust suppression (e.g. water cart access).</li> <li>• Demarcate and contain work zone including stockpile with barriers and signage.</li> <li>• Air monitoring is required where the above controls cannot be maintained.</li> </ul>
		Weather: Wind	High		

**Risk Matrix (AS/NZS 4360:2004)**

--Likelihood	Consequences				
	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
A – Almost certain	H	H	E	E	E
B – Likely	M	H	H	E	E
C – Possible	L	M	H	E	E
D – Unlikely	L	L	M	H	E
E – Rare	L	L	M	H	H

**E:** Extreme risk, immediate action required

**H:** High risk, senior management action required

**M:** Moderate risk, management responsibility must be specified

**L:** Low risk, manage by routine procedures



## 6 CONTINGENCIES

The following sections outline procedures and contingency measures to be implemented in case of incident or emergency.

### 6.1 INCIDENT AND EMERGENCY PROCEDURES

- With respect to asbestos, the following constitute an incident, whereby actions may be required to prevent exposure and information can be obtained through the process of reporting and investigation, and then used to reduce future risk.
- Incidents involving asbestos must be reported in accordance with Water Corporation procedures and timeframes.
- The minimum environmental incident response measures are summarised in Table F.
- Additional corrective actions may be necessary depending on the exact nature of the incident.

**TABLE F: ENVIRONMENTAL INCIDENT RESPONSE MEASURES**

INCIDENT	RESPONSE
Uncontrolled damage or disturbance of the capping layer and / or warning barrier.	<ol style="list-style-type: none"> <li>1. Stop work.</li> <li>2. Notify Water Corporations Site Manager / Representative.</li> <li>3. Proceed as below whilst following advice from the Water Corporations Safety Environment and Aboriginal Affairs (SEAA) Team. <ul style="list-style-type: none"> <li>• Isolate and contain the area, where necessary, to prevent dust being generated and exposure to airborne asbestos fibres.</li> <li>• Conduct an investigation into the causes.</li> <li>• Determine what immediate actions are necessary.</li> <li>• Make recommendations for improvements to prevent similar or related incidents.</li> </ul> </li> </ol>
Uncontrolled disturbance asbestos contaminated soils.	<ol style="list-style-type: none"> <li>1. Stop work.</li> <li>2. Notify Water Corporations Site Manager / Representative.</li> <li>3. Proceed as below whilst following advice from the Water Corporations SEAA Team. <ul style="list-style-type: none"> <li>• Isolate and contain the area, where necessary, to prevent dust being generated and exposure to airborne asbestos fibres.</li> <li>• Conduct an investigation into the causes.</li> <li>• Determine what immediate actions are necessary.</li> <li>• Make recommendations for improvements to prevent similar or related incidents.</li> </ul> </li> </ol>

**TABLE F: ENVIRONMENTAL INCIDENT RESPONSE MEASURES**

INCIDENT	RESPONSE
Identification of unexpected asbestos infrastructure, ACM fragments, FA or AF.	<ol style="list-style-type: none"> <li>1. Stop work and establish exclusion zone.</li> <li>2. Notify Water Corporations Site Manager / Representative.</li> <li>3. Document the subsurface inconsistency by reporting in accordance with the appropriate procedures. Assess if the LTAMP needs to be updated and do so as required.</li> <li>4. Proceed as below whilst following advice from the Water Corporations SEAA Team. <ul style="list-style-type: none"> <li>• Isolate and contain the area, where necessary, to prevent dust being generated and exposure to airborne asbestos fibres.</li> <li>• Determine what actions are necessary to manage the area in the short and long term.</li> <li>• Make recommendations for improvements to prevent similar or related incidents.</li> </ul> </li> </ol>
Identification of unexpected contamination (other than asbestos)	<ol style="list-style-type: none"> <li>1. Stop work.</li> <li>2. Document the subsurface inconsistency by reporting in accordance with the appropriate procedures.</li> <li>3. Notify Water Corporations Site Manager and SEAA Team who will provide further instruction.</li> </ol>
Unacceptable emission/discharge event*	<p>*Examples of an unacceptable discharge or emission at this site may include entrainment of contaminated soil into the stormwater network, visible dust extending beyond site boundaries, uncontrolled off-site disposal of contaminated soil, or an unacceptable discharge or emission determined by other qualitative and/or quantitative means.</p> <ol style="list-style-type: none"> <li>1. Stop work and contain Site discharge or emission where possible.</li> <li>2. Where the Site emission or discharge represents an immediate and significant environmental hazard, immediately notify the relevant emergency departments.</li> <li>3. Document the unacceptable emissions / discharges by reporting in accordance with Water Corporation procedures and notify the relevant Water Corporation personnel.</li> <li>4. An assessment should be undertaken to identify why the unacceptable emission/discharge occurred, identify whether a revision to the LTAMP and / or this Asbestos Management Information Plan is warranted.</li> </ol>
This Asbestos Management Information Package does not appear to address the type of work proposed (and associated contamination risks) or other subsurface restrictions that may arise.	<ol style="list-style-type: none"> <li>1. Notify the relevant personnel for advice prior to completing the works.</li> <li>2. Task-specific procedures may need to be developed and the LTAMP and / or this Asbestos Management Information Plan may need to be revised.</li> </ol>
Community complaint	<ol style="list-style-type: none"> <li>1. Document the community complaint by reporting in accordance with applicable procedures and notify the relevant personnel.</li> <li>2. Investigate the community complaint and whether works are being completed in accordance with this Asbestos Management Information Plan.</li> <li>3. An assessment should be undertaken to identify why the community member(s) was distressed, depending on which, identify whether a revision to the LTAMP and / or this Asbestos Management Information Plan is warranted.</li> </ol>

## **7 KEY MANAGEMENT REQUIREMENTS, TIMEFRAMES AND KEY PERFORMANCE INDICATORS**

Table G outlines key management requirements, timeframes to be adhered to and key performance indicators that shall be integrated into asbestos management control processes at the Site.

Consistent with roles and responsibilities outlined in Section 2.3, it is the responsibility of Water Corporation to ensure LTAMP performance is monitored against the nominated KPIs.



**TABLE G: MANAGEMENT REQUIREMENTS, TIMEFRAMES AND KEY PERFORMANCE INDICATORS**

REQUIREMENT	FREQUENCY	PERFORMANCE INDICATOR	VERIFICATION	RESPONSIBLE PARTY
Review Plan	Review annually OR as required if: a) Site conditions change; or b) if additional information, relevant to the scope of the plan, becomes available.	LTAMP and Asbestos Management Information Plan remain suitable to the needs of the works and Site conditions.	<ul style="list-style-type: none"> <li>Works are implemented in accordance with the LTAMP and this Asbestos Management Information Package.</li> <li>LTAMP and Asbestos Management Information Plan are updated as necessary.</li> </ul>	Water Corporation
Update Plan	Review at least every five years OR as required if: a) Site conditions change; or b) if additional information, relevant to the scope of the plan, becomes available.	LTAMP and Asbestos Management Information Plan remain suitable to the needs of the works and Site conditions.	<ul style="list-style-type: none"> <li>Works are implemented in accordance with the LTAMP and this Asbestos Management Information Package.</li> <li>LTAMP and Asbestos Management Information Plan are updated as necessary.</li> </ul>	Water Corporation
Periodic Inspections and Emu-Picking	Undertake Site inspections biannually (twice per year, end of winter and end of summer).	No visible ACM.	<ul style="list-style-type: none"> <li>Site inspection records including photographs.</li> <li>ACM disposal documentation.</li> </ul>	Water Corporation
Erosion Management	Undertake Site inspections biannually (twice per year, end of winter and end of summer). Implement erosion control as required based on findings of Site inspection.	Embankments of stormwater drain and compensation basin are stable and well vegetated and asbestos contaminated soils are not exposed.	<ul style="list-style-type: none"> <li>Site inspection records including photographs.</li> </ul>	Water Corporation
Community Consultation	Undertake consultation with key stakeholders in accordance with Section 5.4 prior to commencing soil disturbance works.	Key stakeholders are aware of works prior to commencing. No complaints received from the community.	<ul style="list-style-type: none"> <li>Record of notification provided to stakeholders.</li> <li>Daily site records.</li> </ul>	Water Corporation
Appropriate implementation of this Asbestos Management Information Plan	Ongoing	All site workers are aware of this Asbestos Management Information Plan and associated policies and procedures.	<ul style="list-style-type: none"> <li>Maintain record of notifications provided to staff and subcontractors.</li> <li>No incidents of uncontrolled exposure.</li> </ul>	Water Corporation
		No unregistered subsurface disturbances.	<ul style="list-style-type: none"> <li>Maintain subsurface disturbance register.</li> <li>No incidents or uncontrolled exposure.</li> </ul>	Water Corporation
		No visible dust emissions from any materials.	<ul style="list-style-type: none"> <li>Daily site records.</li> <li>Record any community complaints.</li> </ul>	Water Corporation / Approved Subcontractor
		Appropriate health and safety precautions are taken in performing works.	<ul style="list-style-type: none"> <li>HSEP, Task-specific JSEA and Asbestos Removal Control Plan are prepared and incorporate AMP control procedures.</li> <li>Appropriate PPE is being worn.</li> </ul>	Water Corporation / Approved Subcontractor
		Appropriate environmental management precautions are taken in performing works.	<ul style="list-style-type: none"> <li>No environmental incidents (see below).</li> </ul>	Water Corporation / Approved Subcontractor
		Areas of disturbance are appropriately reinstated (compacted) and a 'clean' surface cover is maintained.	<ul style="list-style-type: none"> <li>Recorded inspection of surface cover reinstatement / compaction.</li> <li>Inspection of surface cover by Site Owner / Representative and spot treatments as required.</li> </ul>	Water Corporation / Approved Subcontractor
		No unacceptable discharges or emissions or other environmental incidents*.	<ul style="list-style-type: none"> <li>Qualitatively verified through an inspection of the works during and at the completion of works.</li> <li>In some cases environmental monitoring e.g. airborne asbestos fibre may be used to evaluate the performance of this KPI.</li> <li>Record any community complaints.</li> </ul>	Water Corporation / Approved Subcontractor
		All ACM and asbestos contaminated soils arising from subsurface works that cannot be retained onsite beneath an appropriate warning barrier and capping layer is disposed of at an appropriately licenced landfill.	<ul style="list-style-type: none"> <li>Provision of waste transfer and disposal dockets.</li> </ul>	Water Corporation / Approved Subcontractor

\*Examples of an unacceptable discharge or emission at this site may include entrainment of contaminated soil into the stormwater network or movement offsite via erosion, visible dust extending beyond site boundaries, uncontrolled off-site disposal of contaminated soil, or an unacceptable discharge or emission determined by other qualitative and/or quantitative means. Expert advice shall be sought where environmental monitoring is required.

## 8 DOCUMENTATION, REPORTING AND COMMUNICATION

### 8.1 DOCUMENTATION REQUIRED FOR SITE WORKS

All Water Corporation personnel / approved subcontractors are required to document the following when undertaken works within the Site.

**TABLE H: SITE WORKS DOCUMENTATION CHECKLIST**

NO.	DESCRIPTION	CHECKLIST ✓
1.	Record of visitor notifications, registration/induction of workers conducting subsurface works and any subsurface disturbance works that take place.	<input type="checkbox"/>
2.	Daily Site Records including (but not limited to): <ul style="list-style-type: none"> <li>• weather conditions;</li> <li>• observations of dust;</li> <li>• any control actions undertaken;</li> <li>• summary of works areas;</li> <li>• details of extent of excavations;</li> <li>• material handling processes;</li> <li>• soil or infrastructure removed and associated waste management procedures undertaken;</li> <li>• photographs;</li> <li>• reinstatement of any warning barrier and clean fill cover.</li> </ul>	<input type="checkbox"/>
3.	Materials tracking information for <u>all onsite</u> and <u>off-site</u> movements of material within the Site including importation of Clean Fill, temporary stockpiling, trucking and landfill docket for material disposed of off-site.	<input type="checkbox"/>
4.	Evidence of compliance with environmental management measures and plans during the course of works.	<input type="checkbox"/>
4.	All environmental sampling and monitoring works, as applicable: <ul style="list-style-type: none"> <li>• Earthworks / excavation plans and sample location plans (where applicable).</li> <li>• Chain of Custody laboratory analysis documentation; tabulated analytical results and detailed review of QA/QC results (where applicable).</li> <li>• Air monitoring records (where applicable).</li> </ul>	<input type="checkbox"/>
5.	Survey ('as cons') information.	<input type="checkbox"/>
6.	Safety or environmental incidents.	<input type="checkbox"/>
7.	Complaints / enquiries records (see Section 8.2)	<input type="checkbox"/>

## 8.2 COMPLAINTS, INCIDENTS AND EXCEEDENCES

Water Corporations personnel are required to document complaints, incidents and exceedences in accordance with Water Corporations procedures and policies.

Approved Subcontractors are required to report complaints, environmental incidents and exceedences direct to the Water Corporation in the time frame specified by the Water Corporation.

Where an environmental incident occurs, an incident investigation report shall be completed and retained. Each incident should be investigated and where the control measures defined in this Asbestos Management Information Plan are found to be inadequate or no longer appropriate, this Asbestos Management Information Package shall be revised by the relevant Water Corporation personnel and the overarching LTAMP updated and reissued to the Government of Western Australia or its nominated Management Authority and the Department of Health / Department of Environment Regulation.

The information in Table I should be recorded for the purposes of reporting.

**TABLE I: INCIDENT REPORTING CHECKLIST**

NO.	DESCRIPTION	CHECKLIST ✓
1.	The source of off-site impacts or discharges, including a description of the details of the operations that were being undertaken that resulted in the discharge or impact.	<input type="checkbox"/>
2.	The duration of the environmental incident if it results in, or had the potential to result in, unacceptable off-site impacts.	<input type="checkbox"/>
3.	A description of equipment or machinery being operated at the time that caused the discharge or impact.	<input type="checkbox"/>
4.	A description of the impact management measures that were in place and being used when the discharge or impact occurred.	<input type="checkbox"/>
5.	An assessment of the urgency and immediate impacts of the incident.	<input type="checkbox"/>
6.	A description of the actions to be taken to rectify the discharges or impacts.	<input type="checkbox"/>
7.	Proposed management actions, which include: <ul style="list-style-type: none"> <li>• details of the actions taken to immediately remedy the incident;</li> <li>• a brief report on the success of those actions; and</li> <li>• a description of changes to work practices or operations that are required to ensure that the incident will not re-occur together with a timetable for implementation of those changes.</li> </ul>	<input type="checkbox"/>



### **8.3 ASBESTOS EXPOSURE**

The Water Corporations Health Surveillance Guidelines should be consulted in cases where personnel believe they have been exposed to asbestos on a Water Corporation Site.

## 9 REFERENCES

**Department of Environment and Conservation (DEC) (2009)** Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009).

**Department of Environment and Conservation (DEC) (2011)** A Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities, March 2011.

**Department of Environment Regulation (DER) (2014)** Assessment and Management of Contaminated Sites, Contaminated Sites Guidelines, December 2014.

**Department of Health (DoH) (2009)** Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia.

**National Environment Protection Council (NEPC) (1999)** National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) 1999 (as amended 2013).

**National Occupational Health and Safety Commission (NOHSC) (2005a)** Code of Practice for the Management and Control of Asbestos in Workplaces [(NOHSC: 2018 (April 2005)].

**National Occupational Health and Safety Commission (NOHSC) (2005b)** Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (2<sup>nd</sup> Edition) [NOHSC: 3003 (2005)].

**Standards Australia (1994)** AS 1319: Safety Signs for the Occupational Environment.

**Standards Australia (2003)** AS/NZS 1716: Respiratory Protective Devices (Standards Australia, 2003)

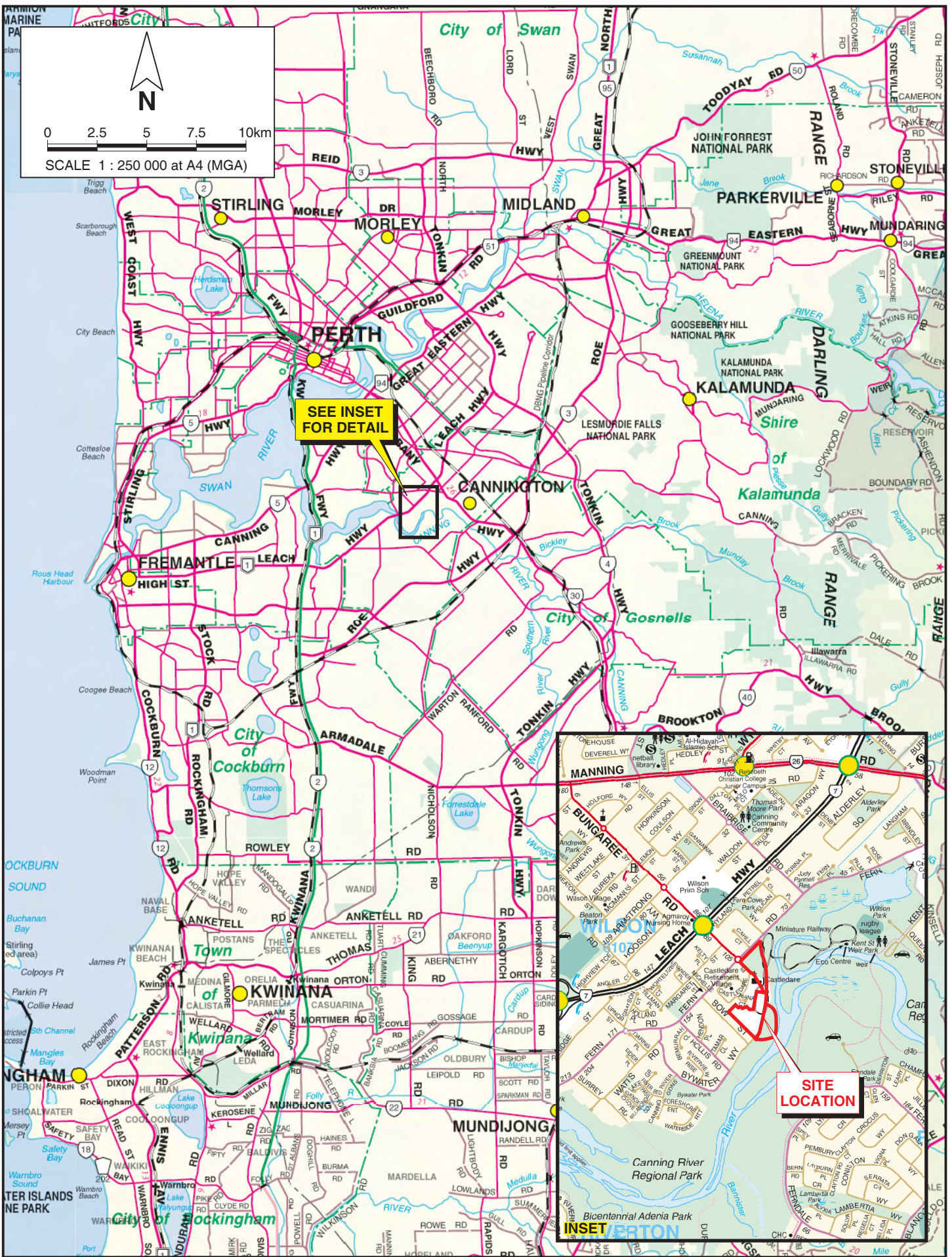
**Standards Australia (2004)** AS / NZS 4360:2004: Risk Management.

**Standards Australia (2004)** AS 4964: Method for the qualitative identification of asbestos in bulk samples.

**Standards Australia (2009)** AS/NZS 1715: Selection Use and Maintenance of Respiratory Protective Equipment.

## FIGURES





RNC2015-001-Phase1&2\_LTMP\_046\_ph01.dgn  
PINPOINT CARTOGRAPHICS (08) 9562 7136



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 1**

Drawn: P. Lee


Date: 4 Jun 2017

**SITE LOCATION**

Job: RNC2015-001





  
 0 25 50 75 100m  
 SCALE 1 : 2 500 at A3 (MGA)  
**Legend**  
 - - - Site Boundary  
 — Cadastral Boundary  
 - - - Easement Boundary



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 2**

Drawn: P. Lee Date: 4 Jun 2017

**SITE IDENTIFICATION**

Job: RNC2015-001

CADASTRAL SOURCE: Landgate, May 2017.  
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2017.





0 25 50 75 100m

SCALE 1 : 2 500 at A3 (MGA)

**Legend**

- Site Boundary
- Cadastral Boundary
- - - Easement Boundary
- Site Features
- Railway



Trustees of the Christian Brothers  
 LONG TERM ASBESTOS MANAGEMENT PLAN  
 LOT 4 AND LOT 102 FERN ROAD, WILSON, WESTERN AUSTRALIA

**Figure 3**

Drawn: P. Lee      Date: 4 Jun 2017

**KEY SITE FEATURES**

Job: RNC2015-001

CADASTRAL SOURCE: Landgate, May 2017.  
 AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2017.



# **ATTACHMENT 1**

## **SITE SURVEY**

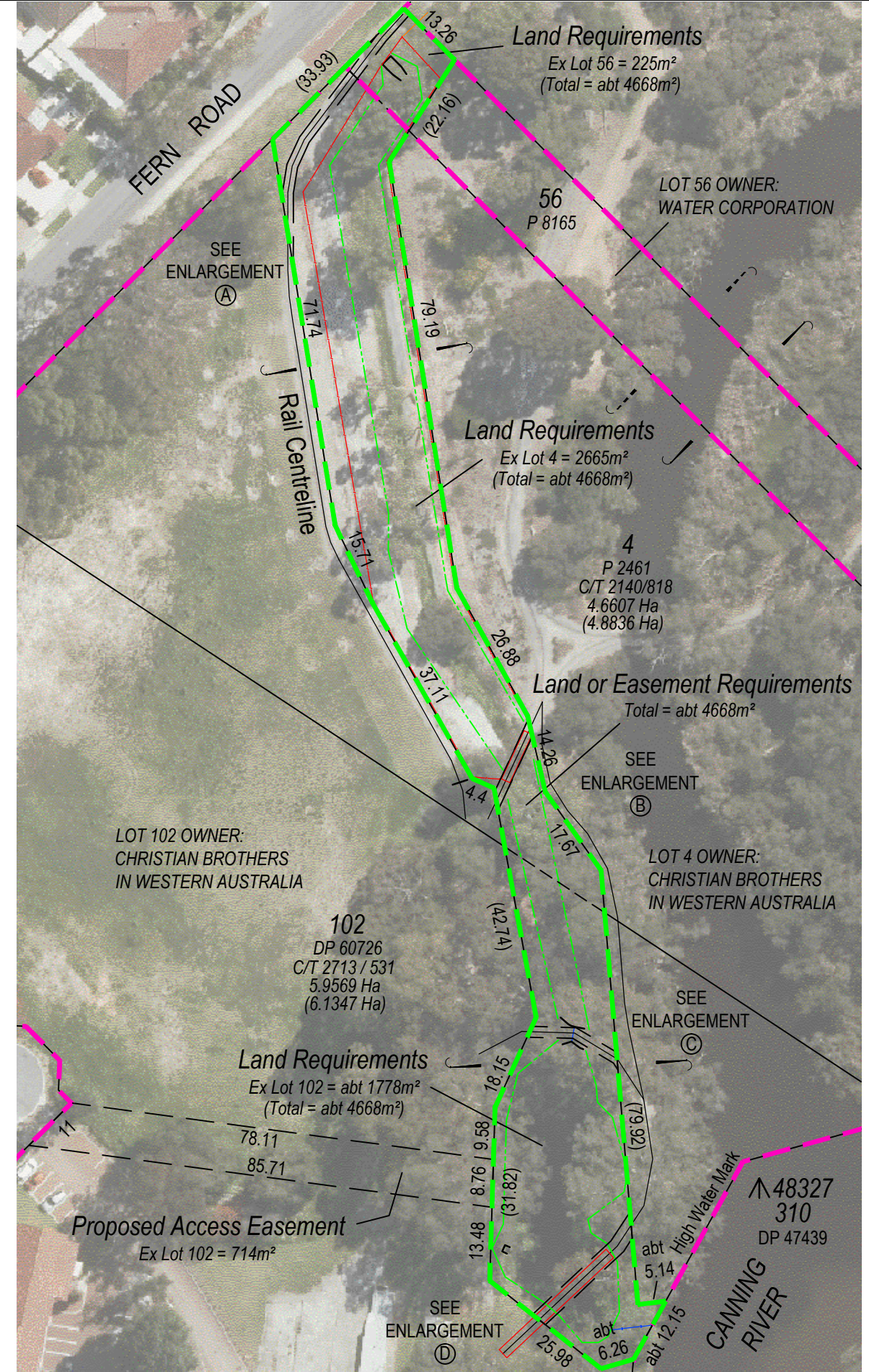
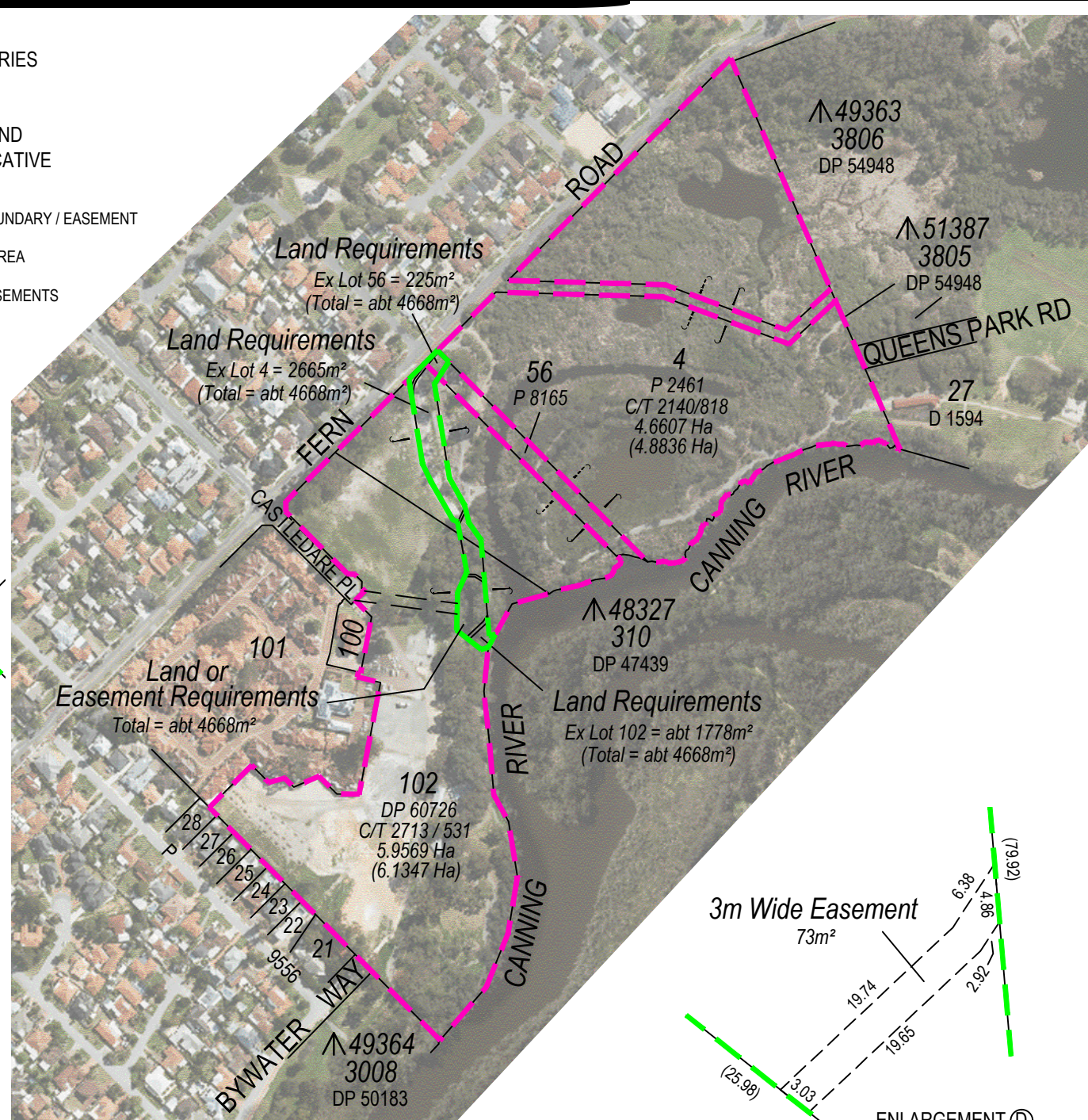
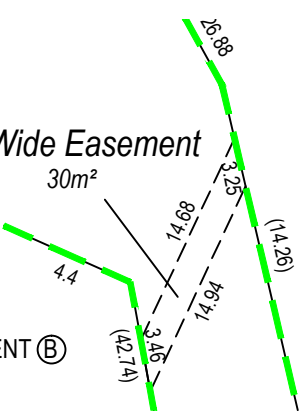
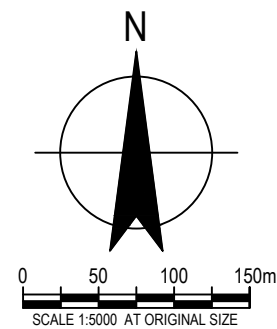
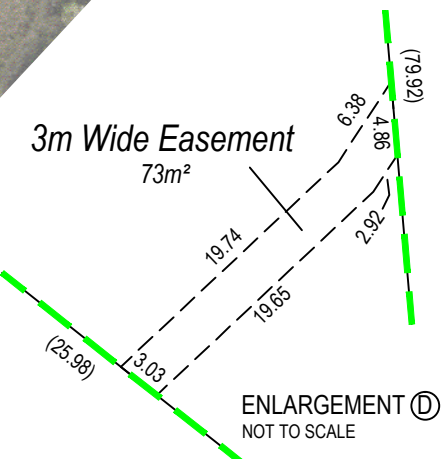
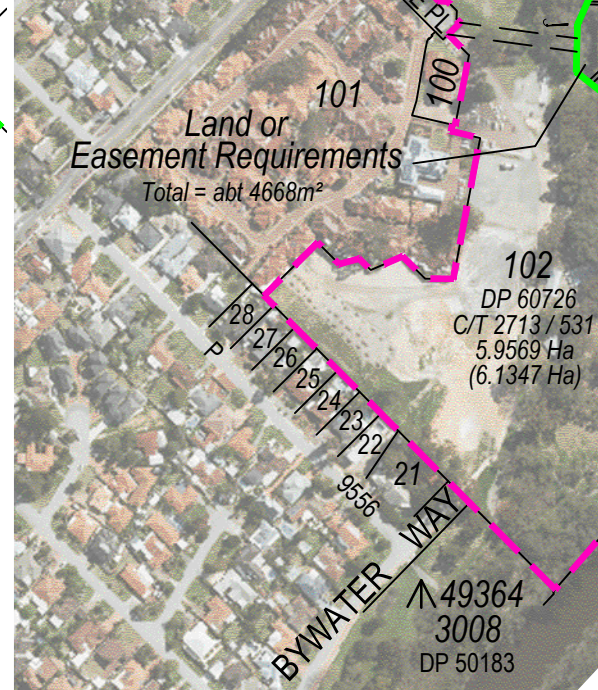
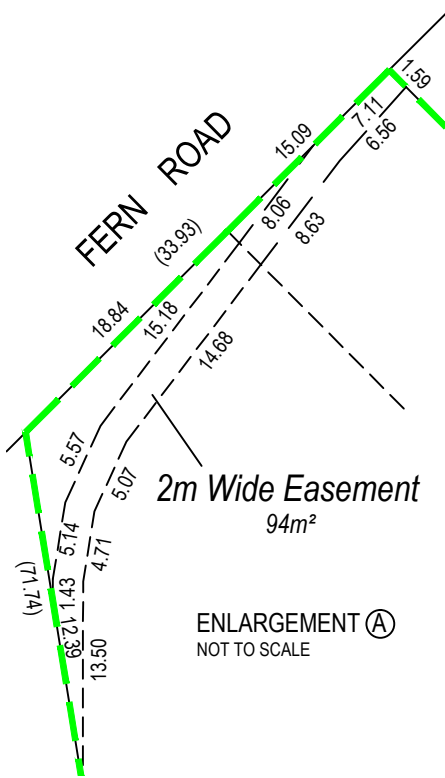
*(Indicative Draft Subdivision Plan)*



**SUBJECT TO SURVEY**

THE EXISTING AND PROPOSED BOUNDARIES SHOWN ON THIS DRAWING HAVE BEEN DETERMINED USING EXISTING PLAN INFORMATION ONLY. ALL DIMENSIONS AND AREAS SHOWN ON THIS PLAN ARE INDICATIVE ONLY AND ARE SUBJECT TO SURVEY.

- PROPOSED BOUNDARY / EASEMENT
- APPLICATION AREA
- PROPOSED EASEMENTS
- BRIDGE
- HEADWALL
- TOP OF BANK
- FENCE HIGH
- FENCE LOW
- RAIL
- DRAIN PIPE



No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
1	PROPOSED BOUNDARY AMENDED		KSJ*	GR*	GR*	14.12.16
0	ISSUED FOR INFORMATION		KSJ	GR	GR	07.12.16



<b>DO NOT SCALE</b>	Drawn KSJ 07.12.16	Scale 1 : 5,000 @ A3	Client <b>WATER CORPORATION</b>
Conditions of Use. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.	Drafting Check GR	Surveyor GR	Project <b>CASTLEDARE RAIL</b>
	Datum ARBITRARY	Field Book *	Title <b>LOTS 4 &amp; 102 FERN ROAD, WILSON LAND REQUIREMENTS</b>
	Grid PCG 94	Level Book *	Original Size <b>A3</b>
Approved G. RUSSO	Date 07.12.16	This Drawing must not be used for Construction unless signed as Approved	Drawing No: <b>61-3183669-V01</b>
			Rev: <b>1</b>



## **ATTACHMENT 2**

Water Corporations Asbestos Policy  
(PCY382)

<b>Doc ID</b> 16594303	<b>Custodian</b> Manager Safety Environment and Aboriginal Affairs	<b>Approved</b> General Manager, Operations Services Group
<b>Version Date</b> 03 March 2017	<b>Accountability Framework</b> Level 1- Manage Occupational Safety and Health Level 2 – Manage Hazards and OSH Incidents	<b>Stakeholders</b> Business Unit Managers
<b>Next Review Date</b> 03 March 2020		

## 1 Policy Statement

Water Corporation is committed to ensuring that Asbestos and Asbestos Containing Material (ACM) present on its sites are appropriately managed and controlled to protect the health and well-being of employees, contractors, the community and the environment.

This Policy must be communicated to all persons working under the control of the Water Corporation, displayed in prominent locations and be made available to interested parties.

This Policy must be reviewed every three (3) years.

## 2 Purpose

The Asbestos Policy has been created to:

- Demonstrate the Water Corporation's commitment to the effective management and control of Asbestos and ACM.
- Ensure that legal obligations relating to the management of Asbestos in the workplace and the environment are fulfilled.
- Outline the key principles associated with protecting the health and safety of employees, contractors, the community and the environment from the risks associated with working with Asbestos and ACM.

## 3 Scope

The Asbestos Policy applies to workers undertaking the following activities related to asbestos identification, assessment, management and work on:

- Water Corporation operating sites.
- Water Corporation non-operating sites including land owned by the Corporation, land managed by the Corporation and land leased by the corporation to other parties.
- Water Corporation assets and equipment that are not on Water Corporation land, including decommissioned assets.
- Construction sites controlled by contractors.
- Construction sites controlled by Water Corporation.
- Office buildings, depots, storage sites, owned (or occupied) by Water Corporation.
- Staffed facilities, unstaffed facilities, commissioned assets and non-commissioned assets.

## 4 Compliance Implications

Failure to comply with Environmental and or Workplace Health and Safety compliance obligations by members or functions of the Corporation could have any or all of the following implications:



- Causing harm to human health and/or the environment.
- Damage to Water Corporation's reputation and community standing.
- Significant fines, civil penalties and custodial sentences.
- Substantial court and legal costs.
- Improvement and/or Prohibition notices and/or Hazard Abatement Notices.
- An individual's reputation and career being irreparably damaged.

Through the implementation of this Policy, the Corporation meets its obligations under the *Occupational Safety and Health Act 1984* and *Contaminated Sites Act 2003*.

## **5 Principles**

This Policy is underpinned by the following principles:

- A risk based approach must be adopted for the management and control of asbestos and ACM.
- All asbestos or ACM must be identified by a competent person. Its presence and location is identified (or assumed to be identified) and clearly signposted and/or labelled so far as is reasonably practicable.
- The condition and likelihood of disturbance of any ACM must be assessed to understand the associated risk of exposure to airborne fibres.
- Asbestos Asset Registers and asbestos management plans must be prepared, maintained and reviewed where Asbestos or ACM has been identified.
- Appropriate control measures must be implemented to minimise any risk of exposure to persons to airborne fibres.
- If ACM is found to be in an unstable condition, which is deemed to be a risk to the environment or the health of workers, contractors and/or the community, it must be removed and/or remediated as soon as practicable.

## **6 Application**

This Policy forms part of the Health, Safety, Environment and Aboriginal Affairs Management System and must be implemented as part of the Asbestos Framework.

## 7 Key References

### Key Compliance References

- Contaminated Sites Act 2003
- Contaminated Sites Regulations 2006
- Environmental Protection Act 1986
- Environmental Protection (Controlled Waste) Regulations 2004
- Health (Asbestos) Regulations 1992
- Occupational Safety and Health Act 1984
- Occupational Safety and Health Regulations 1996
- Code of Practice for the Management and Control of Asbestos in Workplaces 2005
- Code of Practice for the Safe Removal of Asbestos 2005

### Corporate References

- [Asbestos Management Guideline](#)
- [HSEAA-P-132 Identification, Assessment and Management of Asbestos Procedure](#)
- [HSEAA-P-131 Working with Asbestos Procedure](#)
- [Health Surveillance Guideline](#)

Document Revision History	
03 Mar 2017	New Document in line with the Asbestos Management Framework

## **ATTACHMENT 3**

Water Corporations Working With Asbestos Procedure  
(HSEAA-P-131)



<b>Doc ID</b> 14700219	<b>Custodian</b> Manager Governance, Assurance & Approvals
<b>Version Date</b> 28 Feb 17	<b>Accountabilities Framework</b> Level 1: Manage Occupational Safety and Health Level 2: Manage Hazards and OSH Incidents
<b>Next Review Date</b> 28 Feb 20	

## 1 Essential Elements

Essential Elements - A summary of key requirements described in this document, for quick-reference.			
Step	Requirement	Reference	Responsibility
1.	Check the Asbestos Asset Register Database (Lupin) before commencing work in accordance with <a href="#">HSEAA-P-131 Identification, Assessment and Management of Asbestos</a>	6.1	Supervisor
2.	Conduct safe job planning.	6.1.1	Supervisor
3.	Implement controls required to work safely.	6.1.4	Responsible Person and Supervisor
4.	Undertake the works	6.2	Worker
5.	Document and record work documentation	6.3.4	Responsible Person
6.	Implement controls to minimise or mitigate any residual risks.	6.5	Supervisor
7.	Notify the Asbestos Coordinator to update the Asbestos Asset Register Database (Lupin)	6.5.1	Supervisor

### Key Points

<b>DO's</b>	<ul style="list-style-type: none"> <li>Undertake safe job planning to identify the appropriate management controls.</li> <li>Only engage appropriately licensed asbestos removalists to remove bonded asbestos containing materials (ACM) &gt;10m<sup>2</sup> or any amount of friable asbestos.</li> <li>Select the most appropriate work method to minimise the release of airborne asbestos fibres.</li> <li>Document the works and update any changes to the Asbestos Asset Register Database (Lupin)</li> <li>Notify the Asbestos Coordinator and Supervisor if any controls are not adequate and there is a risk of exposure to airborne asbestos fibres.</li> <li>Dispose asbestos and/or ACM as per <a href="#">Asbestos Waste Disposal Work Instruction</a>.</li> <li>Stop work if safe conditions cannot be maintained/achieved.</li> </ul>
<b>DON'Ts</b>	<ul style="list-style-type: none"> <li>Start work until you have checked for the presence of asbestos and/or ACM.</li> <li>Remove any asbestos and/or ACM unless you are appropriately trained.</li> <li>Remove any asbestos management controls (signs, barriers) without prior approval from the Asbestos Coordinator.</li> <li>Work without a valid risk assessment.</li> <li>Accept unsafe conditions.</li> </ul>

## 2 Purpose

This Procedure outlines the responsibilities and minimum requirements to manage works involving asbestos in a safe manner. The purpose of this Procedure is to ensure that the risk posed by asbestos to human health, the environment or an environmental value is managed.

The main tasks that are likely to increase the risks associated with asbestos are:

- Conducting maintenance, refurbishments and servicing activities on asbestos and/or asbestos containing materials (ACM).
- Removing asbestos and/or ACM.
- Transporting asbestos and/or ACM.
- Disposing of asbestos and/or ACM.

This Procedure supports [PCY382 Asbestos Policy](#) and is supported by the following documents:

- [HSEAA-P-132 Identification, Assessment and Management of Asbestos](#)
- [HSEAA-G-130 Asbestos Management Guideline.](#)

## 3 Scope

The requirements of this Procedure apply to all workers undertaking activities related to working with asbestos at:

- Water Corporation operating sites.
- Water Corporation non-operating sites including land owned by the Corporation, land managed by the Corporation and land leased by the corporation to other parties.
- Water Corporation assets and equipment that are not on Water Corporation land, including decommissioned assets.
- Construction sites controlled by contractors.
- Construction sites controlled by Water Corporation.
- Office buildings, depots, storage sites, owned (or occupied) by Water Corporation.
- Staffed facility, unstaffed facility, commissioned asset, non-commissioned assets.

This Procedure covers activities related to working with asbestos including but not limited to:

- ACM removal work.
- Cutting and removing ACM.
- Asbestos PPE requirements.
- Asbestos disposal.
- Decontamination.
- Tool selection.

## Content

1	Essential Elements .....	1
2	Purpose .....	2
3	Scope .....	2
4	Roles and Responsibilities .....	4
5	Training.....	5
6	Process.....	6
6.1	Planning or scheduling work .....	6
6.1.1	Conduct Safe Job Planning / Risk Assessment .....	6
6.1.2	Determine if licences are required .....	7
6.1.3	Planning for Pipe Removal .....	7
6.1.4	Determine the work method.....	7
6.1.5	Select appropriate equipment .....	8
6.1.6	Select Personal Protective Equipment (PPE).....	8
6.1.7	Determine the requirement for monitoring airborne fibre levels .....	8
6.2	Undertaking Works .....	9
6.3	Completion of work.....	9
6.3.1	Decontamination.....	10
6.3.2	Asbestos Waste Disposal - ACM (excluding bitumen pipe coating) .....	10
6.3.3	Waste Removal – Bitumen pipe coating residue.....	11
6.3.4	Retention of Work Documentation .....	11
6.4	Response to unexpected finds.....	12
6.5	Post Work.....	12
6.5.1	Update the Asbestos Asset Register .....	12
7	Records .....	12
8	Definitions.....	13
9	References .....	15
9.1	Referenced policies, standards, procedures, and work instructions .....	15
9.2	Supporting documents, templates and forms .....	15
10	Compliance Mapping .....	16
11	Document Revision History.....	16
Appendix A	Asbestos PPE / Equipment Selection Chart.....	17
Appendix B	Asbestos Work Disposal Consumables .....	19
Appendix C	Asbestos Disposal Form.....	20
Appendix D	Asbestos Containing Materials Work Instruction .....	22



## 4 Roles and Responsibilities

Role	Responsibilities
Asbestos Coordinator	<ul style="list-style-type: none"> <li>• Provide training to all new starters and existing workers who are profiled for working with asbestos.</li> <li>• Undertake 6 monthly reviews of the Asbestos Asset Register Database (Lupin) to ensure the database is maintained and regularly updated.</li> <li>• Arrange for signage and labelling of assets where asbestos has been identified to be sent to the relevant Workplace Manager.</li> <li>• Conduct ad-hoc safety observation on asbestos related work activities and report findings to relevant Supervisor.</li> <li>• Undertake a yearly review of training material to ensure training programs dealing with asbestos and/or ACM are relevant and contemporary.</li> <li>• Coach supervisors and team leaders during field visits to ensure safe work methods contained in this Procedure are followed.</li> <li>• Develop mechanisms for relevant Workplace Managers to assess the ongoing effectiveness of protections installed in the field to mitigate asbestos exposure between workers and the public.</li> </ul>
Regional OSH Coordinators	<ul style="list-style-type: none"> <li>• Coach supervisors and team leaders during field visits to ensure the information contained within this Procedure is followed.</li> <li>• Assist the Workplace Manager in managing and implementing the appropriate controls within their area of responsibility.</li> </ul>
Safety Environment and Aboriginal Affairs (SEAA) Branch Manager	<ul style="list-style-type: none"> <li>• Develop and maintains the Asbestos Management Framework.</li> <li>• Allocate resources for the maintenance and implementation of this Procedure.</li> </ul>
Supervisor (Project Manager / Design Manager / Operations Manager, District Manager)	<ul style="list-style-type: none"> <li>• Understand and complies with the requirements of this procedure, seeks advice from Asbestos Coordinator if they do not understand the requirements.</li> <li>• Review workers training prior to works to ensure they have the relevant skills, knowledge and understanding to comply with this Procedure.</li> <li>• Review and approve risk assessments for works at workplaces under their responsibility.</li> <li>• Undertake regular inspections and supervise workers to ensure they comply with this Procedure.</li> <li>• Assume the responsibilities of the Workplace Manager if they are working on a new site or asset that is not a permanent asset (e.g. a temporary worksite not owned by the Water Corporation, a proposed asset where preliminary design work is being undertaken etc.)</li> </ul>

Role	Responsibilities
Workplace Manager (Regional/ Alliance managers or delegate Property and Procurement Manager or delegate Project Management Branch Manager or delegate Infrastructure Design Branch Manager or delegate)	<ul style="list-style-type: none"> <li>Notify the Asbestos Coordinator of any changes that will impact any Asbestos Asset Registers (e.g. removal of ACM, damage to ACM).</li> <li>Manage and implement the relevant controls that have been developed for a site / asset.</li> <li>Provide suitable equipment, personal protective equipment (PPE) and machinery.</li> <li>Work with the Asbestos Coordinator and Regional/project staff to ensure personnel involved in ACM operations are adequately trained and advised in the relevant ACM procedures.</li> <li>Work with the Asbestos Coordinator and regional/field staff to ensure protective infrastructure (e.g. signs, barriers etc.) installed to warn of the presence of ACM are inspected and maintained until the ACM is safely removed or otherwise treated.</li> <li>Undertake pre-works (contractors) or yearly (operations workers) review of training qualifications to ensure workers are profiled and trained in working safely with asbestos.</li> </ul>
Worker	<ul style="list-style-type: none"> <li>Only perform work on/with asbestos and/or ACM if appropriately training and competent to do so in accordance with the safe work processes contained in this Procedure.</li> <li>Undertake and comply with a risk assessment prior to commencing work.</li> <li>Report any unidentified or suspected asbestos products that are found.</li> <li>Report any damage to asbestos containing products to Supervisor and in Sentinel.</li> <li>Report any potential exposure to airborne asbestos fibres to the Supervisor and in Sentinel.</li> <li>Correctly use PPE that is issued when required.</li> <li>Comply with the requirements of this procedure or safe directions given under this Procedure.</li> <li>Provide feedback on improvements to this Procedure.</li> </ul>

## 5 Training

Line Managers (or Supervisors) must annually check that employees or contractors working with asbestos have satisfactorily completed the required training for roles and activities described in Table 1.

**Table 1 Training requirements for working with asbestos**

Roles / Activities	Course	Comment	Period of Validity
<ul style="list-style-type: none"> <li>Any person working on asbestos assets.</li> <li>Any person removing asbestos containing materials.</li> </ul>	<b>Working safely with asbestos</b> SAP Q#13531	Training on the requirements for working with or removing asbestos, or equivalent for contractors.	3 years.
<ul style="list-style-type: none"> <li>All Water Corporation workers.</li> </ul>	<b>Asbestos Awareness (Internal - Online)</b> #Q4768	Training on the requirements for awareness of asbestos for workers whom do not directly work with or on asbestos and/or ACM, or equivalent for contractors.	No expiry

Contractors or subcontractors whom have not completed **Working Safely with Asbestos** (#Q13531) must be able to demonstrate equivalent training or qualifications to conduct works on Water Corporation's Assets.

Prior to works commencing the equivalent training must be reviewed and approved by the Contract Manager with support from the Safety, Environment and Aboriginal Affairs (SEAA) Branch.

## 6 Process

The two types of works covered in this Procedure are:

- Maintenance and refurbishment work.
- Removal, transport, storage and disposal.

Examples of maintenance and removal work include:

- Painting (i.e. sealing/encapsulating) damaged ACM.
- Cutting or hand drilling a small hole into an asbestos-containing eave to install a cable.
- Removal of an asbestos-containing vinyl tile to install a plumbing fixture.
- Hand-drilling holes into AC sheet or electrical mounting board (zelemite panel) to attach a fitting.
- Dismantling a piece of plant to remove an asbestos-containing gasket.
- Removal of bituminous wrapped pipes containing asbestos or asbestos cement pipes.

### 6.1 Planning or scheduling work

Prior to any activities being undertaken the person planning or scheduling the work must complete the following:

- Understand the risk and location of the asbestos asset (refer to the Asbestos Asset Register (within the Lupin database) and verify the location of buried asbestos cement (AC) pipe using LiteSpatial or My World.

For detail on how to find information within the Asbestos Asset Register Database (Lupin) refer to [Searching the Lupin database Work Instruction](#).

- Communicate the presence and location of any asbestos and/or ACMs to the team leader and all workers conducting the work.
- Determine whether maintenance or service work can be done without disturbing any asbestos and/or ACM.

If in doubt whether or not a material contains asbestos, either assume it contains asbestos and adopt controls as per this Procedure, or contact the Asbestos Coordinator for advice. The asbestos [fact sheet](#) is available in Lupin which identifies the commonly found ACM at our sites.

#### 6.1.1 Conduct Safe Job Planning / Risk Assessment

When it is determined that asbestos is present within the work area, the risk associated with this work must be assessed by the Responsible Person as a part of [Safe Job Planning](#).

The Safe Job Planning must identify the appropriate controls including, but not limited to:

- Training requirements
- Persons involved have the appropriate training and/or licences.
- Appropriate PPE required.
- Administrative controls.



- Selection of appropriate tools.
- Airborne monitoring.

Planning decisions made during Safe Job Planning must be documented on the [Working safely with Asbestos Checklist](#) and attached to the JSEA/SWMS.

### 6.1.2 Determine if licences are required

The Responsible Person must use Table 2 to determine if a licence is required for the work to be undertaken. If it is determined that a licence is required, the Responsible Person must contact the Asbestos Coordinator to arrange an appropriately licenced contractor to be engaged. The requirement for a licence must be documented on the [Working safely with Asbestos Checklist](#).

**Table 2 Asbestos Removal Licences**

Quantity and type of Asbestos to be removed	Licence required?	Who can remove the Asbestos?
Up to 10m <sup>2</sup> of non-friable ACM.	No Licence Required	Any trained person can remove it. Refer to Section 5 for specific training requirements.
Greater than 10m <sup>2</sup> of non-friable ACM	Yes - Restricted Asbestos Removal Licence	Any trained person can remove it; refer to Section 5 for specific training requirements. The removal must be: <ul style="list-style-type: none"> <li>• Supervised by a person who holds a Restricted Asbestos Removal Licence qualification.</li> <li>• Completed in accordance with Part 9 of the <i>Code of Practice for the Safe Removal of Asbestos 2nd Edition</i> [NOHSC: 2002 (2005)].</li> </ul>
Any amount of friable asbestos, or ACM.	Unrestricted Asbestos Removal Licence	The removal work must be: <ul style="list-style-type: none"> <li>• Removed by an asbestos removal professional that holds an Unrestricted Asbestos removal licence.</li> <li>• Completed in accordance with Part 9 of the <i>Code of Practice for the Safe Removal of Asbestos 2nd Edition</i> [NOHSC: 2002 (2005)].</li> </ul>

### 6.1.3 Planning for Pipe Removal

Asbestos pipework (asbestos cement and bitumen coated steel pipe) should be removed from the ground when decommissioned unless operational or safety constraints would it unfeasible.

Where the Project Manager has decided to leave asbestos pipework in the ground, LiteSpatial and MyWorld, must be updated to include this information. The Responsible Person must send the relevant information through to the Asbestos Coordinator.

Bitumen coated pipe may need to be temporarily stored until remediation of the pipe coating can be carried out.

### 6.1.4 Determine the work method

The two approved methods for working with asbestos are wet and dry removal. These are described in the [Wet and Dry Removal of Asbestos Work Instruction](#).

Dry removal methods have a greater potential for generating airborne asbestos fibres and must only be used where electrical services are in close proximity and make wet removal hazardous, or

if the use of water may present a risk to human health, the environment or an environmental value (e.g. the addition of water may lead to the spread of hazardous substances or contaminants).

**Wet Removal (most preferred):** involves using water on the asbestos or ACM to bind and suppress the fibres to decrease their potential of becoming airborne. Where safe to do so, wet methods of working with asbestos must be adopted due to the lower potential for airborne asbestos fibres to be generated.

**Dry Removal (least preferred):** is used when it is unsafe to use water, for example if there are live electrical conductors or if electrical equipment could be permanently damaged or made dangerous by contact with water (refer to [S133 Electrical Safety](#) for further guidance on the using water around electrics).

### 6.1.5 Select appropriate equipment

The Responsible Person must organise and select appropriate equipment to undertake the work.

The following tools and equipment must not be used when working with asbestos:

- Power tools.
- Hand tools which may generate dust and airborne fibres, such as wire brushes, sandpaper, files or rasps.
- Compressed air or high pressure water.

Examples of tools and equipment that can be used during asbestos removal work include approved asbestos vacuum cleaners, manually operated hand tools such as drills, hand saws, chain cutters, and other non-powered equipment.

Where the use of manual tools is not practicable, the use of low speed battery operated tools may be permitted. Written approval must be sought from the Asbestos Coordinator prior to using battery operated tools.

### 6.1.6 Select Personal Protective Equipment (PPE)

The Responsible Person must determine the PPE requirements for the job and document this on the [Working safely with Asbestos Checklist](#).

PPE includes clothing e.g. disposable coveralls, gloves, safety footwear and respiratory protective equipment (RPE).

The Asbestos PPE and Equipment Selection Chart asbestos (Appendix A) provides guidance on the PPE to be used when working with ACM.

At the end of the asbestos removal work, and upon leaving the asbestos removal work area, all disposable PPE must be disposed of as asbestos waste.

Any non-disposable material must be properly decontaminated in accordance with Section 6.3.1

### 6.1.7 Determine the requirement for monitoring airborne fibre levels

Airborne fibre monitoring is required when there is a potential for fibres to be released. Airborne fibre monitoring is not generally required when the following considerations are met:

- Works will be undertaken on a volume of ACM less than 10m<sup>2</sup>.
- The ACM is in a good condition, well bonded, with minimal to no damage.
- Wet Removal methods can be effectively employed and no visible dust is likely to be generated from the proposed works.
- Works are undertaken in a well ventilated environment (e.g. not a confined space).
- There are no sensitive receptors nearby (e.g. near members of the public or residential areas).
- Works will take place over a short duration (<4 hours).

The Asbestos Coordinator must be contacted to determine if airborne fibre monitoring is required, when any of the above points cannot be achieved, or the Responsible Person is unsure of the effectiveness of controls.

If airborne fibre monitoring is required then it must be undertaken in accordance with the *Code of Practice for the Safe Removal of Asbestos 2nd Edition (NOHSC:2002 (2005))* to check that asbestos fibre levels in the air are below the control levels.

*“The national exposure standard (NES) of 0.1 fibres/mL should never be exceeded, and control measures should be reassessed whenever air monitoring indicates the ‘control level’ of 0.01 fibres/mL has been reached”*

Control levels are airborne asbestos fibre concentrations which if exceeded, indicate there is a need to review current control measures or take other action.

### 6.2 Undertaking Works

Prior to commencing the work, the Responsible Person must communicate the works being undertaken to all relevant personnel who are operating within the area.

The Responsible Person must install asbestos signs and/or barricades to clearly indicate the area where the asbestos work is being performed. Signs must be placed in positions so that other workers and the public are aware of where the asbestos work area is and must remain in place until work is completed.

For the removal of non-friable ACM work of short duration, tape or temporary barricading is appropriate. In addition to signage and barricades, the use of construction mesh or netting must be considered at sensitive sites where there is a need to minimise public nuisance and disturbance.

When working with or near ACM, the Responsible Person must adhere to the following safe work practices:

- Document and implement the controls listed within the relevant safety planning documents (e.g. JSEAs, SWMS).
- Refrain from using power tools on ACM.
- Avoid where practicable the cutting, drilling, abrading and crushing of ACM.
- Perform regular housekeeping, including where appropriate the use of wet methods to prevent the release of dust into the atmosphere (spraying or dust suppression). **Do not dry sweep.**

The following activities must be conducted in accordance with this Procedure and the [Asbestos Containing Materials Work Instruction](#), (Refer to Appendix D) which details safe work methods for:

- Cutting and removing ACM.
- Removing bitumen coated/ACM pipe wrap.
- Removing ACM gaskets.
- Removing asbestos cement debris.
- Drilling electrical switchboards containing asbestos.

### 6.3 Completion of work

At the completion of work the following steps must be undertaken to make the work zone safe:

- Decontamination of the asbestos work area, all tools and equipment and personal decontamination (Section 6.3.1).



- Disposal of asbestos waste (Section 6.3.2)
- Retention of documentation e.g. Asbestos Removal Control Plan, waste disposal dockets (Section 6.3.4).

### 6.3.1 Decontamination

All work areas, equipment and personnel must be decontaminated following works involving asbestos and/or ACM. The decontamination must minimise the risk from residual asbestos fibres or debris by either:

- Encapsulating and disposing of materials and equipment which have potentially become contaminated with asbestos fibres as Asbestos Waste to a licensed facility.
- Cleaning or encapsulating work areas or re-useable equipment to remove the risk of the release of airborne fibres (i.e. wiping away dust containing asbestos fibres or spraying a surface with an adhesive solution).

For detail information on how to undertake decontamination refer to [Asbestos decontamination of work area Work Instruction](#).

### 6.3.2 Asbestos Waste Disposal - ACM (excluding bitumen pipe coating)

**Note:** Refer to Section 6.3.3 for information on the management of bitumen pipe coating residue and waste.

When transporting or disposing of asbestos all disposal bags/sheets used to store asbestos waste must be heavy duty 0.2mm (200 µm (micron)) plastic and marked as containing asbestos (Refer to Appendix B).

The disposal process must eliminate the release of airborne asbestos fibres by ensuring:

- Waste material is wetted prior (if safe to do so) to reduce asbestos dust emissions during bag sealing or any subsequent rupture of a bag.
- All asbestos waste material is double bagged.
- Only new, unused bags must be used, and bags marked for asbestos waste must not be used for any other purpose.
- Hard and sharp asbestos waste requires preliminary sealing or a protective covering before it is placed in the waste bags, to minimise the risk of damage to the bags.
- Asbestos waste bags are not filled more than half full and excess air is gently evacuated from the waste bag in a manner that does not cause the release of dust.
- The bag opening is twisted tightly, folded over and the neck secured in the folded position with adhesive tape or any other effective method ("goose necking" method).
- Bagged asbestos waste that has been securely sealed and packaged is placed in labelled containers;
- Waste containers are secure during transport to minimise damage to the asbestos within.
- The method of unloading the waste is undertaken in a manner that minimises the risk of tearing or other damage to the bags / wrapping.

Asbestos waste must be disposed of as soon as reasonably practicable, whether that is:

- At the end of the removal job.
- When the designated asbestos waste containers (skip bins) are full.
- At the end of each day if the asbestos waste cannot be secured at the removal site.

Where asbestos waste is kept in skip bins, the bins must be solely dedicated for asbestos with signage clearly present and secured to prevent exposure and unauthorised access.

If waste will not fit inside a lidded asbestos skip bin, it must be taken directly to an approved waste facility.

### **Asbestos waste must be controlled and not left unsecured on sites or at depots.**

An asbestos disposal form (Appendix C) is required to be completed whenever asbestos waste (excluding bituminous wrapped material) is taken to an approved waste facility by workers.

The facility must be contacted prior to disposing of the waste to confirm that they are able to accept the type and volume required.

The form shall be completed prior to attending the facility and a copy of the receipt for the disposal must be attached to it. Both the form and receipt shall be filed and retained in accordance with Section 7.

The Workplace Manager is responsible for organising regular inspections are undertaken on the containment (skip bin or similar), signage and barriers to ensure they remain effective.

### **6.3.3 Waste Removal – Bitumen pipe coating residue**

In addition to asbestos, bitumen and coal tar wrapped pipe or debris may contain Poly Aromatic Hydrocarbons (PAH's) which are known carcinogens.

Pipes with a coal tar or bituminous wrapping can generally be identified by a black or black/grey spiral wrapping surrounding a steel pipe although the appearance of the wrapping varies depending on its original application.

Routinely the application combined the use of a coal tar or bituminous coating over of a fabric wrap which contained asbestos. Over time the material degrades which exposes the fabric wrap which eventually flakes off as it becomes more brittle. Following degradation it is common for fragments of the bitumen and fabric wrap to fall from the pipe, particularly if handled or moved by heavy machinery.

The adopted handling, storage and disposal process must minimise the release of airborne asbestos fibres by:

- Collecting all debris and double bagging it in an asbestos removal bag or wrap it in heavy duty 0.2mm thick plastic sheeting.
- Placing the bags into a 200 litre drum and put an asbestos warning sticker on the drum.
- Storing the drum securely (preferably under cover) at a Water Corporation site, in a location away from personnel or site activities. The drum will need to remain there until the Asbestos Coordinator can identify an appropriate disposal solution (a facility for the disposal of this waste is currently being established and agreed upon).
- The material is added to the Asbestos Asset Register.

For further guidance, refer to the [Working on Asbestos Coated Pipes](#) Fact Sheet.

### **6.3.4 Retention of Work Documentation**

All documentation relating to the works must be kept on record.

Examples of documentation that must be recorded includes:

- Safe Job Planning (e.g. JSEA, SWMS).
- [Working Safely with Asbestos Checklist](#).
- Clearance Monitoring documentation (only required as described in Section 6.1.7)
- Waste Disposal Forms / Asbestos Disposal Record Form (Appendix C).

Copies of Clearance Monitoring documents and Waste Disposal Forms must be provided to the Asbestos Coordinator (see Section 7).

## 6.4 Response to unexpected finds

If asbestos and/or ACM is unexpectedly identified during works (e.g. if asbestos material is uncovered while trenching), or if known asbestos assets are damaged during work, then the [Work Instruction for unexpected asbestos finds](#) must be followed.

This Work Instruction details the notification, reporting and control actions required to adequately manage the risk from unexpected finds of asbestos and/or ACM.

## 6.5 Post Work

### 6.5.1 Update the Asbestos Asset Register

The Responsible Person must communicate the removal of asbestos and/or ACM to the Asbestos Coordinator along with the relevant documentation so that it can be taken off the register in the Asbestos Asset Register. In the case of removal of buried pipe, the Supervisor must notify the LiteSpatial / MyWorld Team to update our spatial mapping software.

If coal tar and/or bitumen pipe residue has been stored at a site this must be communicated to the Asbestos Coordinator to add to the Asbestos Asset Register.

## 7 Records

Water Corporation records associated with working with asbestos shall be stored in an easily retrievable manner.

Records must be stored in corporate files using the naming convention, retention period and disposition type outlined below. It is a legal requirement to store records in accordance with the [Water Corporation Records Retention and Disposal Schedule](#).

Record	To be retained by	Filing convention	Retained for (time period)	Disposition Type
JSEA & Working Safely with Asbestos Checklist (filed together)	Manager of the Relevant Work Area	OSH – Risk Management – Identification and Analysis – Job Safety Analysis and Step Back Forms	2 years after last action	Destroy 2 years after last action
JSEA & Asbestos Removal Control Plan Under Restricted Asbestos Licence (filed together)	Manager of the relevant work area	OSH – Risk Management – Identification and Analysis – Job Safety Analysis and Step Back Forms- Restricted Asbestos Work	5 years after last action	Destroy 5 years after last action
Asbestos Disposal Record Form	Supervisor	PROPERTY MANAGEMENT - Disposal - [Most Specific Asset Name and Number or Scheme Name Asbestos or Hazardous Substances]	Permanent 5 years after last action	Transfer to State Records Office
Working safely with asbestos checklist	Supervisor	PROPERTY MANAGEMENT - Planning - [Subject of Planning for Asbestos and Hazardous Substances or Materials]	Permanent 5 years after last action	Transfer to State Records Office



## 8 Definitions

Term	Description
Asbestos	The fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock forming minerals and includes actinolite, amosite (brown asbestos), anthophyllite, crocidolite (blue asbestos), chrysotile (white asbestos), tremolite, or any material containing one or more of those materials.
Asbestos Containing Material (ACM)	Means any material object, product or debris that contains asbestos
Asbestos Cement (AC)	Means products consisting of sand aggregate and cement reinforced with asbestos fibres (e.g. asbestos cement pipes and flat or corrugated asbestos cement sheets)
Asbestos Related Work	NOHSC declared a prohibition of all uses of asbestos from 31 December 2003, subject to a very limited range of exemptions. As such, any maintenance of, or service work on materials fixed or installed before this date must be considered to be potentially asbestos related work.
Asbestos Removal Work	Work involving the removal of asbestos or ACM.
Competent Person	A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to perform a specified task safely and correctly in accordance with Water Corporation's Standards and Procedures and Legislative requirements.
Contractor	A company or person that has contracted with the Corporation to provide goods and/or services including Suppliers, Consultants and Vendors.  The term includes direct employees of the contractor, subcontractors engaged by the contractor, and any other persons who have been engaged by the Contractor to perform work on behalf of the contractor.
Control Levels	Refers to the airborne concentration of a particular substance which, if exceeded, indicates a need to implement a control, action or other requirement. Control levels are generally set at no more than half the NES for the substance. Control levels are occupational hygiene 'best practice', and are not health-based standards.  Note: The first Control Level for Asbestos is set at 0.01 fibres/mL of air.
Dust and Debris	Refers to visible particles, fragments or chunks of material, large and heavy enough to have settled in the work area, that are likely to have originated from ACM.
Employee	A person who is conducting work covered by the Enterprise Agreement or an individual common law contract with the Water Corporation or an alliance, or who meets the definition of an employee under the <i>Fair Work Act 2009</i> . This includes: - consultants or contractors working within water corporation business units or regions - alliance personnel performing the services under an alliance contract.
Friable Asbestos	Friable asbestos is asbestos in the form of a powder, or which is soft and crumbles under hand pressure.
Licensed Asbestos Removalist	A person conducting a business or undertaking who is licensed under the WA OSH Regulations 1996 to carry out non-restricted or restricted asbestos removal work.

Term	Description
Must/Should	The words 'shall' and 'must' are to be understood as mandatory, non-negotiable requirement that is to be followed. There will be no deviation from this requirement.
National Exposure Standard (NES)	Refers to an airborne concentration of a particular substance, within the worker's breathing zone, which according to current knowledge, should not cause adverse health effects or undue discomfort to nearly all workers.  Note: The NES for all forms of asbestos is 0.1 fibres/mL of air
Non-Friable Asbestos	Refers to ACM which is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix. This is also restricted to material that measures greater than 7mm x 7mm  This is often referred to as 'bonded ACM'
Respirable Asbestos Fibre	Refers to a fibre of Asbestos small enough to penetrate into the gas exchange regions of the lungs. Respirable asbestos fibres are technically defined as fibres that are less than 3 µm wide, more than 5 µm in length and have a length to width ratio of more than 3 to 1.
Responsible Person	A person who provides direct supervision of work that is being undertaken in the absence of a Supervisor. The Responsible Person can give instructions to workers and can be held accountable for the work and actions of other workers under their supervision.  The responsible person is appointed by the Supervisor and it is not necessarily the line manager of the workers.
Restricted Licence	Required by WorkSafe to undertake work involving removal of non-friable ACM >10m <sup>2</sup> .
Should/May	The word 'should' is to be understood as recommended but non-mandatory. Deviation from the requirement is permissible provided there is a sound reason for it. 'Should' allow the reader to make a judgement and decide whether or not to follow the recommendation.
Supervisor	A person who is directly supervising work and has the power and authority to give instructions and be held accountable for the work and actions of other employees or contractors  A supervisor holds this authority within a workplace or workgroup but may not be a direct line manager of the people within that workplace or workgroup. For example: a supervisor may be the most senior person within a team on a site but the line manager(s) of people within that team may be located off site. This can include Project Managers or a suitable delegate if unable to supervise works.
Unrestricted Licence	Required by WorkSafe to undertake work involving friable asbestos and/or ACM.
Visitor	Any person (WC or non WC) who attends a workplace that is not their normal place of work for the purpose of one off and/or irregular visit.
Worker	A person who carries out work in any capacity for or on behalf of the Water Corporation. A worker agrees to perform work at Water Corporation's direction, instruction or request (whether express, implied, oral or in writing).  These includes employees, contractor, subcontractors, employees of contractors and subcontractors, labour hire employees, apprentice and trainees, work experience student, outworker, or volunteer.

Term	Description
Workplace	<p>Any place, including any aircraft, ship, or vehicle, where an employee works, or is likely to work, and includes any place where an employee goes while at work.</p> <p>A place where any person is or may work. The workplace is defined by the extent of activities being conducted.</p> <p><b>Operational</b> - Where operational work is undertaken – including, but not limited to, depots, workshops, treatment plants, dams, construction sites, vehicles and excavation sites.</p> <p><b>Non-operational</b> - where no operational work is undertaken including, but not limited to office buildings, office areas of depots, vehicles.</p>
Workplace Manager	Person who oversees the operation of a <b>workplace</b> and is responsible for ensuring the safety of people within that workplace and that operation of assets/activities is undertaken in an environmentally sound manner.

## 9 References

### 9.1 Referenced policies, standards, procedures, and work instructions

Document Number	Title	Location
S133	<a href="#">S133 Electrical Safety</a>	HSEAA MS
	<a href="#">Searching the Lupin database</a>	HSEAA MS
	<a href="#">Asbestos Containing Materials Work Instruction</a>	HSEAA MS, App D
	<a href="#">Decontamination of work area Work Instruction</a>	HSEAA MS
	<a href="#">Wet and Dry Removal Work Instruction</a>	HSEAA MS
	<a href="#">Asbestos Waste Disposal Work Instruction</a>	HSEAA MS
	<a href="#">Unexpected Finds Work Instruction</a>	HSEAA MS

**Note: App** - Document is included as an Appendix. **HSEAA MS** - available from the SEAA branch website, **Internal** - available from internal WC document management systems (Aquadoc, CorDocs), **External** - document available from the linked source but is not controlled within the HSEAA MS.

### 9.2 Supporting documents, templates and forms

Document Number	Title	Location
	<a href="#">Working Safely with Asbestos Checklist</a>	HSEAA MS
	<a href="#">Asbestos Disposal Record Form</a>	HSEAA MS. App C

**Note: App** - Document is included as an Appendix. **HSEAA MS** - available from the SEAA branch website, **Internal** - available from internal WC document management systems (Aquadoc, CorDocs), **External** - document available from the linked source but is not controlled within the HSEAA MS.



### 10 Compliance Mapping





Task	Legislation
Management of Asbestos in the Workplace	Health Act 1911 Occupational Safety and Health Act 1984 Environment Protection Act 1986 The Contaminated Sites Act 2003, Government of Western Australia Workers Compensation and Injury Management Act 1991
	Occupational Safety and Health Regulations 1996 Environmental Protection (Controlled Waste) Regulations 2000
	Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC: 2018(2005)] Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC: 2002 (2005)] Guidelines for the Assessment, Remediation and management of Asbestos-Contaminated Sites in Western Australia (Department of Health May 2009) Guide to the Control of Asbestos Hazards in Buildings and Structures [NOHSC: 3002 (1988) - ARCHIVED] Guidance Note on the Membrane Filter Method for. Estimating Airborne Asbestos Fibres [NOHSC: 3003 (2005)]
	AS 1216 Class Labels for Dangerous Goods AS 1319 Safety Signs for the Occupational Environment AS/NZS 1715 Selection, Use and Maintenance of Respiratory Protective Devices AS/NZS 1716 Respiratory Protective Devices AS 2601 The demolition of structures AS/NZS 3012 Electrical installations – construction and demolition sites AS4964 Method for the qualitative identification of asbestos in bulk samples AS/NZS 60335.2.69 Industrial vacuum cleaners


### 11 Document Revision History

Document Revision History	
28 Feb 2017	New Asbestos Framework

To provide feedback about this procedure, please email the SEAAB Management System Team on [SEAABManagementSystems@watercorporation.com.au](mailto:SEAABManagementSystems@watercorporation.com.au) or visit the SEAAB WaterNet.





## Appendix A Asbestos PPE / Equipment Selection Chart

Equipment Type	Recommended Type	Tips & Guidelines	Search term / MMR
<b>Disposable Coveralls</b>		<ol style="list-style-type: none"> <li>1. Use disposable coveralls with fitted hoods and cuffs so that personal clothing does not become contaminated.</li> <li>2. Don't wear personal clothing made from wool or other materials that attract fibrous dusts when you're working with asbestos.</li> <li>3. Fitted hoods shall always be worn over the straps of respirators, and loose cuffs shall be sealed with tape.</li> <li>4. Don't reuse disposable coveralls. Wrap disposable coveralls in a double layer of plastic and dispose as asbestos waste once the task is completed.</li> </ol>	MMR numbers: M: 17007 L: 17008 XL:17009 2XL:21264 3XL:21265
<b>Gloves</b>		<ol style="list-style-type: none"> <li>1. Single-use disposable nitrile gloves should be worn.</li> <li>2. Gloves used for asbestos removal work should be disposed of as asbestos waste and the workers should clean their hands and fingernails thoroughly whenever leaving the asbestos removal work area.</li> </ol>	Search Term: gloves, nitrile MMR numbers: L: 21094 XL: 21095
<b>Respiratory Protection</b>		<ol style="list-style-type: none"> <li>1. As a minimum you should wear a P2 face respirator, with two straps.</li> <li>2. Either a disposable or non-disposable half-face dust filter respirator is appropriate for work with asbestos cement sheeting (e.g. low speed drilling and cutting) or removal of bonded asbestos cement products.</li> <li>3. Do not reuse a disposable respirator or filters. They must be disposed of as asbestos waste.</li> <li>4. Filters must be replaced if using non-disposable respirators. The respirator must also be cleaned using damp rags. <b>Warning:</b> dispose of used rags as asbestos waste. Do not reuse or resoak rags.</li> <li>5. Persons with beards or other facial hair or stubble should be clean shaven to achieve facial seal required for respirators.</li> <li>6. Remember the respirator should be the first thing to go on and the last thing to come off.</li> </ol>	Cupped Style MMR: 20179 Flat-fold Style MMR: 21500
<b>Eyewear</b>		<ol style="list-style-type: none"> <li>1. Normal safety glasses should be worn</li> <li>2. Safety glasses should be wiped thoroughly with a disposable lens wipe after working with asbestos.</li> </ol>	Personal choice from stores

Equipment Type	Recommended Type	Tips & Guidelines	Search term / MMR
<p><b>Boots &amp; Boot Covers</b></p>		<ol style="list-style-type: none"> <li>1. Gum boots or laceless steel-capped rubber-soled work boots with disposable boot covers are preferred, as asbestos dust can gather in the laces and eyelets. Alternatively, use old footwear and dispose of as asbestos waste when the job is completed, or use disposable boot covers to fully enclose laced boots.</li> <li>2. Always decontaminate safety footwear before you leave the asbestos work area for any reason, or seal footwear in double bags for use only on the next asbestos maintenance task.</li> <li>3. Disposable boot covers must be disposed of as asbestos waste.</li> </ol> <p><b>Caution: Never use laced boots without disposable boot covers; as they are very difficult to clean properly</b></p>	<p>Over boot MMR:21226</p> <p>Gumboot sz6 MMR:1175</p> <p>Gumboot sz7 MMR:1176</p> <p>Gumboot sz8 MMR:1177</p> <p>Gumboot sz9 MMR:1178</p> <p>Gumboot sz10 MMR:1179</p>



## Appendix B Asbestos Work Disposal Consumables

Equipment Type	Recommended Type	Search Term / MMR
Disposal Bags		Search Term: asbestos MMR: 16711
Disposal Sheets		Search Term: asbestos MMR: 18995
Duct Tape		Search Term: asbestos MMR: 16710
Rags		Search Term: rag MMR: 11245

## Appendix C Asbestos Disposal Form

This form must be completed by:

- Contractors when removing asbestos containing material (ACM) or skip bins containing ACM for disposal at an approved waste facility.
- Any Water Corporation employee disposing of ACM at an approved waste facility.

Date: ____/____/____		Disposal Receipt Attached <input type="checkbox"/>	
Description of Asbestos / Location where removed:			
Estimated quantity of asbestos to be disposed:		m <sup>2</sup> / Kg	
Location of waste facility accepting asbestos:			
Name of Contractor or Water Corporation Employee disposing of asbestos:		Name and signature of Waste Facility Operator:	
_____  Licence No (if over 10 <sup>2</sup> m):		_____  Signature:	
_____  _____		_____  _____	

### Steps to complete this form

1. Ensure all parts of the form above have been completed
2. Ensure the landfill is licensed to receive asbestos waste. (All material containing asbestos must be disposed of at a disposal site appropriately licensed or registered under Part V of the Environmental Protection Act 1986 to accept asbestos waste, [Contact your Local Government Authority for disposal site locations](#))
3. Call the approved waste facility to confirm that the volume of ACM can be received for disposal.
4. ACM is to be sealed in heavy duty 200 µm (minimum thickness) polythene plastic and clearly labelled with the appropriate signage warning.
5. Large ACM pieces should never be broken into smaller pieces.
6. All drums or bins used to store and dispose of ACM should be in good condition, with lids and rims in good working order. The drums or bins should be lined with polythene plastic (200 µm minimum thickness) and be clearly labelled.
7. Transport the sealed and labelled ACM to disposal facility and ensure that the facility operator prints their name and signs this form.
8. Attach the disposal receipt to this form.
9. Employees disposing of ACM at an approved waste facility must attach the asbestos disposal receipt and this form to the JSEA and [working safely with asbestos checklist](#) for the job.

**Note:** All contractors must provide a copy of this completed form to their Water Corporation direct site contact.

*\*a list of approved asbestos waste facilities can be found on the next page however please contact your Local Government Authority for disposal site locations as **this list is subject to change and is only intended as a guide.***

## List of approved asbestos waste facilities

Region	District	Licensed Facility	Contact Number
Mid-West Region	Carnarvon	The Browns Range Waste Management Facility	(08) 9941 0000
	Denham	Shire of Shark Bay Refuse Site	(08) 9948 1218
	Dongara	Shire of Irwin Transfer Station	(08) 9927 0000
	Exmouth	Qualing Scarp	(08) 9949 3000
	Geraldton	Meru Waste Disposal Facility	(08) 9923 3188
	Gingin	Shire of Gingin Tip	(08) 9575 2211
	Leeman	Leeman Tip	(08) 9952 0100
	Meekatharra	Meekatharra Refuse Site	(08) 9980 0600
	Moora	Moora Rubbish Tip	(08) 9651 1401
	Morawa	Shire of Perenjori	(08) 9973 0100
	Mt Magnet	Meekatharra Refuse Site	(08) 9980 0600
Mullewa	Meru Waste Disposal Facility	(08) 9923 3188	
Three Springs	Leeman Tip	(08) 9953 1388	
North-West Region	Broome	Shire of Broome Waste Management Facility	(08) 9192 8018
	Derby	Derby Waste Management Facility	(08) 9191 0999
	Karratha	Karratha 7 Mile Waste Facility & Transfer Station	(08) 9186 8555
	Kununurra	Kununurra Landfill	(08) 9168 4100
	Newman	Windell Refuse Site	(08) 9175 8000
	Millstream	Karratha 7 Mile Waste Facility & Transfer Station	(08) 9186 8555
	Port Hedland	South Hedland Landfill	(08) 9158 9700
	Wyndham	Kununurra Landfill	(08) 9168 4100
Great Southern Region	Albany	Hanrahan Road Waste Minimisation Facility	(08) 9842 3555
	Denmark	McIntosh Waste Transfer Station	(08) 9848 0300
	Esperance	Wylie Bay Waste Facility	(08) 9071 0610
	Gnowangerup	Hanrahan Road Waste Minimisation Facility	(08) 9842 3555
	Jerramungup	Hanrahan Road Waste Minimisation Facility	(08) 9842 3555
	Katanning	Katanning Refuse Facility	(08) 9821 9999
	Kulin	Kulin Transfer Station	(08) 9880 1204
	Lake Grace	Lake Grace Waste Facility	(08) 9890 2500
	Mt Barker	Hanrahan Road Waste Minimisation Facility	(08) 9842 3555
	Narrogin	Narrogin Rubbish Tip	(08) 9881 1944
Pingelly	Pingelly Waste Management Facility	(08) 9887 1066	
Ravensthorpe/Hopetoun	Waste Disposal Facility	(08) 9839 0000	
Goldfields and Agricultural Region	Cunderdin	Old Quarry Road Waste Management Facility	(08) 9621 1795
	Corrigin	Merredin Landfill and Resource Recovery Site	(08) 9041 1611
	Dalwallinu	Old Quarry Road Waste Management Facility	(08) 9621 1795
	Kellerberrin	Merredin Landfill and Resource Recovery Site	(08) 9041 1611
	Koorda	Merredin Landfill and Resource Recovery Site	(08) 9041 1611
	Merredin	Merredin Landfill and Resource Recovery Site	(08) 9041 1611
	Mukinbudin	Merredin Landfill and Resource Recovery Site	(08) 9041 1611
	Northam	Old Quarry Road Waste Management Facility	(08) 9621 1795
	Quairading	Old Quarry Road Waste Management Facility	(08) 9621 1795
	Wongan hills	Old Quarry Road Waste Management Facility	(08) 9621 1795
	Wyalkatchem	Merredin Landfill and Resource Recovery Site	(08) 9041 1611
	Coolgardie	Yarri Road Refuse Facility	(08) 9091 4308
	Ghooli	Southern Cross Waste Facility	(08) 9049 1001
	Kalgoorlie	Yarri Road Refuse Facility	(08) 9091 4308
	Laverton	Leonora Waste Facility	(08) 90376044
	Leonora	Leonora Waste Facility	(08) 90376044
Norseman	Yarri Road Refuse Facility	(08) 9091 4308	
Southern cross	Southern Cross Waste Facility	(08) 9049 1001	
South- West Region	Augusta	Dunsborough Waste Facility	0417 179 596
	Bridgetown	City of Bunbury Waste Management Facility	(08) 9782 7333
	Bunbury	City of Bunbury Waste Management Facility	(08) 9782 7333
	Busselton	Dunsborough Waste Facility	0417 179 596
	Collie	Warren Blackwood Waste Facility	(08) 9777 1025
	Manjimup	Warren Blackwood Waste Facility	(08) 9777 1025
	Margaret River	Dunsborough Waste Facility	0417 179 596
Perth Metropolitan	Neerabup	RCG Pty Ltd	(08) 9407 5069
	Mindarie	Mindarie Regional Council	(08) 9306 6300
	Gidgegannup	Eastern Metro Regional Council	(08) 9574 6235
	Forrestdale	City of Armadale	(08) 9399 3935
	Kwinana	Wastestream Management	(08) 9439 1300
	Baldivis	City of Rockingham	(08) 9524 2053
	South Cardup	West Australian Landfill Services	(08) 9525 5355
	Postans	Eclipse Resources	(08) 9381 5600
	Waroona	Buller Road Refuse Disposal Site	(08) 9733 1277
Waroona	Premium Waste Management	0428 261 554	



## Appendix D Asbestos Containing Materials Work Instruction

### Cutting and Removing Asbestos Containing Materials

Step	Instruction	Comment
1.	If removing asbestos pipe, carefully uncover the pipe to expose the repair section. Once exposed, manual excavation should be used.	<ul style="list-style-type: none"> <li>This will minimise the risk of damage to the pipe.</li> </ul>
2.	If removing another type of ACM (excluding buried pipe), ensure all care is taken to prevent breakage of the material.	<ul style="list-style-type: none"> <li>This will minimise the risk of fibre release from the asset.</li> </ul>
3.	Prepare plastic for the disposal of contaminated PPE and waste asbestos product	<ul style="list-style-type: none"> <li></li> </ul>
4.	If cutting pipe thoroughly wet area to be cut before cutting starts and during cutting ensuring it remains wet at all times.	<ul style="list-style-type: none"> <li>Wetting the pipe thoroughly will further reduce the release of dust containing fibres when cutting</li> <li>Where there is an interruption to normal water supplies, sufficient water may need to be transported to the site.</li> </ul>
5.	When cutting pipe only use non-powered hand tools, such as chain cutters or hand saws.	<ul style="list-style-type: none"> <li><b>Never</b> use power tools and abrasive cutting or sanding</li> <li>Manual non-powered tools will generate a smaller quantity of predominately coarser dust or waste chips.</li> <li>Alternatively, if breakage is required to enable removal, break ACM with a hammer or shrouded brick chisel – removing debris as work progresses.</li> </ul>
6.	If removing buried pipe, remove section of pipe from trench including all off-cuts, residue, soil and any collected dust before disposal as asbestos waste.	
7.	Double wrap ACM in plastic sheeting and collect small quantities. Ensure plastic sheeting is fully sealed with duct tape and labelled "Asbestos Waste" before transport back to the depot and/or disposal.	<ul style="list-style-type: none"> <li>Sections of ACM that are too large to fit into the asbestos disposal bags are to be placed into plastic sleeves with the ends sealed and marked along the length with taped marked "Caution Asbestos".</li> </ul>
8.	Paint and seal any exposed edges of the ACM with water based paint or a PVA based adhesive such as "Aquadhere".	<ul style="list-style-type: none"> <li>Sealing the exposed edges minimizes any potential for release of fibres</li> </ul>

### Removing Bitumen Coated / ACM Pipe Wrap

Step	Instruction	Comment
1.	Place a plastic drop sheet under the pipe to collect the loose pieces of stripped coating.	<ul style="list-style-type: none"> <li>Large enough to contain all removed material.</li> </ul>
2.	Mark or score the area on the pipe to be removed with a utility knife or shrouded brick chisel.	<ul style="list-style-type: none"> <li>Wear protective gloves to minimise potential for lacerations.</li> <li>Take care to contain or collect debris removed from chipping.</li> </ul>
3.	Thoroughly wet the material to be removed. It must be kept damp at all times.	<ul style="list-style-type: none"> <li>Keep wetting the area throughout the removal process. Bitumen coatings may be quite resistant to water so ensure the edge of the work surface is kept continually wet.</li> </ul>
4.	Use manual tools (hammer, chisel, wire brush) to chip or break away the wrapping between scored sections.	<ul style="list-style-type: none"> <li>Collect all material on the plastic drop sheet, picking up any loose debris that may have fallen outside the drop sheet.</li> </ul>
5.	Spray all the materials on the sheeting once again, and tightly wrap up stripped coating material by folding sheeting inwards. Place sheeting in asbestos waste bag (0.2mm thick plastic bag) and seal bag securely with tape. All waste to be double bagged.	<ul style="list-style-type: none"> <li>Place all asbestos waste material in the area set aside for placement of disposal bags.</li> <li>Waste must be double wrapped and secured for transport.</li> </ul>
6.	Place all waste contained within the thick plastic bag into a drum and seal the drum.	<ul style="list-style-type: none"> <li>Ensure the drum is labelled with an asbestos warning sticker.</li> </ul>
7.	Store the drum away from interference from site personnel or site activities.	<ul style="list-style-type: none"> <li>The drum must be stored in a secure manner, ideally under cover, until strategy has been worked up for ongoing management of this material</li> <li>Note: Once on the site, the material shall be placed on the sites asbestos register.</li> <li>Note: At time of procedure preparation the Corporation is still developing a final procedure for the management, transport, storage and treatment/disposal of these wastes. Until that procedure is published advice on these waste management issues should be sought from the High Risk and Contaminated Sites teams in the SEAA Branch – in general terms all of the Corporation's procedures around asbestos management apply, and recognition of the potential for the PAHs in the pipe coating to generate vapours should be given in risk assessments – specifically heat and/or cutting tools should not be applied to these pipe coatings, and manual removal techniques used.</li> </ul>
8.	Paint any exposed edges of the wrapping with water based paint.	

## Removing ACM Gaskets

Step	Instruction	Comment
1.	Place a plastic drop sheet under the pipe to collect the loose pieces of stripped coating.	<ul style="list-style-type: none"> <li>Large enough to contain all removed material.</li> </ul>
2.	Carefully uncover the old gasket to be removed by splitting the pipe flange or other equipment.	<ul style="list-style-type: none"> <li>Damaging the gasket can allow fibres to be released to atmosphere.</li> </ul>
3.	Thoroughly soak the gasket material in water, CRC or similar product.	<ul style="list-style-type: none"> <li>Soaking the gasket will minimize the release of fibres during removal</li> </ul>
4.	Remove old gasket using a sharp scraper or wood chisel. No wire buffing	<ul style="list-style-type: none"> <li>Gasket material of any kind must never be sawn, ground, hammered or otherwise treated in a manner that will create dust.</li> <li>Remove the gasket in one piece whenever possible.</li> </ul>
5.	Double wrap gasket debris in plastic sheeting and collect small quantities. Ensure plastic sheeting is fully sealed with duct tape and labelled "Asbestos Waste" before transport back to the depot and/or disposal	<ul style="list-style-type: none"> <li>Sections of ACM that are too large to fit into the asbestos disposal bags are to be placed into plastic sleeves with the ends sealed and marked along the length with taped marked "Caution Asbestos".</li> </ul>

## Removing Asbestos Cement Debris

Step	Instruction	Comment
1.	Dampen the AC debris with spray.	<ul style="list-style-type: none"> <li>A hose or garden sprayer is appropriate</li> </ul>
2.	Pick up larger pieces of debris. Put them in an asbestos waste bag (0.2mm thick plastic bag).	<ul style="list-style-type: none"> <li>For debris on rough surfaces, keep it damp and scoop or scrape it into the waste container.</li> </ul>
3.	Clean contaminated surfaces with damp rags, then put these in the waste bag.	<ul style="list-style-type: none"> <li>If cleaning debris on soil, a small spade can be used to remove a proportion of soil around the debris.</li> </ul>
4.	Press adhesive tape onto small dust deposits, then put the tape in the waste bag.	<ul style="list-style-type: none"> <li>This is applicable where the debris is located on a hard surface such as a cement slab.</li> </ul>
5.	Put used rags and other waste in the waste bag, tape it closed with duct tape and label "Asbestos Waste" before transport back to the depot and/or disposal.	



### Drilling of Electrical Switchboards Containing Asbestos

Step	Instruction	Comment
1.	Tape both the point to be drilled and the exit point, if accessible, with a strong adhesive tape	<ul style="list-style-type: none"> <li>This prevents the edges from crumbling</li> </ul>
2.	Cover the drill entry and exit points (if accessible) with a generous amount of thickened substance.	<ul style="list-style-type: none"> <li>The thickened substance recommended is shaving cream as it works well to hold dust particles together.</li> </ul>
3.	Use a sharp standard spiral drill to drill a hole through the paste.	<ul style="list-style-type: none"> <li>Carbide tip drills, hammer action, spade bits and blunt bits are not to be used.</li> </ul>
4.	Use damp rags to clean off the paste and debris from the wall and drill bit.	
5.	Dispose of the rags as asbestos waste	<ul style="list-style-type: none"> <li>They will contain asbestos dust and fibres.</li> </ul>

## **ATTACHMENT 4**

### Waste and Transport Management Procedure

# ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE

## 1 PURPOSE

The purpose of this procedure is to manage risks related to the management and disposal of asbestos containing material and asbestos contaminated soils to minimise potential health impacts to employees, subcontractors, members of the public and the environment.

## 2 WASTE MANAGEMENT

### 2.1 WASTE HANDLING AND STORAGE

Asbestos waste is required to be managed and disposed of in a manner that complies with relevant regulatory requirements, prevents unacceptable environmental impacts and which permits the reduction, recycling, or re-use of materials where appropriate. The following measures apply to the management of any known or suspected asbestos containing waste.

- Depending on volumes the following options are available if asbestos material is required to be disposed of off-site.
  - For contaminated soils removed from the Site, trucks are required to be fitted with a tarpaulin to cover the load to prevent drying of the soil or dust lift-off from the soil during transport.
  - Asbestos waste, such as friable ACM, small pieces of non-friable ACM, disposable PPE and equipment, needs to be contained in heavy-duty 0.2mm (minimum thickness) polyethylene bags that are no more than 1200mm-long and 900mm-wide for ease of handling. The bags must be labelled with an appropriate warning, clearly indicating that they contain asbestos, that dust creation and inhalation should be avoided (see Figure 1). The bags will be sealed with tape at the end of each day and transferred to a dedicated asbestos disposal container.
  - Non-friable asbestos (such as ACM or infrastructure) can be:
    - a) Wrapped in the polyethylene sheeting (0.2mm minimum thickness) and may be placed directly into a skip or vehicle tray. Adhesive tape needs to be used to secure the entire length of every overlapped wrapping. Wrapped bundles of asbestos sheeting and redundant asbestos lagged pipes and equipment need to be of a size that minimises the risk of the polyethylene sheeting tearing or splitting and/or a manual handling injury occurring.
    - b) Placed directly into waste skip bins that are double lined with polyethylene sheeting (0.2mm minimum thickness).



Figure 1 – heavy duty, polyethylene, 0.2mm thick, labelled, asbestos disposal bag



## **ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE**

- Waste skip bins are required to be covered and contained within an exclusion zone (within the Exclusion Zone) until transported off site. The bins shall be dedicated for asbestos waste (i.e. not to be used for general waste), labelled as containing asbestos, and secured (locked) to prevent accidental exposure to bins contents.
- All waste should be disposed of in a timely manner.
- Any accidental misplacement of waste fill or spillages will be corrected immediately with the incident logged as an environmental incident.
- See section 2.3 for the Waste Classification process.

### **2.2 WASTE TRACKING SYSTEM PROCEDURE**

A Materials Tracking System (MTS) is required to be implemented for any subsurface works in an Exclusion Zone to account for the management of all excavated contaminated material and to ensure that all soils and waste are tracked from cradle-to-grave. The MTS will be used to manage and monitor the movement of contaminated material and will:

- Record and document the handling of clean and contaminated material using a logging sheet of estimated volumes leaving the excavations and a notation of the destination.
- Provide corrective actions to rectify any accidental misplacement or spillage of waste.
- Landfill disposal dockets (where applicable).

Management controls for the movement of a clean and contaminated materials include:

- An initial site induction for all personnel involved with site works in an Exclusion Zone.
- A Materials Tracking Log Sheet (MTLS) will be provided at the completion of earth works to document the movement of all excavated and backfilled material at the Site.
- Documentation for waste or materials tracking should include (but not be limited to) daily site records, stratigraphy of excavations, soil type observations and any waste material present, photographs, excavation surveys, management of stockpiles, records of off-site trucking movements and collection of landfill dockets.

Key performance indicators for the effective performance of the MTS are:

- Unbroken chain of documentation that tracks material from cradle-to-grave.
- All loads are identified and accounted for.
- All waste moved off-site is disposed to the appropriate class of landfill.
- Reasonable agreement between quantities calculated from survey excavations and also trucking/landfill dockets (as applicable).

Monitoring and reporting will include:

- All MTLS, trucking and landfill dockets to be summarised at the completion of each subsurface works for inclusion into future environmental reporting.
- A check of the MTS will be undertaken by the Environmental Management Team to ensure all details are being completed correctly and that material is being relocated in conformance to the MTS.
- Photographic records.

# ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE

- Copies of daily site records.

## 2.3 WASTE CHARACTERISATION

- Asbestos and asbestos cement products are classified as Special Waste - Type 1 and should be disposed of at a landfill licensed to receive this type of material.
- Excavated contaminated soil shall be disposed off-site at a facility licensed to receive Special Waste - Type 1 and in accordance with the chemical classification of the soil as determined by laboratory analytical results and 'Landfill Waste Classification and Definitions' (DEC, 1996 as amended 2009). The chemical classification of the soils should be based on the identified contaminants of concern.
- It is recommended that the advice of a competent person such as an environmental consultant be sought when considering and undertaking soil sampling and laboratory analysis. Sufficient time should be allowed to complete this task in the program.

## 2.4 TRANSPORTATION OF WASTE

The transportation and handling of all contaminated material is required to be undertaken in a safe and environmentally responsible manner, and also to minimise the volume of waste generated by excavation works requiring off-site disposal.

- All movement of material (clean and contaminated) is to be recorded using an MTS.
- Trucks are to be roadworthy and operated in accordance with transport regulations.
- All truck loads are to be within legal weight limits.
- Trucks are to use the major arterial road networks.
- Trucks will enter and exit the Site via the designated entrance.
- Trucks are to be kept to dedicated clean tracks. If trucks have entered Exclusion Zones, they must exit through a vehicle wash-down area prior to exiting the Exclusion Zone to remove any contaminated material that may be adhering to tyres and wheels.
- The road condition at the entrance/exit to the work Site will be monitored and regularly sweep/wash as necessary and particularly during periods of busy truck movements.
- Contaminated material that is required to be transported off-site can be done so once approval has been provided by the landfill operator. The landfill operator will be supplied with the necessary documentation to arrange for approval to transport the material to their facility prior to commencing. Clarification should also be sought as to whether the landfill will accept asbestos contaminated soil loose in the haulage truck or whether it is required to be bagged.

## 3 REFERENCES

Department of Environment and Conservation (DEC) (1996) *Landfill Waste Classifications and Waste Definitions*, 1996 as amended 2009.

Department of Health (DoH) (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*.

# ASBESTOS WASTE AND TRANSPORT MANAGEMENT PROCEDURE

## 4 DEFINITIONS OF ACRONYMS OR TERMS

ACRONYM OR TERM	DEFINITION
Asbestos	<p>The asbestiform variety of any mineral silicate belonging to the serpentine or amphibole group of rock-forming minerals and includes the asbestiform variety of the following:</p> <ul style="list-style-type: none"> <li>a) actinolite;</li> <li>b) grunerite or amosite (known as brown asbestos);</li> <li>c) anthophyllite;</li> <li>d) chrysotile (known as white asbestos);</li> <li>e) crocidolite (known as blue asbestos); and</li> <li>f) tremolite.</li> </ul> <p>Asbestos is a Class 1 carcinogen (known to cause cancer) with the main risk to health being through inhalation of respirable fibres</p>
Asbestos Containing Material (ACM)	<p>Asbestos Containing Material (ACM) is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos cement fencing. This is also restricted to material that cannot pass through a 7mm x 7mm sieve. ACM usually represents a low human health risk if it has not been weathered or crushed/ abraded and is handled intact</p>
Asbestos Fines (AF)	<p>Asbestos fines (AF) includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7mm x 7mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibund, which can pose a considerable inhalation risk if made airborne.</p>
Asbestos Impacted Soils	<p>Soils that are impacted by asbestos containing materials, asbestos fines and fibrous asbestos.</p>
DoH	<p>Department of Health</p>
Fibrous Asbestos (FA)	<p>Severely weathered ACM and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined by the DoH as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Examples of friable asbestos include, but are not limited to, asbestos lagging, sprayed insulation, millboard, felt and woven asbestos matting. Both ACM and FA can often be detected visually.</p>
Mm	<p>Millimetre</p>
MTLS	<p>Materials Tracking Log Sheet</p>
MTS	<p>Materials Tracking System</p>
NOHSC	<p>National Occupational Health and Safety Commission</p>
PPE	<p>Personal Protective Equipment</p>



**APPENDIX 6:**  
PUBLIC OPEN SPACE  
SCHEDULE

Appendix Six

**Public Open Space Schedule**



## POS SCHEDULE - TABLE 1 (of 2)

PRO BRO/ 210414 POS Schedule.xlsx

ha

ha

	<b>Gross area</b>		
	Structure Plan area	2.9897	
<b>A</b>		<b>GROSS AREA</b>	<b>2.9897</b>
	<b>Deductions</b>		
	Non Creditable open areas (1:1 drainage) (H)	0.0096	
	Private Community Purposes	0.0004	
<b>B</b>		<b>Sub-total</b>	<b>0.0100</b>
<b>C</b>	Excess Restricted POS $((M-(0.02(A-B)))/0.98=C)$	0.0000	
<b>D</b>		<b>Total deductions (B+C=D)</b>	<b>0.0100</b>
<b>E</b>		<b>Net subdivisible area (A-D=E)</b>	<b>2.9797</b>
<b>F</b>		<b>10% requirement (10% of E = F)</b>	<b>0.2980</b>
	<b>POS provided</b>		
<b>M</b>	Unrestricted open space (L)		0.1639
<b>N</b>	Creditable restricted open space $(K-C=N)$ (Max 20% of F)		0.0186
<b>O</b>	<b>Total creditable POS provided (M+N)</b>		<b>0.1825</b>
<b>P</b>	<b>Percentage of POS provided (O/E)</b>		<b>6.12%</b>
<b>Q</b>	POS Balance area (O-F)		-0.1155
<b>R</b>	Gross POS (G)		0.1921
<b>S</b>	Gross POS /gross area (G/A)		6.43%



## POS SCHEDULE - TABLE 2 (of 2)

PRO BRO/ 210414 POS Schedule.xlsx

(NOTE: all figures quoted in 'ha')			G	H	I	J	K	L
BDG Code	LWMS Catchment	POS LOCATION	Gross POS	1:1 Area (deduction)	Net Area (G-H)	1:5 Area (Restricted)	Total restricted (J-H)	Total Unrestricted (I-K)
POS 1	1	North	0.0797	0.0000	<b>0.0797</b>	0.0112	<b>0.0112</b>	<b>0.0685</b>
POS 2	2	South	0.1124	0.0096	<b>0.1028</b>	0.0170	<b>0.0074</b>	<b>0.0954</b>
<b>TOTAL</b>			0.1921	0.0096	0.1825	0.0282	0.0186	0.1639
						0.0282		

Issue:	Date:	Author:	Revision:
a	28/11/2018	Mitch Bisby	First issue (RNC CAS 03-01c-01 dated 14/04/21)

Appendix Seven

# Traffic Impact Statement



# TRANSPORT IMPACT STATEMENT

Lot 4 Fern Road  
& Lot 102 Castledare Place, Wilson

March 2021

Rev F

The logo for KCTT features a stylized 'K' on the left, composed of three parallel diagonal lines above a solid vertical bar. To the right of the 'K' are the letters 'C', 'T', and 'T' in a bold, rounded, sans-serif font. The entire logo is rendered in a dark red color.

kctt



## Transport Impact Statement

KC00812.000 Lot 4 Fern Road & Lot 102 Castledare Place, Wilson

### HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Rev A	23.03.2018	M Kleyweg	M Kleyweg	28.03.2018	Issued for Review
Rev B	18.04.2018	M Kleyweg	M Kleyweg	18.03.2018	Issued for Review
Rev C	19.04.2018	M Kleyweg	M Kleyweg	19.03.2018	Issued for Review
Rev D	26.06.2018	M Kleyweg	M Kleyweg	26.06.2018	Amended according to the received comments
Rev E	3.04.2021	M Kleyweg	M Kleyweg	10.03.2021	Proposed layout amended
Rev F	19.03.2021	M Kleyweg	M Kleyweg	19.03.2021	Amended according to the received comments

### DISTRIBUTION OF COPIES

Revision	Date of issue	Quantity	Issued to
Rev A	28.03.2018	1 (PDF)	Mr Peter Dockett
Rev B	18.04.2018	1 (PDF)	Mr Peter Dockett
Rev C	19.04.2018	1 (PDF)	Mr Peter Dockett
Rev D	26.06.2018	1 (PDF)	Mr Peter Dockett
Rev E	10.03.2021	1 (PDF)	Mr Peter Dockett, Andy Tyack (Richard Noble)
Rev F	19.03.2021	1 (PDF)	Mr Peter Dockett, Andy Tyack (Richard Noble)

<b>Document Printed</b>	19/03/2021 9:47 AM
<b>File Name</b>	C:\Users\Innovo\Box\KCTT Projects\KC00000 Current Projects\KC00812.000 Lots 4 and 102 Fern Road, Wilson TIS\Outgoing\Report\210319 Rev F\KC00812.000 Lot 4 Fern Road & Lot 102 Castledare Place, Wilson - Rev F.docx
<b>Author of the Report</b>	Jelena Simic
<b>Project Team</b>	Ana Nikolic
<b>Project Director / Project Manager</b>	Marina Kleyweg
<b>Name of Project</b>	Lot 4 Fern Road & Lot 102 Castledare Place, Wilson
<b>Name of the Document</b>	Lot 4 Fern Road & Lot 102 Castledare Place, Wilson – Transport Impact Statement
<b>Document Version</b>	KC00812.000_R01_Rev F



Quality  
ISO 9001

SAI GLOBAL

Prepared by: **KCTT (Trading as Traffic and Transport Pty Ltd)**

ABN 35 148 970 727 |

Postal address: **PERTH:** Unit 7, No 10 Whipple Street Balcatta WA 6021 | **BELGRADE:** 23 Hilandarska, Beograd 11000

Phone: 08 9441 2700 |

Website: [www.kctt.com.au](http://www.kctt.com.au) |

# Table of Contents

---

<b>1. Executive Summary .....</b>	<b>4</b>
<b>2. Transport Impact Statement.....</b>	<b>5</b>
2.1 Location .....	5
2.2 Technical Literature Used .....	5
2.3 Land Uses .....	6
2.4 Local Road Network Information.....	8
2.5 Traffic Volumes .....	9
2.6 Vehicular Crash Information.....	12
2.7 Public Transport Accessibility .....	13
2.8 Pedestrian Infrastructure.....	13
2.9 Cyclist Infrastructure.....	13
2.10 Vehicular Parking .....	14
2.11 Parking Surveys .....	14
2.12 Bicycle Parking.....	15
2.13 ACROD Parking .....	15
2.14 Delivery and Service Vehicles.....	15
2.15 Calculation of Development Generated / Attracted Trips .....	15
2.16 Trip Purposes.....	17
2.17 Expected Origin / Destination .....	17
2.18 Traffic Flow Distribution onto External Road Networks.....	18
2.19 Road Safety.....	18
2.20 Proposed Intersection Controls.....	19
2.21 Proposed Internal Road Network.....	19
2.22 Proposed Internal Transport Networks.....	22
2.23 Changes to External Transport Networks.....	22
2.24 Integration with Surrounding Area .....	23
2.25 Analysis of Transport Networks.....	23
2.26 Site Specific Issues and Proposed Remedial Measures.....	24

## Appendices

---

**Appendix 1** - The layout of the proposed development

**Appendix 2** - Transport Planning and Traffic Plans

## **Transport Impact Statement**

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### **1. Executive Summary**

This Transport Impact Statement has been prepared to investigate the potential transport impact due to rezoning portions of Lot 4 Fern Road & Lot 102 Castledare Place, Wilson.

Lot 4 Fern Road & Lot 102 Castledare Place are currently predominantly vacant. Portion of Lot 102 features Castledare Miniture Railways, a tourist attraction, which is to be retained with a dedicated car parking area.

Proposed Structure Plan Area indicates 44 residential lots, with an average Lot area of 434m<sup>2</sup> (minimum Lot area of 298m<sup>2</sup> and a maximum Lot area of 905m<sup>2</sup>). Please refer to the Appendix 1 for clarity.

The estimate of traffic impact assumes that the area will have up to 44 individual residential dwellings. Total traffic generated by the proposed 44 single residential dwellings situated within the scheme amendment area is approximately 295VPD. Peak traffic, 36 vehicular trips per hour, will coincide with the peak hour time of the surrounding road network. According to WAPC Guidelines, developments generating 10-100 VPH can be deemed to have a moderate impact on the existing road network. The proposed zoning amendment to urban will not have a negative impact on the existing road network as the traffic generated by the proposed development would be less than 1% of the existing traffic.

Crash history of Fern Road fronting both Lot 4 and Lot 102 and the intersection of Fern Road and Castledare Place fronting Lot 102 was investigated. It can be concluded that above nominated locations do not do not raise safety concerns in relation to the crash history data available from Main Roads for the period of December 2015 to December 2019.

KCTT believe that the proposed scheme amendment to rezone subject site from "Parks and Recreation / Bush Forever" to "Urban" is not likely to have negative impact on the existing transport network.



## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

## 2. Transport Impact Statement

**Note:** This document is copyright to KCTT (trading as KC Traffic and Transport Pty Ltd). The information provided in this TIS report has been developed by KCTT over a period of years and has been presented in accordance with the requirements of a number of our clients. The information in this report is therefore intended to be commercial in confidence and is not to be shared with external parties at any time, unless a Director of KCTT provides written authorisation that the document may be shared at a specific time to a specific party, or parties. The terms and conditions associated with the receipt of this material is that it is not shared or distributed without our express, and written consent.

If you have received this information in error, KCTT must be notified immediately. We request the immediate destruction of all formats of this document, inclusive of paper and electronic copies should you have received this document in error.

### 2.1 Location

Lot Numbers/ House Number Suburb	Lot 4 (No 100) Fern Road & Lot 102 (No 16) Castledare Place Wilson
Description of Site	Lot 4 Fern Road & Lot 102 Castledare Place are currently vacant. Lot 102 in part features Castledare Miniature Railways, a tourist attraction, which is to be retained with redesigned dedicated car park.  Proposed Structure Plan Area indicates 44 residential lots, with an average Lot area of 434m <sup>2</sup> (minimum Lot area of 298m <sup>2</sup> and a maximum Lot area of 905m <sup>2</sup> )  Please refer to the Appendix 1 for clarity.

### 2.2 Technical Literature Used

Local Government Authority	City of Canning
Type of Development	Local Structure Plan & Proposed Scheme Amendment (Rezoning of portion of Lots 4 and 102 Fern Road to Urban)
Are the R-Codes referenced? <i>If YES, nominate which:</i>	YES State Planning Policy 7.3 Residential Design Codes Volume 1 - 2019 R-Codes (incorporating amendments gazetted on 2/8/2013, 23/10/15 and 2/3/2018 and 24/5/2019)

**Transport Impact Statement**

KC00812.000 Lots 4 and 102 Fern Road, Wilson

Is the NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses) referenced? YES

Which WAPC Transport Impact Assessment Guideline should be referenced? Volume 2 - Planning Schemes, Structure Plans & Activity Centre Plans

Are there applicable LGA schemes for this type of development? YES

*If YES, Nominate:*

Name and Number of Scheme City of Canning Town Planning Scheme No.40

**2.3 Land Uses**

Are there any existing Land Uses within the Scheme Amendment Area? YES

*If YES, nominate:*

Castledare Miniature Railways (a tourist attraction) partly located in Lot 102.

What zone is the scheme amendment (rezoning) area zoned in accordance to the Metropolitan Region Scheme? Lot 4 – Parks and Recreation / Bush Forever  
Lot 102 – Parks and Recreation / Bush Forever and Urban



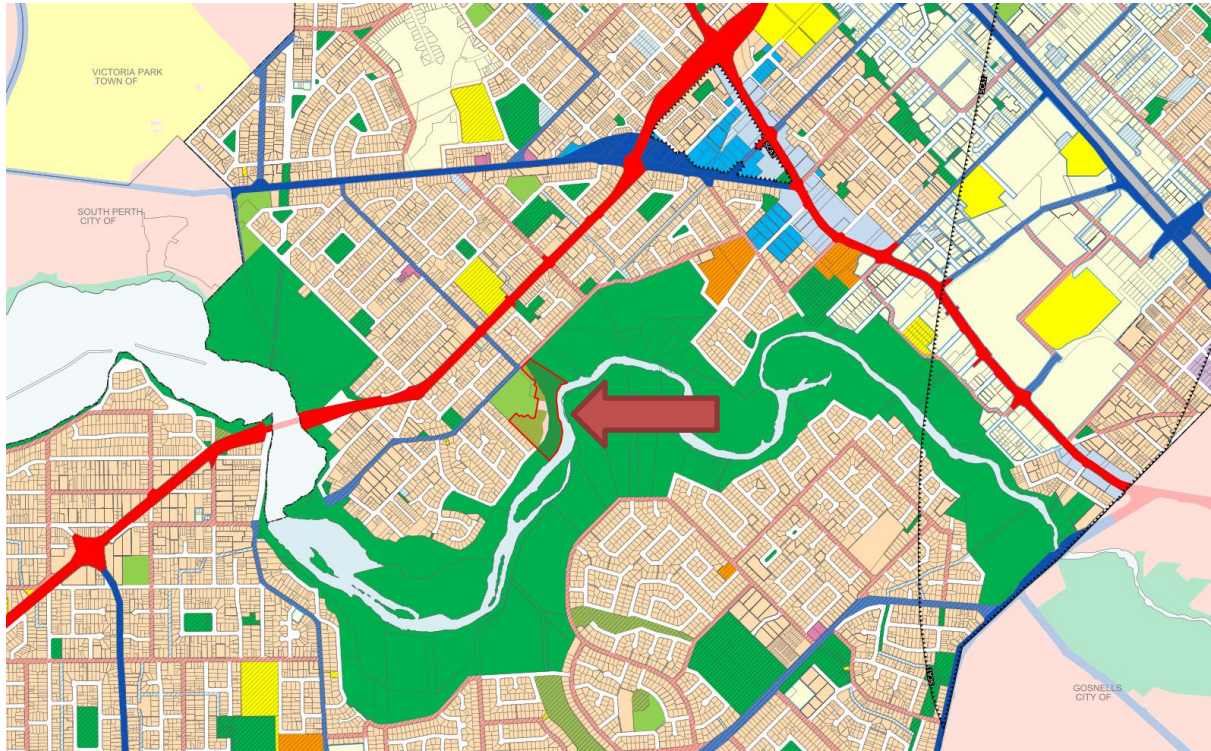
Source: Department of Planning Lands and Heritage Plan WA Mapping System (2018)

**Transport Impact Statement**

KC00812.000 Lots 4 and 102 Fern Road, Wilson

What zone is the scheme amendment (rezoning) area zoned in accordance with the LPS / TPS?

Lot 4 – Parks and Recreation / Bush Forever  
 Lot 102 – Private Clubs and Institutions and Parks and Recreation / Bush Forever



Source: City of Canning IntraMaps (2021)

Existing land uses surrounding the Scheme Amendment Area

Residential (R25), Parks and recreation, Private Community Purposes

**Proposed Scheme Amendment**

Nominate current zoning within Lot 4

Parks and recreation (Regional Reserve), Urban Development

Nominate current zoning within Lot 102

Parks and recreation (Regional Reserve), Private Community Purposes, Urban Development

Nominate proposed zoning within Lots 4 and 102

Urban Zone / Parks and Recreation

Nominate land use type and yield

44 residential lots proposed (R30) on a total of 18.677m<sup>2</sup> Lot area, with an average Lot area of 434m<sup>2</sup> (minimum Lot area of 298m<sup>2</sup> and a maximum Lot area of 905m<sup>2</sup>)

Is the proposed scheme amendment zoning complimentary with the surrounding land-uses?

YES



## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.4 Local Road Network Information

How many existing roads are there within the subject site? The subject site is serviced by existing roads; however it is not traversed by existing roads.

#### *Name of Roads Fronting Scheme Amendment Area / Road Classification and Description:*

<b>Road Name</b>	Castledare Place
Number of Lanes	One lane per direction (no centreline)
Road Reservation Width	16m
Road Pavement Width	6m
Road Hierarchy	Access Road
Speed Limit	50kph or State Limit
Bus Route	NO
<i>If YES Nominate Bus Routes</i>	-
On-street parking	NO
<b>Road Name</b>	Fern Road
Number of Lanes	One lane per direction (with centreline)
Road Reservation Width	20m
Road Pavement Width	7.4m
Road Hierarchy	Local Distributor
Speed Limit	50kph
Bus Route	YES
<i>If YES Nominate Bus Routes</i>	75, 179, 509
On-street parking	NO
<b>Road Name</b>	Bywater Way
Number of Lanes	One lane per direction (no centreline)
Road Reservation Width	20m
Road Pavement Width	8m
Road Hierarchy	Access Road
Speed Limit	50kph
Bus Route	NO
<i>If YES Nominate Bus Routes</i>	-
On-street parking	NO

#### *Name of Other Roads within 2km radius of site, or roads likely to take increased traffic due to the development:*

<b>Road Name</b>	Bow Street
Number of Lanes	One lane per direction (no centreline)
Road Reservation Width	20m
Road Pavement Width	7.5m
Road Hierarchy	Access Road
Speed Limit	50kph
Bus Route	NO
<i>If YES Nominate Bus Routes</i>	-
On-street parking	NO

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

<b>Road Name</b>	Bungaree Road
Number of Lanes	One lane per direction (with centreline)
Road Reservation Width	20m
Road Pavement Width	9m
Road Hierarchy	Distributor B
Speed Limit	50kph
Bus Route	YES
<i>If YES Nominate Bus Routes</i>	72, 75
On-street parking	NO

<b>Road Name</b>	Leach Highway
Number of Lanes	Four Lanes (two lanes per direction) with central raised median
Road Reservation Width	40m
Road Pavement Width	30m
Road Hierarchy	Primary Distributor
Speed Limit	70kph
Bus Route	YES
<i>If YES Nominate Bus Routes</i>	72,178,179,509
On-street parking	NO

## 2.5 Traffic Volumes

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)				Heavy Vehicle % <i>If HV count is Not Available, are HV likely to be in higher volumes than generally expected?</i>	Year	
			AM Peak Time	AM Peak VPH	PM Peak Time	PM Peak VPH		Date of Traffic Count	<i>If older than 3 years multiply with a growth rate</i>
Leach Highway	North of Manning Road (SLK 16.31)	45,952	07:30 – 3,616		16:30 – 3,956		n/a	2018/19	–
	West of Manning Rd (SLK 15.89)	42,486	07:30 – 3,298		16:30 – 3,524		9.6%	2019/20	–
	East of Bungaree Road (SLK 15.24)	42,135	07:30 – 3,324		16:30 – 3,502		9.8%	2019/20	–
	West of Bungaree Road (SLK 14.85)	40,923	07:30 – 3,333		16:30 – 3,360		8.6%	2019/20	–

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)				Heavy Vehicle % <i>If HV count is Not Available, are HV likely to be in higher volumes than generally expected?</i>	Year	
			AM Peak Time	AM Peak VPH	PM Peak Time	PM Peak VPH		Date of Traffic Count	<i>If older than 3 years multiply with a growth rate</i>
Fern Road	Between Bungaree Road & Cahill Court *	2,842	08:00 – 208		15:00 – 274		n/a	Oct 2020	–
	Between Rose Place & Brindley Street *	2,977	08:00 – 209		15:00 – 293		n/a	Oct 2020	–
	At Riverton Bridge *	8,549	08:00 – 840		15:00 – 767		n/a	Oct 2020	–
	Between Surrey Road & Upnor Street *	7,325	08:00 – 735		17:00 – 661		n/a	Oct 2020	–
	Between Upnor Street & Watts Road *	7,306	08:00 – 725		15:00 – 651		n/a	Oct 2020	–
Bungaree Road	South of Leach Highway (SLK 0.16)	6,465	08:00 – 687		16:30 – 582		6.7 %	2020/21	–
	North of Leach Highway (SLK 0.35)	4,746	08:00 – 486		16:45 – 411		7.3 %	2019/20	–
	Between Westlake Street & Eureka Road *	4,491	08:00 – 459		16:00 – 406		n/a	Aug 2020	–
	Between McManus Street & Armstrong Road *	4,797	08:00 – 484		16:00 – 423		n/a	Aug 2020	–
	South of Manning Rd (SLK 1.25)	4,357	08:00 – 429		16:45 – 361		5.7%	2020/21	–



## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)				Heavy Vehicle % <i>If HV count is Not Available, are HV likely to be in higher volumes than generally expected?</i>	Year	
			AM Peak Time	AM Peak VPH	PM Peak Time	PM Peak VPH		Date of Traffic Count	<i>If older than 3 years multiply with a growth rate</i>
High Road	East of Riley Road (SLK 2.82)	22,907	08:15–1,662		16:45–1,993		3.0%	2019/20	–
Riley Road	North of High Road (SLK 0.68)	13,229	08:15–1,000		15:15–1,439		n/a	2016/17	
Manning Road	West of Leach Highway (SLK 1.13)	29,565	08:00 – 2,229		15:15 -2,298		5.6 %	2019/20	–
	East of Leach Highway (SLK 0.67)	26,969	08:00 – 2,078		15:00 -2,309		5.6%	2020/21	–
	East of Lawson Street (SLK 2.38)	28,116	08:00– 2206		14:45 – 2,209		6.3%	2020/21	–

Note – ‘n/a’ indicates that Heavy Vehicle are not likely to be in higher volumes than generally expected.

Note\* - These traffic volumes have been received from the City of Canning.

Note \*\* - These traffic volumes have been delivered from SCATS.

Based on the information provided in the table above, it could be concluded that the surrounding network carries high volumes of traffic and that estimated traffic of the proposed development is likely to be negligible when compared to the existing traffic. Please refer to the section 2.13 Calculation of Development Generated / Attracted Trips of this report for more details related to the traffic impact of the proposed development.

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.6 Vehicular Crash Information

Is Crash Data Available on Main Roads WA website?	YES
Analysis Period	01/01/2015 to 31/12/2019
<i>If YES, nominate important survey locations:</i>	
Location 1	Fern Road (1.59 to 0.85)
Location 2	Fern Road & Castledare Place & Bungaree Road (1.32)

Road Name	SLK	Road Hierarchy	Speed Limit	Crash Statistics			
				No of KSI* Crashes (Fatal + Hospital)	No of Medical Attention Crashes	No of PDO** Major Crashes	No of PDO** Minor Crashes
Fern Road	(1.59 to 0.85)	Local Distributor	50kph	0	1	1	2
No of MVKT (Million Vehicle Kilometres Travelled) Travelled at Location				Approximately 8,000* 365 * 5 yrs * 0.74km = 10.8 MVKT			
KSI Crash Rate				0 crashes / MVKT			
Other Crash Rate				4 per 10.8 MVKT = 0.37crashes / MVKT			
Comparison with Crash Density and Crash Rate Statistics				0.37 crashes / MVKT; crash rate is significantly lower than network average of 0.86			
Fern Road / Castledare Place / Bungaree Road	(1.32)	Local Distributor / Access Road/ Access Road	50kph/ 50kph/ 50kph	0	0	0	3
No of MVKT*** Travelled at Location				App. 15,000* 365 * 5 yrs * 0.4km = 10.95 MVKT			
KSI Crash Rate				0 crashes / MVKT			
Other Crash Rate				3 per 10.95 MVKT = 0.27crashes / MVKT			
Comparison with Crash Density and Crash Rate Statistics				0.27 crashes / MVKT; crash rate is significantly lower than network average of 1.83			

Note \* - KSI – Killed (and) Seriously Injured

Note \*\* - PDO – Property Damage Only

Note \*\*\* - MVKT – Million Vehicle Kilometres Travelled

The following tables shows the Crash Density and Crash Rates on Metropolitan Local and Regional Roads as obtained from Main Roads WA on the 13<sup>th</sup> May 2020 by email request:

#### Crash Density and Crash Rate on Metropolitan Local Roads Network only

	All Crashes		Serious Injury Crashes (Fatal+Hospital)	
	Average Annual Crash Density (All Crashes/KM)	Average Annual Crash Rate (All Crashes/MVKT)	Average Annual Crash Density (Ser. Inj. Crashes/KM)	Average Annual Crash Rate (Ser. Inj. Crashes/MVKT)
Metro Local Road - Midblock	2.67	0.86	0.11	0.04
Metro Local Road - All	5.70	1.83	0.22	0.07

Note: Based on 5-years data for the period 2015 to 2019.

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.7 Public Transport Accessibility

How many bus routes are within 400 metres of the subject site? Few  
How many rail routes are within 800 metres of the subject site? None

Bus / Rail Route	Description	Peak Frequency	Off-Peak Frequency
72	Perth - Cannington Station via Victoria Park & Curtin University	5 minutes	30 minutes
178	Perth - Bull Creek Stn via Albany Hwy, Shelley & Rossmoyne	60 minutes	60 minutes
179	Bull Creek Station – Perth via Albany Highway	10 minutes	60 minutes
509	Bull Creek Station - Cannington Station via Fern Road and High Road	20 minutes	30 minutes

Are high frequency bus routes required to justify a reduction in parking? NO

Walk Score Rating for Accessibility to Public Transport.

46 - A few nearby public transportation options.

Is the development in a Greenfields area? NO

### 2.8 Pedestrian Infrastructure

Describe existing local pedestrian infrastructure within a 400m radius of the site:

Classification	Road Name
Pedestrian Path	Fern Road, Bow Street, Castledare Place, Leach Highway
Other Shared Path (Shared by Pedestrians & Cyclists)	Fern Road (north of Hyland Way)
Does the site have existing pedestrian facilities	NO

What is the Walk Score Rating?

36 - This location is a Car-Dependent neighborhood, so most errands require a car.

### 2.9 Cyclist Infrastructure

Are there any PBN Routes within an 800m radius of the subject site? YES

If YES, describe:

Classification	Road Name
Other Shared Path (Shared by Pedestrians & Cyclists)	Fern Road (north of Hyland Way)
Good Road Riding Environment	Upnor Street, Bridge Street
High Quality Shared Path	Centenary Avenue
Perth Bicycle Network (PBN)	Centenary Avenue

Are there any PBN Routes within a 400m radius of the subject site? YES

If YES, describe:

Classification	Road Name
Other Shared Path (Shared by Pedestrians & Cyclists)	Fern Road (north of Hyland Way)
Does the site have existing cyclist facilities?	NO



## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.10 Vehicular Parking

Local Government City of Canning

Local Government Document Utilised City of Canning Town Planning Scheme No.40  
State Planning Policy 7.3 Residential Design Codes Volume 1 - 2019 R-Codes (incorporating amendments gazetted on 2/8/2013, 23/10/15 and 2/3/2018 and 24/5/2019)

#### Description of Parking Requirements in accordance with Scheme:

Vehicular parking requirements will be formally determined at a later stage, during the development application process. Vehicular parking requirements for detached dwellings is set out in the Residential Design Codes as follows:

#### R-Codes:

*“ The following minimum number of on-site car parking spaces is to be provided for each single house, grouped dwelling and special purpose dwelling comprising the following number of bedrooms:*

- 1-bedroom dwellings – Location B – 1 bay per dwelling

*2+ bedroom dwellings – Location B – 2 bays per dwelling”.*

#### Calculation of Parking

Land Use	Requirements	Yield	Total Parking
Residential	1 or 2 bays per dwelling	44 residential lots	From 44 to 88 bays
<b>Total Car Parking Requirement</b>			<b>44 - 88</b>
<b>Total Volume of Parking Provided by Proponent</b>			<b>N/A</b>

#### Justification

As outlined in the City of Canning Town Planning Scheme No.40, parking should be provided in accordance with the R-Codes (and other relevant documents) within the lot boundary of the residential lots. KCTT believe that every house will have its own garage, providing parking for the owner in the garage and visitors in front of garage. Calculations above were given as a general guide only.

A total of 70 car parking bays are proposed within carparking area dedicated Castledare Miniture Railways, a tourist attraction which is to be retained.

### 2.11 Parking Surveys

Was a parking survey required? NO

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.12 Bicycle Parking

Local Government

City of Canning

Reference Document Utilised

City of Canning Town Planning Scheme No.40

Description of Parking Requirements:

Bicycle parking requirements will be formally determined at a later stage during the development application process.

Justification

Bicycle parking requirements are to be determined in accordance with the City of Canning Town Planning Scheme No.40 once the exact quantum of use is known. However, it could be assumed that the residents of houses will store their bicycles and the equipment within their respective dwellings.

### 2.13 ACROD Parking

Class of Building

**Class 1a** - a detached house or one of a group of two or more dwellings separated by a fire resisting wall, including a row house, terrace house, town house or villa unit.

Does this building class require specific provision of ACROD Parking?

NO

(Given there are no accessible units proposed within the development, there is no requirement for provision of ACROD parking)

### 2.14 Delivery and Service Vehicles

Guideline Document used as reference Requirements

NSW RTA Guide to Traffic Generating Developments

**Residential flat buildings**

*(50% of spaces adequate for trucks): < 200 flats or home units = 1 space per 50 flats or home units*

Justification

It is expected that waste collection will take place within the road reservation. No other permanent service vehicle parking is required for the operation of the development.

### 2.15 Calculation of Development Generated / Attracted Trips

What are the likely hours of operation?

For residential land uses, the hours of operation are not applicable.

What are the likely peak hours of operation?

AM 07:00 to 08:00  
PM 15:00 to 16:00

Do the development generated peaks coincide with existing road network peaks?

YES

If YES, Which:

Both AM peak and PM peak

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### Guideline Document Used

*Rates from above document:*

WAPC Transport Assessment Guidelines for Developments - Volume 5

**Residential** - 0.8 vehicle trips per dwelling for the AM and PM peak hours. A 25% IN / 75% OUT split has been adopted for the AM peak and a 67% IN / 33% OUT split for the PM peak hour.

### Guideline Document Used

*Rates from above document:*

NSW RTA Guide to Traffic Generating Developments

**Residential** - The NSW RTA Guide to Traffic Generating Developments suggests developments of this type in Sydney tend to generate between 4 and 5 vehicular trips per dwelling for medium to high density developments. In Perth, the Department of Planning and Infrastructure conducted a series of studies in the late 1990's / early 2000's which showed that higher density dwellings tended to average closer to 5.5 vehicle trips per day. These studies assumed that anywhere between 50% and 70% of commuters were travelling to the work by car as a driver. KCTT propose to use an average VPD of 5.5 vehicular trips per day per residence for R40 and an average VPD of 6.7 vehicular trips per day per residence for R20 to R30. 6.7 vehicular trips per dwelling

Base data for trip calculation (daily trips)

Base data for trip calculation (AM peak trips)

Base data for trip calculation (PM peak trips)

0.8 trips per dwelling (20% IN / 80% OUT)

0.8 trips per dwelling (67% IN / 33% OUT)

Land Use Type	Rate above	Yield	Daily Traffic Generation	Peak Hour Traffic Generation
Single Dwelling	6.7 vehicular trips per unit (Peak 0.8 vehicular trips per unit)	44	295 VPD	36 VPH
<b>Total - The Proposed Development</b>			<b>295 VPD</b>	<b>36 VPH</b>

Does the site have existing trip generation / attraction?

YES

Castledare Miniature Railways partly passes through the subject site and partially generates vehicle traffic within subject area given that one of the rail terminus points can be accessed via Lot 27 Queens Park Road, while the other is accessible via the subject site. However, Castledare Miniature Railways are only open to the public one day every month (on the 3<sup>rd</sup> Sunday) and therefore trip generation is negligible.

What is the total impact of the new proposed development?

The total traffic generated by the proposed 44 single residential dwellings situated within the scheme amendment area is approximately 295VPD. Additionally, 36 of these trips will coincide with the peak hour time of the surrounding road network.

According to WAPC Guidelines, all developments generating 10-100 VPH can be deemed to have a moderate impact on the existing road network. As the peak hour vehicular trip generation is 36 VPH the proposed zoning amendment to urban will not have a negative impact on the existing road network.



## 2.16 Trip Purposes

*Determine the likely percentage share for different trip purposes based on the land usage.*

Land Use	Employment	Shopping	Education	Social / Recreational
Residential	40%	25%	17.5%	17.5%

## 2.17 Expected Origin / Destination

*Name the closest existing major residential generators and non-residential attractors of traffic and the distance from the boundaries of the Scheme Amendment subject site:*

Residential	Employment 40%	<p>The majority of employment trips will be external to the Lots 4 and 102 Fern Road. The Profile ID website on the City of Canning’s webpage suggests the following breakdown for employment destinations for residents of the City of Canning:</p> <ul style="list-style-type: none"> <li>• Canning (C) – 25.2%</li> <li>• Perth (C) – Inner – 8.5%</li> <li>• Perth (C) – Remainder – 6.2%</li> <li>• Melville (C) – 6.2%</li> <li>• Victoria Park (C) – 6.0%</li> </ul>
	Shopping 25%	<ul style="list-style-type: none"> <li>• Lynwood Village Shopping Centre approximately 2,000m to the southeast.</li> <li>• Stockland Riverton shopping centre approximately 2,000m to the southwest</li> <li>• Westfield Carousel shopping centre approximately 2,000m to the east.</li> </ul>
	Education 17.5%	<ul style="list-style-type: none"> <li>• Wilson primary school approximately 500m northwest.</li> <li>• Bentley Library approximately 1,000m north.</li> <li>• Al-Hidayah Islamic School approximately 1,000m north.</li> <li>• Fountain College (primary and secondary school) located approximately 1,500m southeast.</li> <li>• Clontarf Aboriginal College approximately 2,000m west.</li> <li>• Canning College and Curtin University approximately 2,000m northwest.</li> <li>• Lynwood Senior High School approximately 2,000m south.</li> <li>• Parkwood Primary School approximately 2,000m south.</li> </ul>
	Social / Recreational 17.5%	<ul style="list-style-type: none"> <li>• Multiple Parks and Recreation areas on adjoining and surrounding lots.</li> </ul>

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.18 Traffic Flow Distribution onto External Road Networks

How many routes are available for access / egress to the site? The site has one access to Bywater Way to the south and two access points on Castledare Place to the north.

#### Route 1 / Movement 1

Provide details for Route No 1

Percentage of Vehicular Movements via Route No 1

**Via proposed Bywater Way extension**  
**52% (153 VPD / 19 VPH)**

*Further split as follows:*

*20% - to/ from the southwest via Bywater Way*

*80% - to/from the northwest via Bow Street*

#### Route 2 / Movement 2

Provide details for Route No 2

Percentage of Vehicular Movements via Route No 2

**Via proposed Castledare Place extension**  
**48% (141 VPD / 17 VPH)**

*Further split as follows:*

*20% - to/ from the northeast via Fern Road*

*75% - to/from the northwest via Bungaree Road*

*5% - to/ from the southeast via Fern Road*

KCTT estimates that the generated traffic will be spread through the internal road network as follows:

- **52%** via Road A (section east of the Road B)  
*Inclusive of:*
  - 31% via Road A (section west of the Road B)
  - 16% via Road B
  - 5% traffic impact of 2 residential dwellings accessing Road A section east of the Road B.
- **36%** via Road C
- **12%** via Road D

It should be taken into the consideration that traffic flow distribution is based on the assumption that proposed Bywater Way and Castledare Place extensions would be constructed simultaneously as the proposed Structure Plan Area is developed. It is expected that the traffic distribution percentage between abovementioned routes may vary due to additional changes to the adjacent network and or if any of the planned road extensions delays.

### 2.19 Road Safety

Are sight distances adequate at proposed intersections?

YES

#### Justification

Distances between intersections should be determined in accordance to the Liveable Neighbourhoods. Based on the requirements provided in Table 5 – *Junction spacing (measured from road reserve centreline to centreline of terminating street pavement, pg.24)* the spacing between the intersections for Access Street is 20m. The proposed layout complies with the above-mentioned requirement and therefore the intersection spacing between all access points is adequate and allows full unrestricted movements of vehicles.

Both, Castledare Place and Bywater Way have a speed limit of 50km/h, however, to navigate the access/egress point of the subject Structure Plan Area, vehicles must reduce operating speed to a maximum of 20km/h (if not stop fully), therefore the requirements for ASD and SISD are satisfied. A review of the plan for the proposed Structure Plan Area indicates there are sufficient sight distances for safe traffic movements. Having in mind the low-speed environment, vehicles travelling southbound via Castledare Place and Bywater Way will have enough time to notice the vehicle egressing the Subject Structure Plan Area and stop if necessary. Similarly, the vehicles egressing the Subject Structure Plan Area would have enough sight distance to notice a vehicle travelling via Castledare Place and Bywater Way before egressing.

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.20 Proposed Intersection Controls

How many proposed intersections have been analysed? 4

*Name of Intersections within the Structure Plan Area / Road Classification and Description:*

#### Intersection type 1

Name	Proposed Castledare Place extension / Fern Road
Proposed Intersection Control	Roundabout

#### Intersection type 2

Name	Proposed Castledare Place extension / Proposed Road C Proposed Castledare Place extension / Proposed Road D
Proposed Intersection Control	Give Way - Sign Control

#### Intersection type 3

Name	Proposed Road A / proposed Road B
Proposed Intersection Control	Priority / Yield Control

It is important to reduce any possible opportunity for anti-social behaviour on the priority-controlled intersections. Therefore, the following methods can be considered: -

- Smaller kerb radii – kerb radius should be 6 metres wherever possible; the visual narrowing of the intersection drives the road users to reduce the operating speed limit;
- Paved / Raised intersections – this should be considered on longer stretches of road; while it a strong visual cue for the road users the change in the tactile surface signals the requirement for caution and reduction of the operating speed; this type of traffic management can help defining the visual identity of the future place.
- Slow Points / Blisters – this should be considered on longer stretches of the road; this type of traffic management method can be combined with the retention of selected existing vegetation.
- Pedestrian Crossings – pedestrian crossings should be positioned so that they offer unobstructed sight distances to the pedestrians preparing to cross. Pedestrians should be clearly visible to the drivers in the on-coming traffic. Pedestrian crossings should have pram-ramps which would allow for vulnerable road users safer environment.

### 2.21 Proposed Internal Road Network

Guideline Document used as reference	Liveable Neighbourhoods
How many proposed roads are there within the Structure Plan Area?	4 Please refer to the Plan S08 in Appendix 2 for clarification

*The classification below is reflective of minimal traffic requirements. The road reservation widths can be expanded and re-organised to satisfy different types of requirements (e.g. civil engineering, environmental, conservational, urban design etc.), therefore roads that have lower order hierarchy according to traffic engineering requirements might have expanded road reservation widths.*

**Transport Impact Statement**

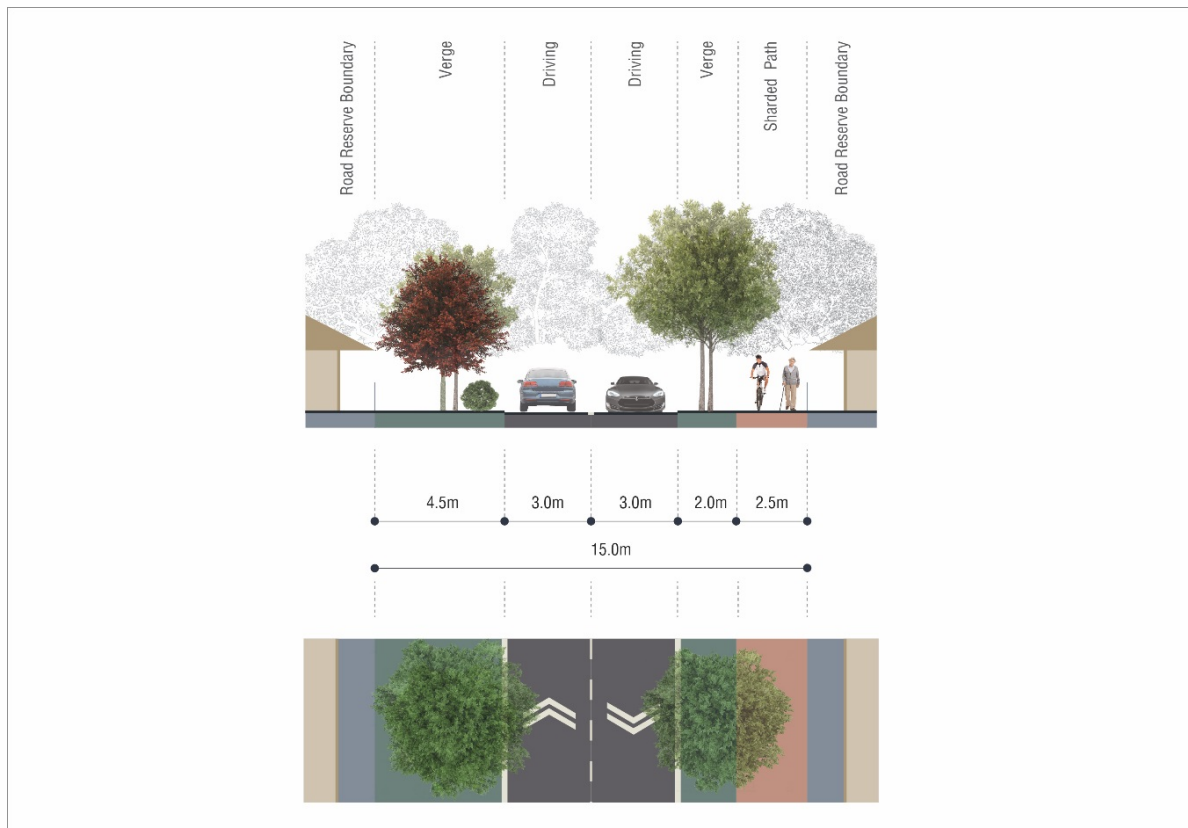
KC00812.000 Lots 4 and 102 Fern Road, Wilson

*Name of Roads within the Structure Plan Area / Road Classification and Description:*

**Road A (section west of the Road B) & Road C**

Projected Traffic Volumes	Less than 200VPD
Proposed Number of Lanes	2
Proposed Road Reservation Width	15m
Proposed Road Pavement Width	6m
Proposed Median Width	-
Proposed Pedestrian / Cyclist / Shared Path Width	2.5m wide shared path on one side of the road reservation
Proposed Classification	Access Street D
Proposed Speed Limit	Target speed 30mk/h
Proposed Bus Route Extension / Introduction	NO
If YES Nominate Bus Routes	-
Proposed On-street parking	NO

*Provide graphics of the proposed internal road cross section within the Structure Plan Area*





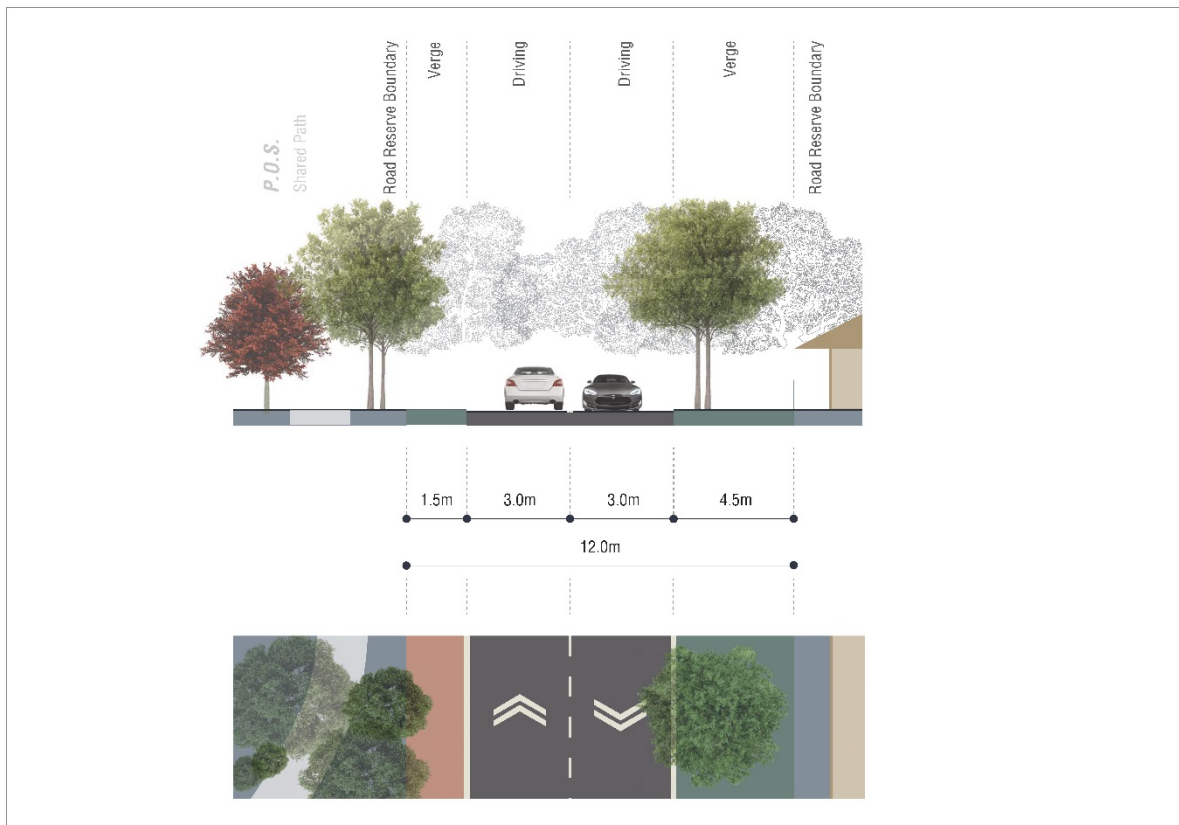
**Transport Impact Statement**

KC00812.000 Lots 4 and 102 Fern Road, Wilson

**Road A (section east of the Road B), Road B & Road D**

Projected Traffic Volumes	Less than 200VPD
Proposed Number of Lanes	2
Proposed Road Reservation Width	12m
Proposed Road Pavement Width	6m
Proposed Median Width	-
Proposed Pedestrian / Cyclist / Shared Path Width	shared path will be provided within P.O.S.
Proposed Classification	Access Street D
Proposed Speed Limit	Target speed 30mk/h
Proposed Bus Route Extension / Introduction	NO
<i>If YES Nominate Bus Routes</i>	-
Proposed On-street parking	NO

*Provide graphics of the proposed internal road cross section within the Structure Plan Area*



## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.22 Proposed Internal Transport Networks

Are there any changes / additions to the existing road network?	YES Proposed Roads A, B, C and D within subject Structure Plan Area and proposed Bywater Way and Castledare Place extensions
Were there any discussions / agreements with MRWA regarding intersections with, or direct access onto roads under their jurisdiction?	Not Applicable.
Are there any pedestrian / cycle networks and crossing facilities proposed for the roads within the Structure Plan Area?	The Structure Plan Area proposes construction of shared paths to cater for pedestrian and cyclist needs in the area. Some of the proposed roads will have shared path on one side of the road reservation, while for the other roads shared path will be provided within P.O.S. area they are adjacent to.
Were there any discussions / agreements with the local authority over local road networks and pedestrian and cycle facilities?	Not at this stage – the requirements were determined as per Liveable Neighbourhoods.
Were there any discussions / agreements with PTA / Transperth on new bus services or extensions / alterations to existing bus services to serve the Structure Plan Area?	Not Applicable.

### 2.23 Changes to External Transport Networks

Are there any proposed changes of the road network?	YES
<i>If YES, nominate:</i>	<ul style="list-style-type: none"><li>Proposed extension of Bywater Way will provide connectivity between the proposed Structure Plan Area and other streets to the west.</li><li>Proposed extension of Castledare Place will provide connectivity between the proposed Structure Plan Area and Fern Street and Bungaree Road to the north.</li></ul>
Are there any proposed changes of the intersection controls?	No
Are there any proposed changes of the pedestrian / cycle networks and crossing facilities?	No
Are there any proposed changes of the public transport services?	No. The extent of the change is not sufficient to warrant change in the external transportation systems.

## Transport Impact Statement

KC00812.000 Lots 4 and 102 Fern Road, Wilson

### 2.24 Integration with Surrounding Area

Are there any existing major residential generators of traffic within a minimum of 800 metres from the boundaries of the Structure Plan Area?

YES

*If YES, nominate:*

Existing surrounding residential lots.

Are there any existing major non-residential attractors of traffic within a minimum of 800 metres from the boundaries of the Structure Plan Area?

Multiple parks and recreational areas Wilson Primary School

Identify any proposals for major changes to the land uses within 800 metres of the boundaries of the Structure Plan Area.

None identified

What are the main desire lines between the Structure Plan Area land uses and these external attractors / generators?

Via Fern Road

Will the existing transport networks, plus any proposed changes, adequately match these desire lines, particularly for pedestrians, cyclist, and public transport users?

YES

Identify any deficiencies or areas for improvement in the surrounding transport networks and/or areas where improvements could be made.

None identified.

### 2.25 Analysis of Transport Networks

Determine the year(s) for assessment and the time period(s) for the traffic flow analysis.

2021

Determine the proposed scheme amendment (rezoning) generated traffic.

The total traffic generated by the approximate yield of 44 single residential dwellings situated within the scheme amendment area is approximately 295VPD while, 36 of these trips will coincide with the peak hour time of the surrounding road network.

Determine the base, i.e. without rezoning, flows on the surrounding road network. These are to be factored up to the scheme amendment (rezoning) assessment year(s).

Existing Traffic Volumes (2018/19)

Fern Road \_ 8,422VPD (East of Riverton Dr East (SLK 2.65))

Identify all schools within a 800 metres of the scheme amendment (rezoning) area.

Wilson Primary School approximately 500m northwest.

Identify the most likely walk and cycle routes to each school from the catchment areas.

Via pedestrian paths on proposed roads within subject area and further along numerous of pedestrian and shared paths as noted on relevant plans in Appendix 2.

## **2.26 Site Specific Issues and Proposed Remedial Measures**

How many site-specific issues need to be discussed? None

### **Discussion**

Based on the above findings, KCTT believe the proposed scheme amendment of rezoning portions of Lot 4 and Lot 12 Fern Road, Wilson does raise safety concerns for the existing immediate and surrounding transport network. The proposed zoning amendment from Parks and Recreation to Urban is complimentary to the land uses surrounding the subject site.

Crash record on Fern Road and the intersection of Fern Road / Castledare Place / Bungaree Road have been assessed and do not raise any safety concerns. Both crash locations assessed have significantly lower crash rate statistics in comparison to Main Roads WA crash Density guidelines.

KCTT believe that the land use is appropriate and the traffic volumes from the proposed development will not have adverse impact on the current surrounding network.

Remedial Measure / Response

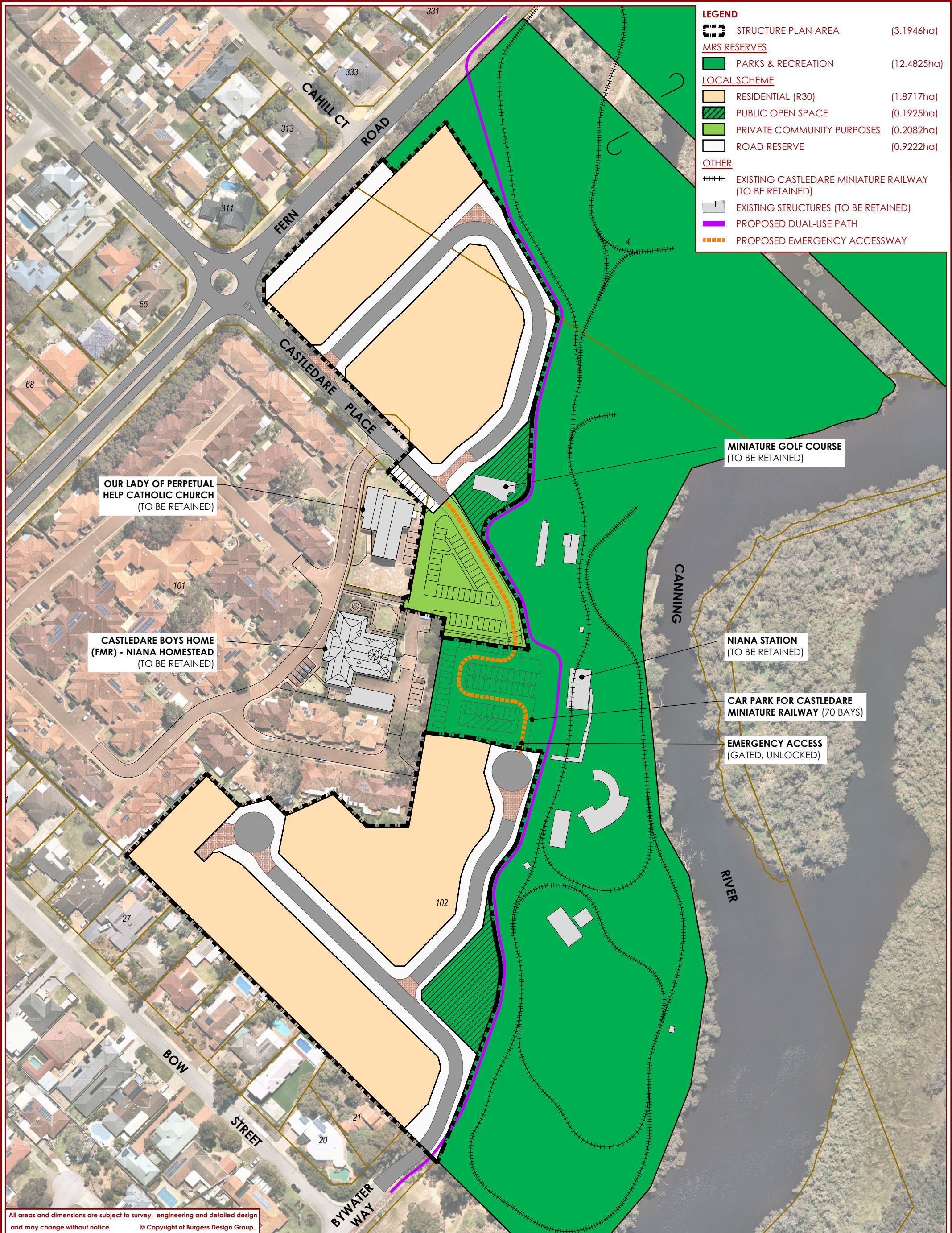
N/A



# **Appendix 1**

## **The Layout of the Proposed Development**





**LEGEND**

	STRUCTURE PLAN AREA	(3.1946ha)
<b>MRS RESERVES</b>		
	PARKS & RECREATION	(12.4825ha)
<b>LOCAL SCHEME</b>		
	RESIDENTIAL (R30)	(1.8717ha)
	PUBLIC OPEN SPACE	(0.1925ha)
	PRIVATE COMMUNITY PURPOSES	(0.2082ha)
	ROAD RESERVE	(0.9222ha)
<b>OTHER</b>		
	EXISTING CASTLEDARE MINIATURE RAILWAY (TO BE RETAINED)	
	EXISTING STRUCTURES (TO BE RETAINED)	
	PROPOSED DUAL-USE PATH	
	PROPOSED EMERGENCY ACCESSWAY	

OUR LADY OF PERPETUAL HELP CATHOLIC CHURCH (TO BE RETAINED)

CASTLEDARE BOYS HOME (FMR) - NIANA HOMESTEAD (TO BE RETAINED)

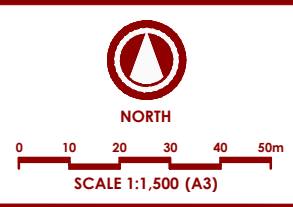
MINIATURE GOLF COURSE (TO BE RETAINED)

NIANA STATION (TO BE RETAINED)

CAR PARK FOR CASTLEDARE MINIATURE RAILWAY (70 BAYS)

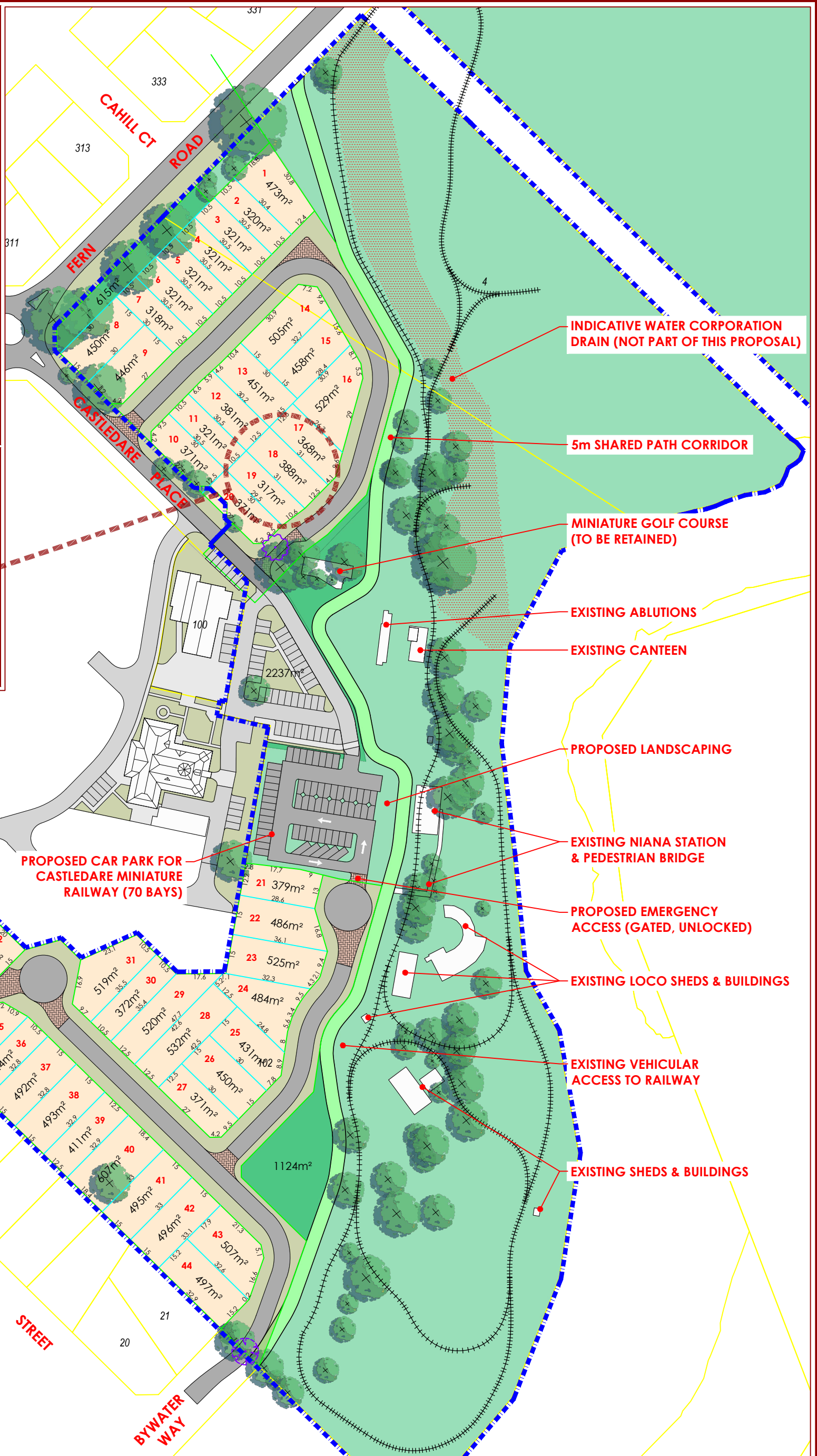
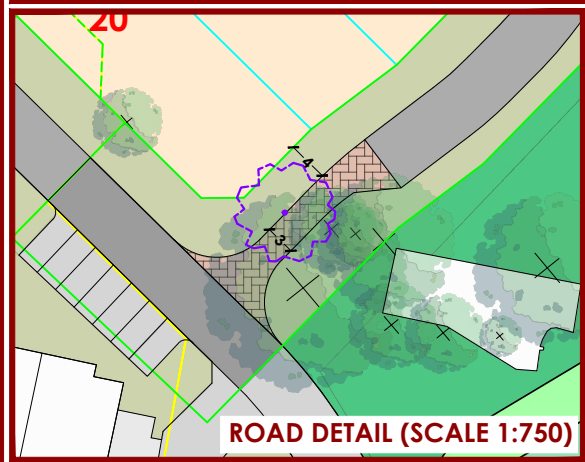
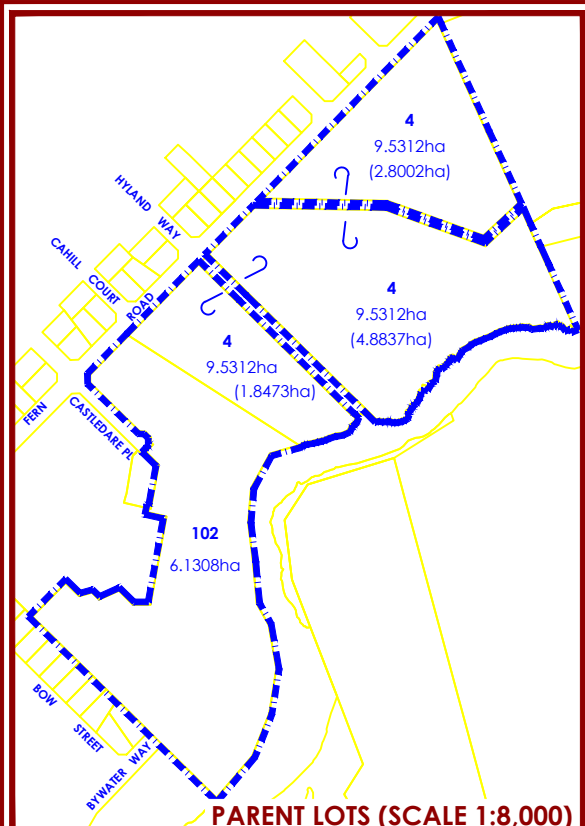
EMERGENCY ACCESS (GATED, UNLOCKED)

All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.



**PLAN 1: STRUCTURE PLAN MAP**  
**CASTLEDARE LOCAL STRUCTURE PLAN**  
**LOT 4 FERN RD & LOT 102 CASTLEDARE PL, WILSON**







LOT SUMMARY	
Number of Lots	44
Total Area of Lots	18,677 m <sup>2</sup>
Average Area of Lots	424 m <sup>2</sup>
Minimum Lot Area	298 m <sup>2</sup>
Maximum Lot Area	607 m <sup>2</sup>


- SUBJECT SITE
- TREES TO BE RETAINED
- TREES TO BE REMOVED
- SHARED PATH CORRIDOR
- INDICATIVE WATER CORPORATION DRAIN

All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.





NORTH



SCALE 1:1,500 (A3)

**CONCEPT PLAN**

**LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE**

**WILSON**

**CITY OF CANNING**

# **Appendix 2**

## **Transport Planning and Traffic Plans**





	PARKS AND RECREATION		ROAD		LOCATION BOUNDARY
	WATERWAYS		STREET NAME		DISTANCE FROM LOCATION
	PUBLIC PURPOSE		RAILWAY		CITY OF CANNING LOCAL GOVERNMENT NAME
			ROAD BRIDGE		CITY OF CANNING LOCAL AUTHORITY BOUNDARY
					CITY OF CANNING SUBURB

**MANAGEMENT SYSTEMS REGISTERED TO ISO 9001**

**LEGEND**

No	DATE	AMENDMENT
B	28-01-2021	INFORMATION UPDATED
A	19-03-2018	ISSUED FOR REVIEW

PROJECT:	LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON
TITLE:	LOCALITY PLAN - 2,000M RADIUS
DRAWING NUMBER:	KC00812.000_S01

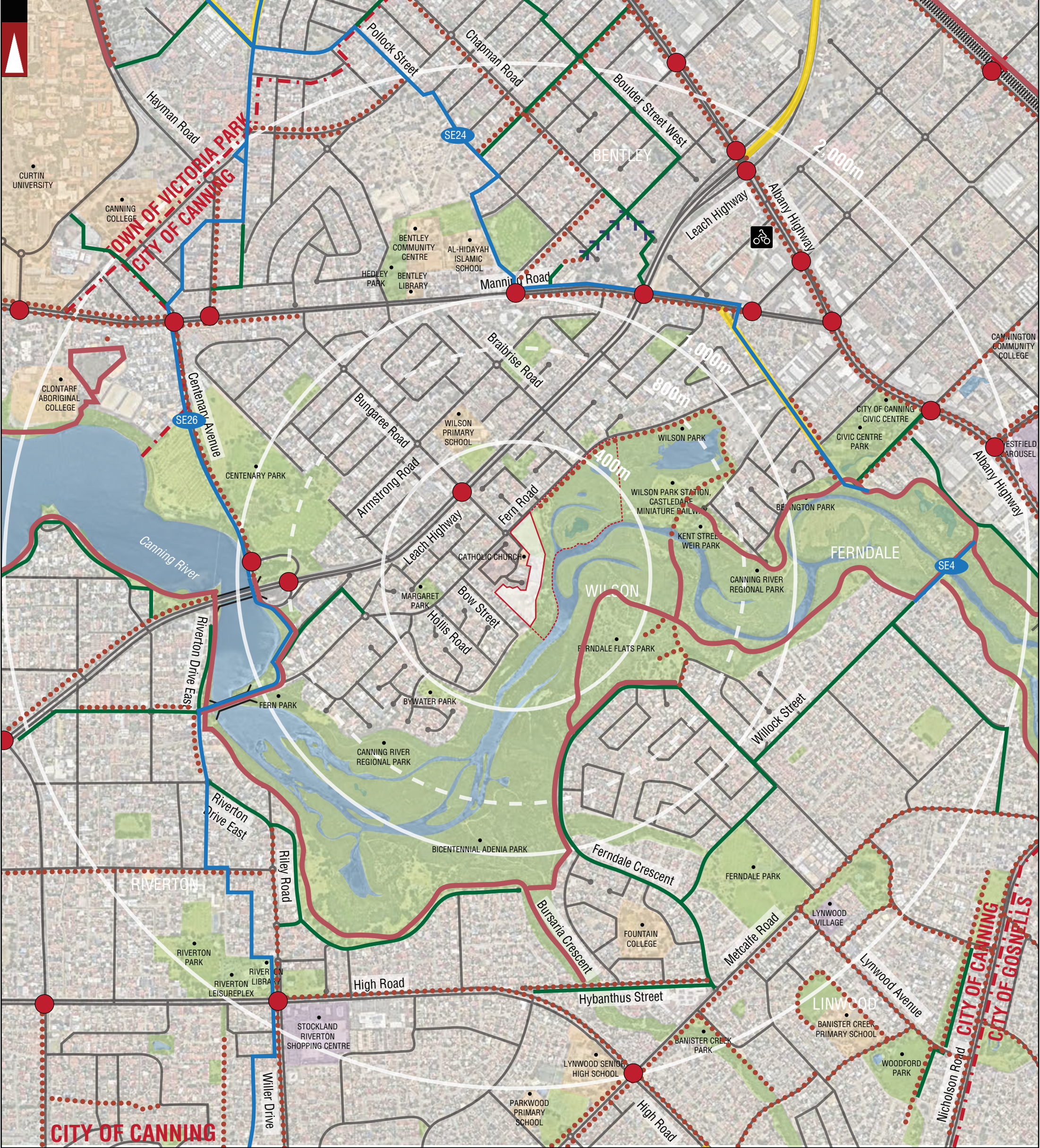
DRAWN BY: Civil & Traffic Engineering Consultants  
Suite 7 No 10 Whipple Street Balcatta WA 6021

J.S.

PH: 08 9441 2700  
WEB: www.kctt.com.au







	PARKS AND RECREATION		ROAD		LOCATION BOUNDARY		PRINCIPAL SHARED PATH (PSP)		GOOD ROAD RIDING ENVIRONMENT
	WATERWAYS		STREET NAME		DISTANCE FROM LOCATION		HIGH QUALITY SHARED PATH		BICYCLE LANES OR SEALED SHOULDER EITHER SIDE
	PUBLIC PURPOSE		RAILWAY		LOCAL GOVERNMENT NAME		OTHER SHARED PATH (SHARED BY PEDESTRIANS & CYCLISTS)		GRADIENT ARROW
			ROAD BRIDGE		LOCAL AUTHORITY BOUNDARY		PERTH BICYCLE NETWORK (PBN)		TRAFFIC LIGHT
					SUBURB		BIKE SHOP		

**MANAGEMENT SYSTEMS REGISTERED TO ISO 9001**

**LEGEND**

No	DATE	AMENDMENT
B	28-01-2021	INFORMATION UPDATED
A	19-03-2018	ISSUED FOR REVIEW

PROJECT:	LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON
TITLE:	BICYCLE NETWORK PLAN - 2,000M RADIUS
DRAWING NUMBER:	KC00812.000_S02

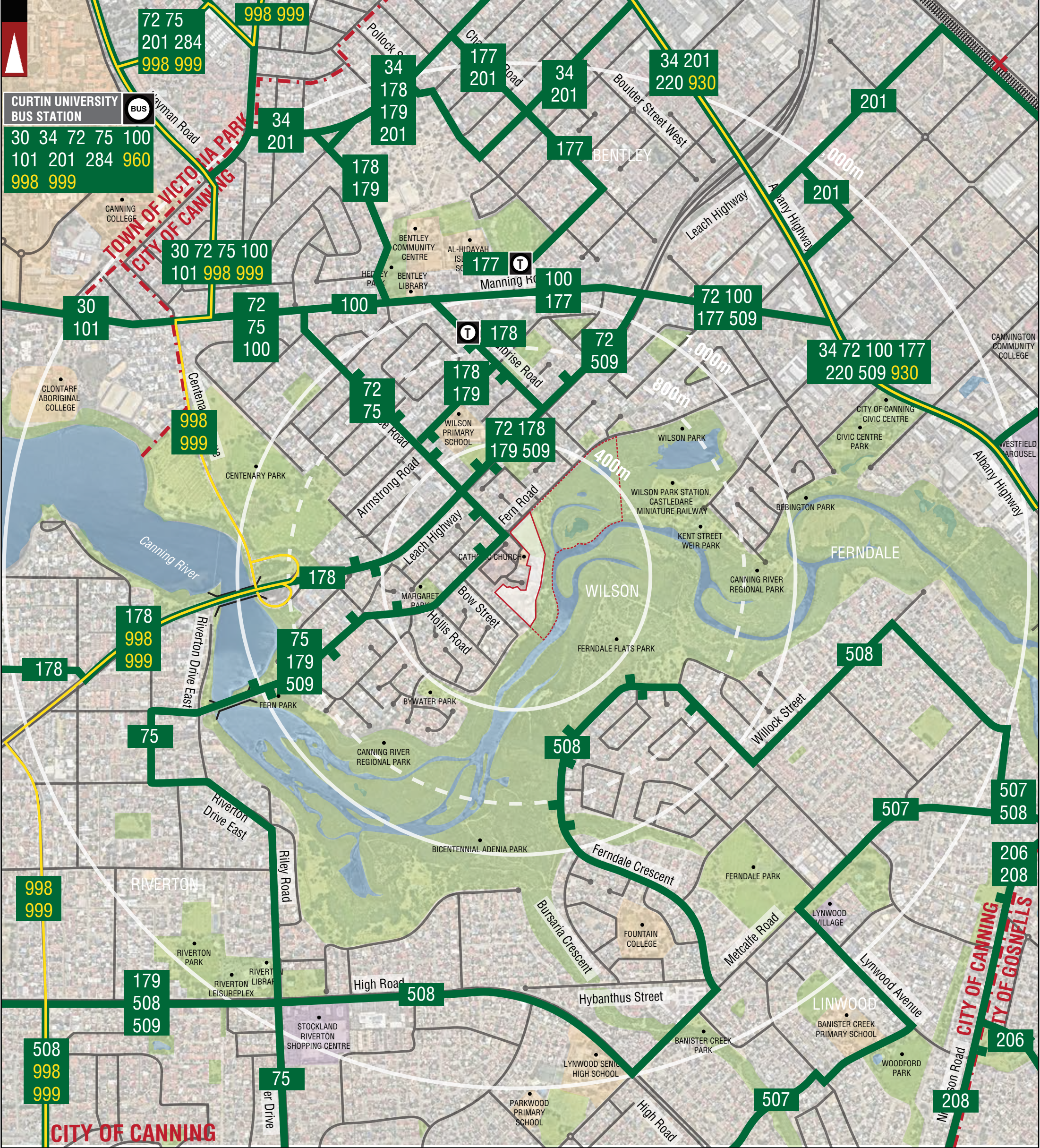
DRAWN BY: J.S.

Civil & Traffic Engineering Consultants  
Suite 7 No 10 Whipple Street Balcatta WA 6021

PH: 08 9441 2700  
WEB: www.kctt.com.au







PARKS AND RECREATION	ROAD	LOCATION BOUNDARY	BUS ROUTES	<b>103</b> BUS ROUTE NUMBER	BUS TERMINUS	<b>MANAGEMENT SYSTEMS REGISTERED TO ISO 9001</b>
WATERWAYS	Hay Street STREET NAME	DISTANCE FROM LOCATION	HIGHFREQUENCY BUS ROUTE	<b>990</b> HIGH FREQUENCY BUS ROUTE NUMBER	BUS STATION	
PUBLIC PURPOSE	RAILWAY	LOCAL GOVERNMENT NAME	BUS STOPS WITHIN 1KM RADIUS		RAILWAY CROSSING	
	ROAD BRIDGE	LOCAL AUTHORITY BOUNDARY				

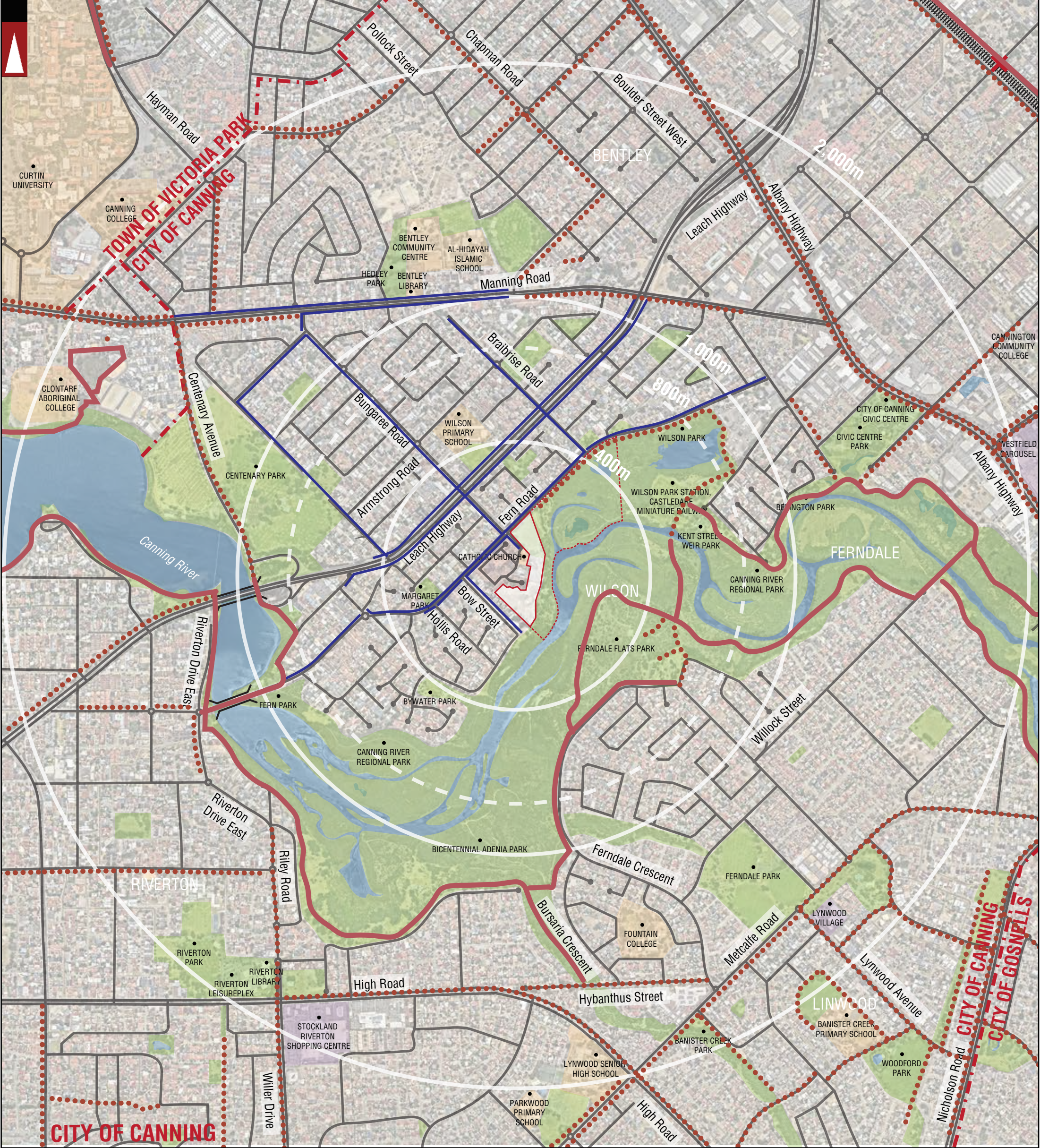
**LEGEND**

NOTE : FOR MORE INFORMATION REGARDING BUS ROUTES AND THEIR INDICATIVE PEAK AND OFF-PEAK FREQUENCIES REFER TO THE REPORT

PROJECT: <b>LOT 4 FERN ROAD &amp; LOT 102 CASTLEDARE PLACE, WILSON</b>			DRAWN BY: Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021
TITLE: <b>PUBLIC TRANSPORT PLAN - 2,000M RADIUS</b>			J.S.
DRAWING NUMBER: <b>KC00812.000_S03</b>			PH: 08 9441 2700 WEB: www.kctt.com.au
B	28-01-2021	INFORMATION UPDATED	
A	19-03-2018	ISSUED FOR REVIEW	
No	DATE	AMENDMENT	







PARKS AND RECREATION	ROAD	LOCATION BOUNDARY	PRINCIPAL SHARED PATH (PSP)
WATERWAYS	STREET NAME	DISTANCE FROM LOCATION	HIGH QUALITY SHARED PATH
PUBLIC PURPOSE	RAILWAY	LOCAL GOVERNMENT NAME	OTHER SHARED PATH (SHARED BY PEDESTRIAN & CYCLIST)
ROAD BRIDGE	CITY OF CANNING	LOCAL AUTHORITY BOUNDARY	PEDESTRIAN PATH
	NORTHBRIDGE SUBURB		

**MANAGEMENT SYSTEMS REGISTERED TO ISO 9001**

**LEGEND**

No	DATE	AMENDMENT
B	28-01-2021	INFORMATION UPDATED
A	19-03-2018	ISSUED FOR REVIEW

PROJECT:	LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON
TITLE:	PEDESTRIAN PATHS PLAN - 2,000M RADIUS
DRAWING NUMBER:	KC00812.000_S04

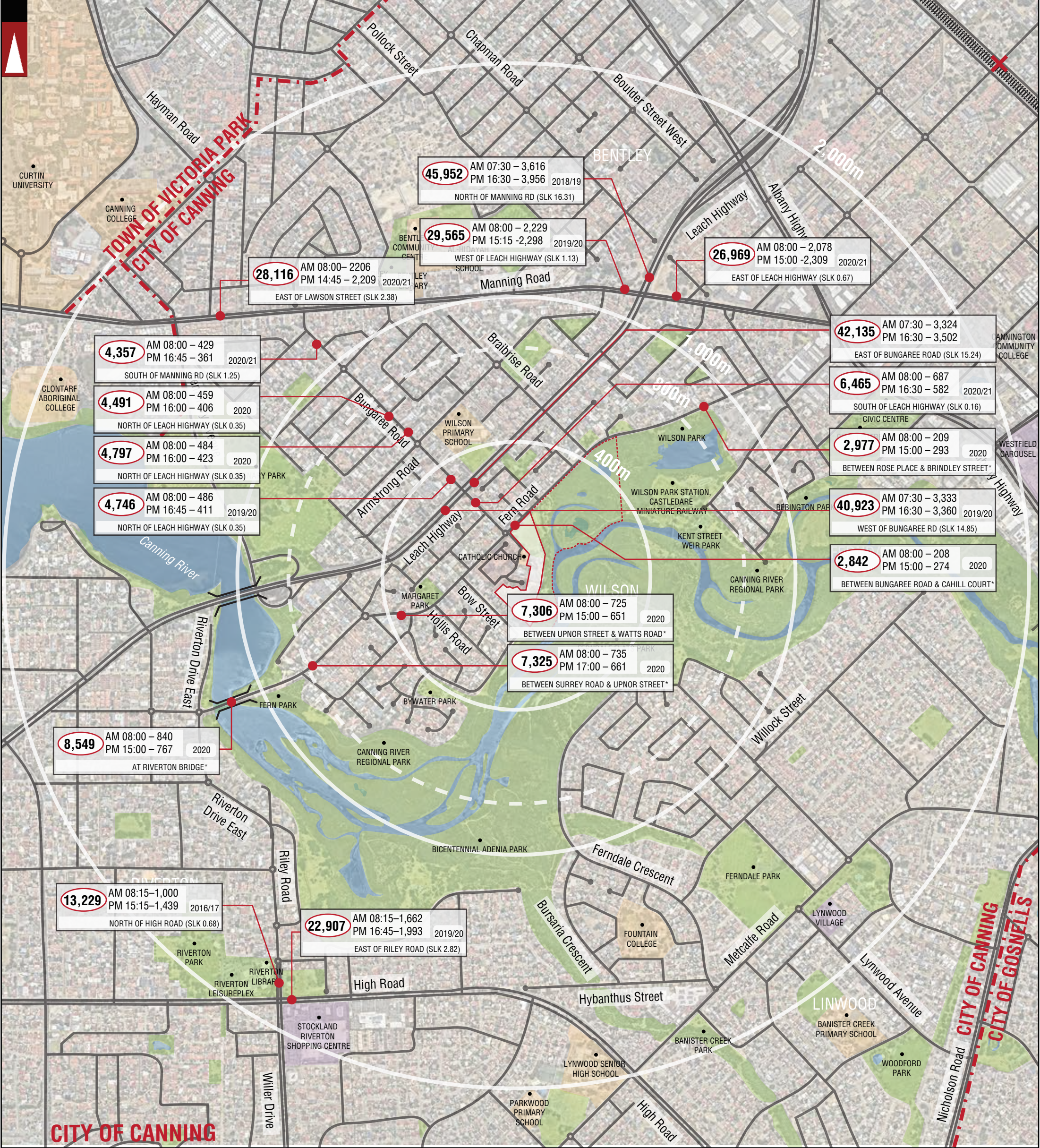
DRAWN BY: Civil & Traffic Engineering Consultants  
Suite 7 No 10 Whipple Street Balcatta WA 6021

J.S.

PH: 08 9441 2700  
WEB: www.kctt.com.au







PARKS AND RECREATION	ROAD	LOCATION BOUNDARY	NUMBER OF VEHICLES PER DAY	<b>MANAGEMENT SYSTEMS REGISTERED TO ISO 9001</b>
WATERWAYS	STREET NAME	DISTANCE FROM LOCATION	NUMBER OF VEHICLES PER AM PEAK HOUR	
PUBLIC PURPOSE	RAILWAY	LOCAL GOVERNMENT NAME	NUMBER OF VEHICLES PER PM PEAK HOUR	
ROAD BRIDGE	LOCAL AUTHORITY BOUNDARY	YEAR	LOCATION	

No	DATE	AMENDMENT	PROJECT:	DRAWN BY:
B	28-01-2021	INFORMATION UPDATED	LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021
A	19-03-2018	ISSUED FOR REVIEW	TITLE: EXISTING TRAFFIC COUNTS - 2,000M RADIUS	J.S.
			DRAWING NUMBER: KC00812.000_S05	PH: 08 9441 2700 WEB: www.kctt.com.au







	LOCATION BOUNDARY		Total Expected Traffic Generation from the proposed development	<b>MANAGEMENT SYSTEMS REGISTERED TO ISO 9001</b>
	ROAD (VARIED WITH ROAD WIDTH)		Total Expected Traffic Generation from Subject Site on the specific section of road - IN and OUT direction	
	PROPOSED ROAD		Traffic Flow IN Direction	
	ROAD NAME		Traffic Flow OUT Direction	

NOTE: THE PLAN IS COURTESY OF BURGESS DESIGN GROUP

LEGEND

C	04-03-2021	ISSUED FOR REVIEW	PROJECT: LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON	DRAWN BY:	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021  PH: 08 9441 2700 WEB: www.kctt.com.au
B	18-04-2018	ISSUED FOR REVIEW	TITLE: TRAFFIC FLOW DIAGRAM	J.S.	
A	20-03-2018	ISSUED FOR REVIEW	DRAWING NUMBER: KC00812.000_S06		
No	DATE	AMENDMENT			







 LOCATION BOUNDARY  ROAD (VARIED WITH ROAD WIDTH)  PROPOSED ROAD  FERN ROAD ROAD NAME	 Total Expected Traffic Generation from the proposed development  Total Expected Traffic Generation from Subject Site on the specific section of road - IN and OUT direction  Traffic Flow IN Direction  Traffic Flow OUT Direction	<p><b>MANAGEMENT SYSTEMS REGISTERED TO ISO 9001</b></p> <p>NOTE: THE PLAN IS COURTESY OF BURGESS DESIGN GROUP</p> <p><b>LEGEND</b></p>
--	--	--

C	04-03-2021	ISSUED FOR REVIEW	PROJECT: LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON	DRAWN BY: Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021
B	18-04-2018	ISSUED FOR REVIEW	TITLE: TRAFFIC FLOW DIAGRAM - PEAK HOUR	J.S.
A	20-03-2018	ISSUED FOR REVIEW	DRAWING NUMBER: KC00812.000_ S07	
No	DATE	AMENDMENT		PH: 08 9441 2700 WEB: www.kctt.com.au







- INDICATIVE WATER CORPORATION DRAIN (NOT PART OF THIS PROPOSAL)
- 5m SHARED PATH CORRIDOR
- MINIATURE GOLF COURSE (TO BE RETAINED)
- EXISTING ABLUTIONS
- EXISTING CANTEN
- PROPOSED LANDSCAPING
- EXISTING NIANA STATION & PEDESTRIAN BRIDGE
- PROPOSED EMERGENCY ACCESS (GATED, UNLOCKED)
- EXISTING LOCO SHEDS & BUILDINGS
- EXISTING VEHICULAR ACCESS TO RAILWAY
- EXISTING SHEDS & BUILDINGS

PROPOSED CAR PARK FOR CASTLEDARE MINIATURE RAILWAY (70 BAYS)

- LOCATION BOUNDARY
- ROAD (VARIED WITH ROAD WIDTH)
- PROPOSED ROAD
- ROAD NAME

**ROAD 02** PROPOSED ROAD NAME

NOTE: THE PLAN IS COURTESY OF BURGESS DESIGN GROUP

**LEGEND**

MANAGEMENT SYSTEMS REGISTERED TO ISO 9001

No	DATE	AMENDMENT
C	04-03-2021	ISSUED FOR REVIEW
B	18-04-2018	ISSUED FOR REVIEW
A	20-03-2018	ISSUED FOR REVIEW

PROJECT: LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON	DRAWN BY:  J.S.
TITLE: PROPOSED ROADS NAMING CONVENTION	
DRAWING NUMBER: KC00812.000_S08	

Civil & Traffic Engineering Consultants  
Suite 7 No 10 Whipple Street Balcatta WA 6021  
PH: 08 9441 2700  
WEB: www.kctt.com.au


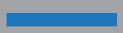
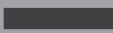









- INDICATIVE WATER CORPORATION DRAIN (NOT PART OF THIS PROPOSAL)
- 5m SHARED PATH CORRIDOR
- MINIATURE GOLF COURSE (TO BE RETAINED)
- EXISTING ABLUTIONS
- EXISTING CANTEN
- PROPOSED LANDSCAPING
- EXISTING NIANA STATION & PEDESTRIAN BRIDGE
- PROPOSED EMERGENCY ACCESS (GATED, UNLOCKED)
- EXISTING LOCO SHEDS & BUILDINGS
- EXISTING VEHICULAR ACCESS TO RAILWAY
- EXISTING SHEDS & BUILDINGS

PROPOSED CAR PARK FOR CASTLEDARE MINIATURE RAILWAY (70 BAYS)

	LOCATION BOUNDARY		ACCESS STREET D
	ROAD (VARIED WITH ROAD WIDTH)		ACCESS STREET D ADJACENT TO P.O.S.
	PROPOSED ROAD		
	ROAD NAME		

NOTE: THE PLAN IS COURTESY OF BURGESS DESIGN GROUP

**LEGEND**

**MANAGEMENT SYSTEMS REGISTERED TO ISO 9001**

C	04-03-2021	ISSUED FOR REVIEW	PROJECT: LOT 4 FERN ROAD & LOT 102 CASTLEDARE PLACE, WILSON	DRAWN BY:  J.S.	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021  PH: 08 9441 2700 WEB: www.kctt.com.au	
	B	18-04-2018	ISSUED FOR REVIEW			TITLE: ROAD HIERARCHY SKETCH
	A	20-03-2018	ISSUED FOR REVIEW			DRAWING NUMBER: KC00812.000_S09
	No	DATE	AMENDMENT			





Appendix Eight

Infrastructure Servicing Report





Richard Noble  
Level 1, 189 Hay Street  
SUBIACO, WA, 6008

19 February 2021  
CCB/2069-00-LTR-003

**Attention: Peter Dockett**

Dear Peter,

**RE: LOTS 4 AND 102 FERN ROAD, WILSON  
SERVICING FOR PROPOSED RESIDENTIAL DEVELOPMENT**

This servicing report has been prepared to support the Trustees of Christian Brothers (WA) proposal to undertake rezoning associated with future development of lots 4 and 102 Fern Road, Wilson as a residential land subdivision. TABEC, as consulting engineers specialising in land development have prepared this report based on a review of information available from service authorities, the local authority, feature survey information, geotechnical investigations and through advice provided by the broader project team.

Lot 102 has legal road frontage of approximately 60m to Fern Road and 100m to Castledare Place, as well as 20m along the eastern extent of Bywater Way. Under the Metropolitan Region Scheme it has a dual zoning of Parks and Recreation (Bush Forever) for the portion nearest to Canning River, and Urban for the western portion. In the local Town Planning Scheme No. 40, the dual zoning of Regional Parks and Recreation and Private Clubs and Institutions exists.

Lot 4 has legal frontage of approximately 100m to Fern Road and is zoned Parks and Recreation (Bush Forever). In the local Town Planning Scheme No. 40, it is zoned Regional Parks and recreation.

Current zoning of lots 4 and 102 is shown in Figure 1 below.



Within the recreation portion of both lots a miniature railway and associated facilities exists, which is open to the public on selected days of the month. It is understood that the miniature railway has been operating since the early 1960's. Off the eastern end of Castledare Drive, an asphalt / kerbed carpark has been constructed, which is utilised by patrons of Wilson Catholic Church and the miniature railway.

The site has in the past accepted fill material from a number of sites across the metropolitan area. Testing of this material by Aurora Environmental confirmed the presence of contaminants that would not be compatible with future residential use. Throughout 2016 and 2017, works were undertaken to relocate the contaminated material to a containment cell immediately south of the asphalt carpark. This containment cell is overlain by a geofabric guard layer and road base material, which will likely form the base for a formalised extension to the existing carpark. Any works proposed within the vicinity of the containment cell are to be undertaken in accordance with the Management Plan prepared by Aurora Environmental.

As a result of these works, the area of the site that is proposed to be rezoned, indicated green in the image below, has been extensively tested and is now clear of contamination, as reported by Aurora Environmental.



For context in this report, the green areas will be referred to as the north and the south development cells respectively.

A geotechnical investigation has been undertaken for both the north and south development cells by CMW Geosciences in July 2015.

Within the northern cell, the whole area is expected to produce lots classified A in accordance with Australian Standard 2870-2011, once the site is earth worked and compacted as part of future subdivision construction. Within the southern cell, following subdivision siteworks, approximately 60% of the area will likely yield A site classification lots, with the remainder at the very southern end more likely to yield S site classification lots.

Landform generally slopes from west to east across the site with gradients averaging about 1 in 70 (1.4%).

The northern cell is gently undulating and some cut to fill earthworks will be required to produce level building lots. The southern cell will require both cut to fill and some imported fill to ensure that future lot levels are compatible with the abutting residential development, most of which is higher than the southern cell, in particular lot 21 Bywater Way.

Within the northern cell, there is a stand of vegetation adjacent to Fern Road which is to be retained in a strip of POS. The proposed development levels are compatible with the retention of these trees.

The southern cell is largely devoid of existing vegetation except for three trees located near the boundary at Bywater Way. It would be possible to retain two trees provided that City of Canning allow some flexibility with respect to road design. Should the two trees at the site boundary near the Bywater Way pavement be removed, a conventional extension of Bywater Way can be accommodated. Refer image below.



From an overall siteworks and vegetation perspective the site is capable of supporting an urban form of development.

Groundwater was encountered in one of the twelve test pits during the geotechnical investigation, central within the south cell at 1.5m below surface level. From interpolation of contours the groundwater level as at July 2015 was AHD 2.0m at the test pit location. However, it is noted that the test pit where water was encountered is underlain with a clayey sand layer which could have led to localised perched groundwater conditions.

With the creation of the POS strip along Fern Road to protect the trees, road access to the north cell is will be achieved from Castledare Place, which also provides access to Castledare Village (retirement living), Wilson Catholic Church and the miniature railway. Two access points are provided with the lot layout optimised to maintain existing trees, with the eastern access point providing a localised and reduced width single lane access to reduce impact on a number of significant trees.

The southern cell has a single road access point off the eastern end of Bywater Way. However, for bushfire and emergency access requirements, a secondary access through an unlocked gate to Castledare Place via the existing and proposed carpark (over the containment cell) is proposed.



With close proximity to the Canning River, site levels are influenced by ensuring that freeboard exists above 1 in 100-year flood levels. Adjacent to the site, the maximum 1 in 100-year flood level is 2.40m AHD. This compares to a minimum proposed development level of 3.7m AHD in the northern cell and 4.1m AHD in the southern cell, which provides sufficient freeboard for infiltration of stormwater drainage on site.

Both the northern and southern cells can be provided with sewer reticulation via an orderly extension of the existing systems. The existing 150mm diameter PVC gravity sewer in Castledare Place can be readily extended to service the northern cell, and the 150mm diameter PVC gravity sewer in Bywater Way can readily be extended to service the southern cell. Depending on timing of construction, a short portion of the sewer near Bywater Way may require dewatering during construction.

Similarly, both the northern and southern cells can be readily serviced with scheme water from the existing networks located in Castledare Place and Bywater Way respectively. These existing networks both comprise 100mm diameter water mains.

Western Power have sufficient overall capacity in the area to service the site however detailed design will be required to determine if any upgrade to existing high voltage infrastructure is required. For the northern cell, there is a small kiosk transformer located in Castledare Place, near Fern Road and for the southern cell, there is a larger transformer located in Bywater Way, approximately 30m west of the site.

As these essential water, wastewater and power services are available in near proximity, there is no undue impediment for these services regarding development of the site.

Although not typically a condition of development, both gas and communications services are available in near proximity to the site.

Based on our overall review of the site constraints and servicing requirements, we believe that the north and south cells as indicated above are readily capable of being serviced as residential development.

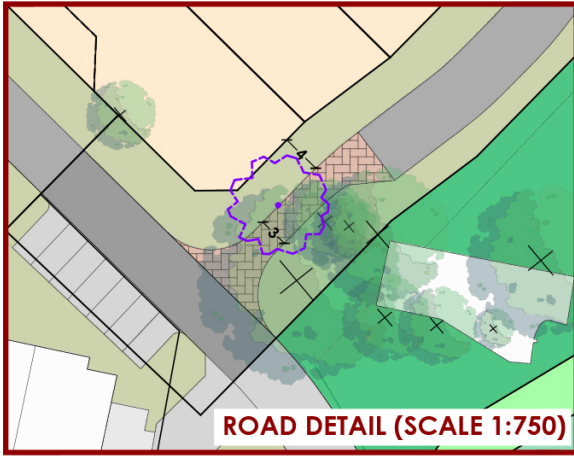
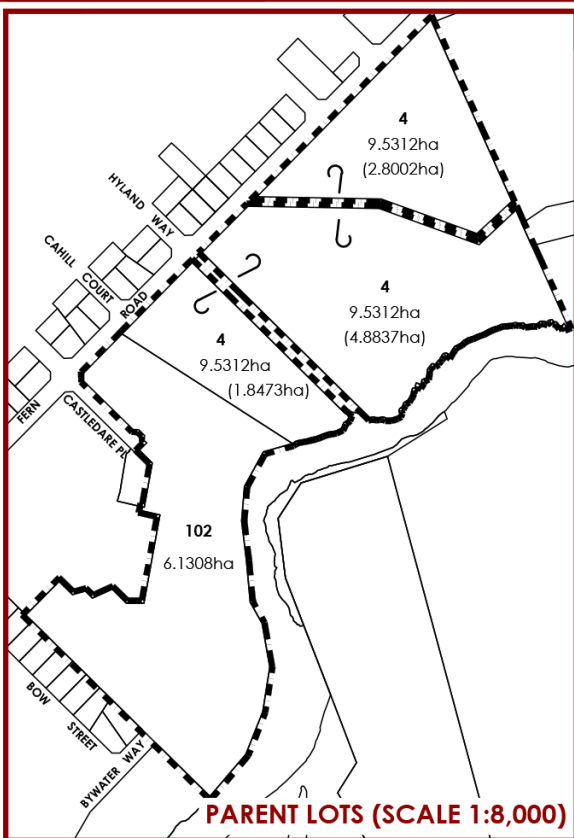
Should you wish to discuss any aspect of the above, please do not hesitate to contact the undersigned.

Yours sincerely  
**TABEC Pty Ltd**



**CHRIS BITMEAD**  
Director





LOT SUMMARY	
Number of Lots	43
Total Area of Lots	18,677 m <sup>2</sup>
Average Area of Lots	434 m <sup>2</sup>
Minimum Lot Area	298 m <sup>2</sup>
Maximum Lot Area	905 m <sup>2</sup>

- SUBJECT SITE
- TREES TO BE RETAINED
- TREES TO BE REMOVED
- PRINCIPAL SHARED PATH CORRIDOR

All areas and dimensions are subject to survey, engineering and detailed design and may change without notice. © Copyright of Burgess Design Group.



Appendix Nine

# Tree Management Strategy





18 March, 2021

# Tree Management Report



**Castledare**

Castledare Place, Wilson 6107 WA 6230

**Consulting Arborist**

David Cuddihy

Graduate Certificate Arboriculture (AQF 8)

[www.arboritetms.com](http://www.arboritetms.com)

[arboritetms@gmail.com](mailto:arboritetms@gmail.com)

#0456 152 142

## Contents

1.	Client.....	3
2.	Summary .....	3
3.	Key objectives.....	3
4.	Methodology.....	3
5.	Duty of care.....	3
6.	Limitations .....	4
7.	Site details .....	4
	7.1 Site Map.....	4
8.	Tree survey.....	6
9.	Tree management concepts.....	6
	9.1 Pruning to Australian standards (AS 4373-2007) .....	6
	9.2 Useful life expectancy (ULE).....	6
	9.3 Amenity value.....	7
	9.4 Retention value .....	7
	9.5 Soil testing .....	8
	9.6 Soil amendments .....	8
10.	Pruning specifications .....	8
	10.1 Clearance Pruning.....	8
	10.2 Crown lifting.....	8
	10.3 Remedial pruning.....	8
	10.4 Dead Wooding .....	8
	10.5 Branch order .....	8
11.	Quantified Tree Risk Assessment (QTRA).....	9
	11.1 QTRA overview.....	9
	11.2 Risk management.....	9
	11.3 Tree risk management.....	9
	11.4 Tree risk management vs. cost .....	10
	11.5 Weather affected targets .....	10
12.	Risk assessment & pruning requirements.....	11
13.	Recommendations .....	13
14.	Disclaimer .....	13
15.	Appendix.....	13
	15.1 Preferred contractors .....	13
	15.2 Photos.....	13

## 1. Client

---

### The Christian Brothers of WA

C/o Richard Noble

M 0415 953 034 | T +61 8 9380 3813 | W [rnoble.com.au](http://rnoble.com.au) | E [atyack@rnoble.com.au](mailto:atyack@rnoble.com.au)

Street Address: Level 1, 189 Hay Street, Subiaco WA 6008

Mailing Address: PO Box 8210, Subiaco East WA 6008

## 2. Summary

---

The purpose of this report is to provide an independent Arboricultural assessment of a selection of trees located at Castledare Place, Wilson (Fig. 1 & 2). Arborite Tree Management Solutions has been employed to assess 16 trees on site and provide risk mitigation strategies and tree management requirements where required.

## 3. Key objectives

---

- Retain trees through appropriate management.
- Perform visual tree inspection (VTA) on all trees to determine health and structure.
- Conduct a 'walk-by' risk assessment of the identified trees on site
- Provide recommendations to maintain and improve the health and structure of existing trees to maximise amenity value.
- Provide recommendations to mitigate risk of target trees.

## 4. Methodology

---

- The site was assessed from observations made from ground level on the 10<sup>th</sup> March 2021.
- A walk by assessment (ISA Level 2 risk assessment) was performed on all trees on site and QTRA risk assessment model was applied to determine levels of risk.
- Trees with a DBH of <100mm or <3m in height are not perceived to have elevated levels of risk
- Field notes were taken and the information documented was an accurate account of the subject trees on the above specified date.
- A Samsung tablet and Geographic Information System (GIS) have been used to capture trees and their locations imposed on Google satellite imagery.

## 5. Duty of care

---

Whether in the public, corporate or private sectors, land managers have a legal duty to take reasonable care in managing the risks associated with trees in their control.

Property owners could be held liable if a tree injures a member of the public. Typically, this will only occur if a party can prove that the tree fell as a result of the owner's negligence. Therefore, landowners have the responsibility to identify, and reduce or eliminate risks where practicable to ensure a safe environment.



By quantifying the risk from tree failure as a probability, QTRA enables a tree owner or manager to manage the risk in accordance with widely applied and internationally recognised levels of risk tolerance. QTRA further provides a decision-making framework which considers the balance between the benefits provided by trees, levels of risk they pose, and costs of risk management.

## 6. Limitations

Information contained in this report pertains only to the tree(s) examined on the above specified date of inspection. The tree assessment was performed by a suitably qualified arborist (AQF 8) using a recognised model (VTA) that aligns with the International Society of Arboriculture (ISA). The assessment was limited to a ground based VTA that did not extend to aerial inspections, nor below ground evaluations. The documented, observations, results, recommendations and conclusions given may vary after the site visit due to environmental conditions or variances in site conditions. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject tree may not arise in the future.

## 7. Site details

### 7.1 Site Map



Fig. 1 – Indicating tree ID's 1 – 13 (Google maps)



Fig. 2 – Indicating tree ID's 14 – 16 (Google maps)

## 8. Tree survey

Tag no	Species	Height (m)	Width (m)	DBH (m)	Trunk Calliper	Health & Condition	Age class	ULE	Retention Value	Pruning recommended
1	<i>Eucalyptus camaldulensis</i> var	10-15	5-10	0.5	0.6	good	semi-mature	25+	High	No
2	<i>Eucalyptus camaldulensis</i> var	10-15	5-10	0.35	0.4	good	semi-mature	25+	High	No
3	<i>Eucalyptus camaldulensis</i> var	15-20	10-15	0.8	0.75	good	mature	25+	High	No
4	<i>Eucalyptus camaldulensis</i> var	25+	20-25	1.2	1.4	good	mature	25+	High	Yes
5	<i>Eucalyptus camaldulensis</i> var	25+	20-25	1.25	1.6	good	mature	25+	High	Yes
6	<i>Eucalyptus camaldulensis</i> var	25+	15-20	1.1	1.3	good	mature	25+	High	Yes
7	<i>Eucalyptus gomphocephala</i>	15-20	10-15	1	1.3	average	mature	15-25	High	Yes
8	<i>Eucalyptus citriodora</i>	10-15	10-15	0.5	0.55	good	semi-mature	25+	Moderate	Yes
9	<i>Eucalyptus camaldulensis</i> var	10-15	10-15	0.5	0.55	average	semi-mature	5-15	Low	Yes
10	<i>Agonis flexuosa</i>	5-10	5-10	0.75	0.85	average	mature	5-15	Moderate	Yes
11	<i>Agonis flexuosa</i>	5-10	5-10	0.5	0.55	dead	semi-mature	0-5	Low	Yes
12	<i>Agonis flexuosa</i>	10-15	10-15	0.65	0.75	good	semi-mature	25+	Low	No
13	<i>Eucalyptus sideroxylon</i>	15-20	10-15	0.65	0.75	good	mature	25+	High	Yes
14	<i>Eucalyptus cladocalyx</i>	10-15	5-10	0.6	0.7	average	semi-mature	15-25	Moderate	Yes
15	<i>Eucalyptus cladocalyx</i>	20-25	10-15	1.2	1.3	good	mature	25+	High	Yes
16	<i>Corymbia calophylla</i>	15-20	10-15	0.75	0.85	average	mature	15-25	High	Yes

Table 1 – Tree survey

## 9. Tree management concepts

### 9.1 Pruning to Australian standards (AS 4373-2007)

Trees often require pruning to maintain clearance for utility services and buildings or to improve the safety, structure, and health of the tree. They are also often pruned to improve the amenity of sites in order to enable successful cohabitation between trees and people. Assessment of trees and specification of their pruning should be carried out by a suitably qualified arborist (AQF 5) and pruning should be carried out by arborists or tree workers who are familiar with the principles, techniques and hazards of this work (AQF 3). The procedures in AS 4373-2007) are guided by theories of branch attachment and compartmentalization of decay in trees. Lopping, topping and flush cutting are unacceptable practices.

### 9.2 Useful life expectancy (ULE)

ULE is an estimate of the number of years a tree is expected to stay alive and is a method of assessing the relative importance of individual trees and the amenity value that can be realised for the remaining duration



of the trees lifespan. In conjunction with landscape significance, ULE helps making informed decisions on the retention value of trees on site.

To arrive at a ULE figure, it is necessary to consider the present age of the tree, the average life span of the species and any local environmental modifying factors that may influence that potential.

### 9.3 Amenity value

Tree amenity is described as a quality, feature, or attribute of the tree that makes it pleasant, attractive, and agreeable which is conducive to the comfort, convenience, and enjoyment of people. It is a physical feature which increases attractiveness and value of a site through contributions to the physical, psychological, or material comfort of people and which facilitates happiness, pleasure, enjoyment, and contentment. The greater amenity a tree has, the greater its respective value.

### 9.4 Retention value

Retention values have been established based on landscape significance and ULE and will be subject to changed based on finalized plans.

There is always a compromise between retaining trees on a development site and the economic imperatives of land development. Establishing priorities for the retention of trees is an important part of the planning process if amenity is to be sustained in the long term.

The methodology for the purpose of this report focus primarily on the sustainability of the tree in the landscape as a way of determining its value for retention, thus a tree that has a high landscape significance (Appendices 12.2) with a long remaining life expectancy is considered the best candidate for retention on a development site. The following table illustrates the criteria for determining retention value.

Useful Life Expectancy (ULE)	Landscape Significance Rating (appendices 12.2)						
	1	2	3	4	5	6	7
Long - Greater than 40 years	High retention vale						
Medium - 15 to 40 years			Moderate retention value				
Short - 5 to 15 years				Low retention value			
Transient - Less than 5 years				Very low retention value			
Dead or Potentially hazardous							

Table 2: Tree retention matrix

If the trees are found to have high significance plans may be altered or construction methods changed to accommodate tree retention. Excavation within the TPZ can be conducted in a non-intrusive manner that can dramatically reduce disturbance to the trees roots.

### 9.5 Soil testing

Soil analysis is a cost effective method for diagnosing declining trees or trees that are under performing and a soil amendment strategy can be implemented to satisfy the trees deficiencies. Soil analysis is helpful in formulating and improving a soil amendment strategy because soil testing measures organic matter content, pH and extractable nutrients. Soil analysis is particularly useful when conducted for several consecutive years because trends can be observed.

### 9.6 Soil amendments

Soil amendment involves introducing organic matter into the current soil profile. Unlike fertilizers, which add nutrients to soil, amendments modify the condition of the soil itself. The condition of the soil and specifically its suitability for supporting plant roots is called 'Tilth'. When tilth is right, plants experience healthy growth.

Soil amendments are used in tree management to support plant growth and development, specifically by adding organic and inorganic nutrients to the soil, and improving soil tilth, organic matter, and water holding capacity.

Amending the soil profile achieves the following; it minimises further disturbance to the soil and roots, improves gaseous exchange, reduces compaction, improves soil nutrients, increases water availability and increases soil biodiversity, all of which stimulate and facilitate root growth.

## 10. Pruning specifications

---

### 10.1 Clearance Pruning

To reduce or remove branches as required to achieve physical clearance of a certain target. Usually to maintain distance from utility service wires, gutters or of tree's over the boundaries of neighbouring properties.

### 10.2 Crown lifting

Crown lifting involves removing or pruning lower limbs of trees to achieve a certain clearance from the ground/obstacles to eliminate the possibility of contact. For the purpose of this report, canopy clearance over walkways is 2.5 meters and car park clearance is 4 meters.

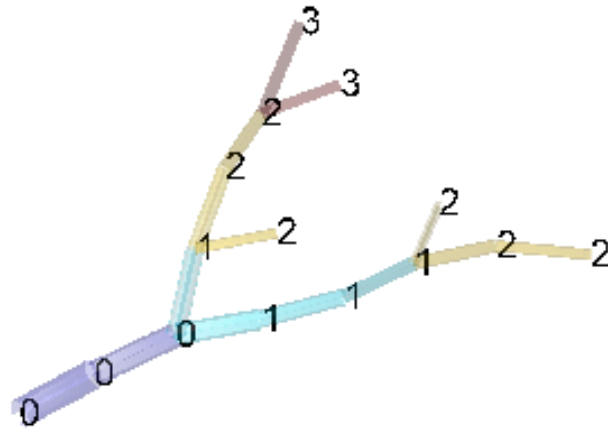
### 10.3 Remedial pruning

Involves reducing or removing branches as required to correct structural defects and restore a foundation for future growth. Remedial pruning is typically done on mature tree's to repair damages after major failures from storm events, other mechanical damage or previous poor pruning.

### 10.4 Dead Wooding

The removal of dead, dying, diseased, detached or broken branches is specified to improve crown appearance and long life of the tree. For the purpose of this report, major deadwood is considered limbs of 50mm diameter and above.

### 10.5 Branch order



The order of limbs on a tree. 0 being the trunk and 1 being a limb attaching directly to the trunk etc.

## 11. Quantified Tree Risk Assessment (QTRA)

### 11.1 QTRA overview

The Quantified Tree Risk Assessment (QTRA) system, applies established and accepted risk management principles to tree safety management. The system moves the management of tree safety away from labelling trees as either 'safe' or 'unsafe' and thereby away from requiring definitive judgements from either tree assessors or tree managers. Instead, QTRA quantifies the risk of significant harm from tree failure in a way that enables tree managers to balance safety with tree values and operate to predetermined limits of tolerable or acceptable risk.

Tree safety management should not seek to minimise the risk of falling trees, but should balance the benefits of risk reduction with the associated costs in terms of both lost tree value and financial expenditure and maintain risks and benefits at a reasonable level.

The QTRA method provides a framework for the assessment of the three primary components of tree failure risk. The input values for these components are set out in broad ranges of Target, Size, and Probability of Failure. The QTRA User estimates values for the three components and inputs them to either the QTRA manual calculator or software application to calculate the Risk of Harm.

### 11.2 Risk management

When managing risks in all walks of life we strive to balance the costs of our actions and choices with the benefits that they provide. If, for example, you want to travel by car you must accept that even with all the extensive risk control measures, such as seat-belts, speed limits, airbags, and crash barriers, there is still a significant risk of death. This is an everyday risk that is taken for granted and accepted by millions of people in return for the benefits of convenient travel. Managing risks and benefits from trees should be no different.

### 11.3 Tree risk management

The risks from tree failure are generally very low and high risks will usually be encountered only in areas with either high levels of human occupation or where valuable property can be affected by the structural failure of trees. Where human occupation and the value of property are sufficiently low, we may be able to identify that the risk is 'broadly acceptable'.



#### 11.4 Tree risk management vs. cost

Risk minimisation is often cited as an objective when managing risks from trees. This is not a reasonable aim because it does not take account of the cost of risk reduction. If reasonable management decisions are to be made, the benefits of controlling a risk must be balanced with its costs, and those costs are not just financial. The tree-related benefits that are lost to risk control are often a substantial cost of managing risks from falling trees.

When considering risks from falling trees, the cost of risk control will usually be too high when it is clearly 'disproportionate' to the reduction in risk. The issue of 'gross disproportion's, where decisions are heavily biased in favour of safety, is likely to be considered only where there are annualised risks greater than 1/10 000.

#### 11.5 Weather affected targets

Often the nature of a structural weakness in a tree is such that the probability of failure is greatest during windy weather, while the probability of the site being occupied by people during those weather conditions is often low. As wind speeds increase to 60-70 knots the failure of branches will increase both in size and number and the population is put on notice that catastrophic tree failure is increasingly likely. In most recreational areas, including the streets of our towns and cities, pedestrian access reduces with inclement weather.

## 12. Risk assessment & pruning requirements

Tag no	Species	Tree defect 1	Tree defect 2	Tree defect 3	Tree defect 4	Risk rating	Pruning recommended	Action	Comments	Residual risk
1	Eucalyptus camaldulensis var	Suckering				low	No	No action		low
2	Eucalyptus camaldulensis var	Northern canopy bias				low	No	No action		low
3	Eucalyptus camaldulensis var	Multi-stemmed habit	Acute unions, minor inclusion			low	No	No action		low
4	Eucalyptus camaldulensis var	Co-dominant stem	Major deadwood			low	Yes	Major deadwood removal		very low
5	Eucalyptus camaldulensis var	Weighted lateral limb	Major deadwood	History of failures		medium	Yes	1. Terminally weight reduce limbs extending over footpath by 10-15% 2. Major deadwood removal 3. Terminally weight reduce limbs on the SE canopy aspect by 5-10%		low
6	Eucalyptus camaldulensis var	Low hanging limbs likely to impede future construction	Major deadwood			medium	Yes	1. Selectively prune lower limbs extending SE to achieve clearance and weight reduction		low
7	Eucalyptus gomphocephala	Slightly thinning canopy	Major deadwood	Active beehive		medium	Yes	1. Major deadwood removal	Consider soil testing and amendment (Tree management concepts 9.5 & 9.6)	low
8	Eucalyptus citriodora	Low hanging limbs likely to impede future construction	distally loaded limbs	Crossing and rubbing limbs		medium	Yes	1. Selectively prune limbs to achieve appropriate ground clearances 2. Terminally weight reduce lateral, distally loaded limbs to appropriate growth points	Reduce no more than 25% of the canopy at any given time.	low
9	Eucalyptus camaldulensis var	Heavily leaning tree	Low hanging limbs	Crossing and rubbing stem with adjacent tree		medium	Yes	1. Remove tree to achieve risk reduction and to allow adjacent tree to grow to potential		very low

Tag no	Species	Tree defect 1	Tree defect 2	Tree defect 3	Tree defect 4	Risk rating	Pruning recommended	Action	Comments	Residual risk
10	Agonis flexuosa	Separation of structural limb from the trunk. Major limb failure imminent	Low hanging limbs	Epicormic growth		medium	Yes	1. Remove lowest limb (200mm dia) originating from the base to canopy uplift 2. Brace (static/dynamic) limb separating from the trunk		low
11	Agonis flexuosa	Dead tree				medium	Yes	1. Remove dead tree		very low
12	Agonis flexuosa	Multi-stemmed habit	Major deadwood	History of failures		low	No	1. Marked for removal		low
13	Eucalyptus sideroxylon	Low hanging limb over road	Major deadwood			medium	Yes	1. Uplift limbs over existing access road to achieve a minimum clearance of 4.5m 2. Major deadwood removal		low
14	Eucalyptus cladocalyx	Major deadwood	Parrot browsing and cavity forming @ 8m union			medium	Yes	1. Prune lowest limb over proposed access road to source 2. Major deadwood removal	Establish a tree protection plan	low
15	Eucalyptus cladocalyx	Major deadwood	Parrot browsing in major unions	History of failures	Historic large pruning wounds	medium	Yes	1. Major deadwood removal 2. Inspect unions with parrot browsing for structural integrity		low
16	Corymbia calophylla	Canopy dieback	Major deadwood	History of failures	Unbalanced canopy	medium	Yes	1. Major deadwood removal 2. Terminally reduce northern facing limb vying for apical dominance	Limb reduction to happen gradually over 10 years to slow growth down and establish a more central leader	low

Table 3 – Risk assessment &amp; mitigation actions



## 13. Recommendations

---

1. Prepare a Tree protection plan (TPP) for the protection of all trees on site during construction

## 14. Disclaimer

---

The conclusions and recommendations contained in this report refer to the tree's condition on the day of inspection only. The report should be read and considered in its entirety. All care has been taken using the most up to date Arboricultural information in the preparation of this report. The report is based on visual inspection only. No guarantee can be given nor can it be predicted that branch failure or uprooting (windthrow) would not occur as a result of high winds and /or excessive rainfall and other unpredictable events. Tree health and environmental conditions can change at any time due

## 15. Appendix

---

### 15.1 Preferred contractors

Urban Forest Care

0423 359 892

[www.urbanforestcare.com.au](http://www.urbanforestcare.com.au)

### 15.2 Photos

Tag 1



Tag 2



Tag 3



Tag 4



Tag 5



Tag 6



Tag 7



Tag 8





Tag 9



Tag 10



Tag 11



Tag 12



Tag 13



Tag 14





Tag 15



Tag 16

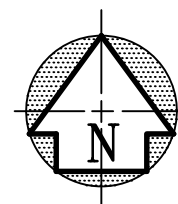


Appendix Ten

**Principal Shared Path Concept**





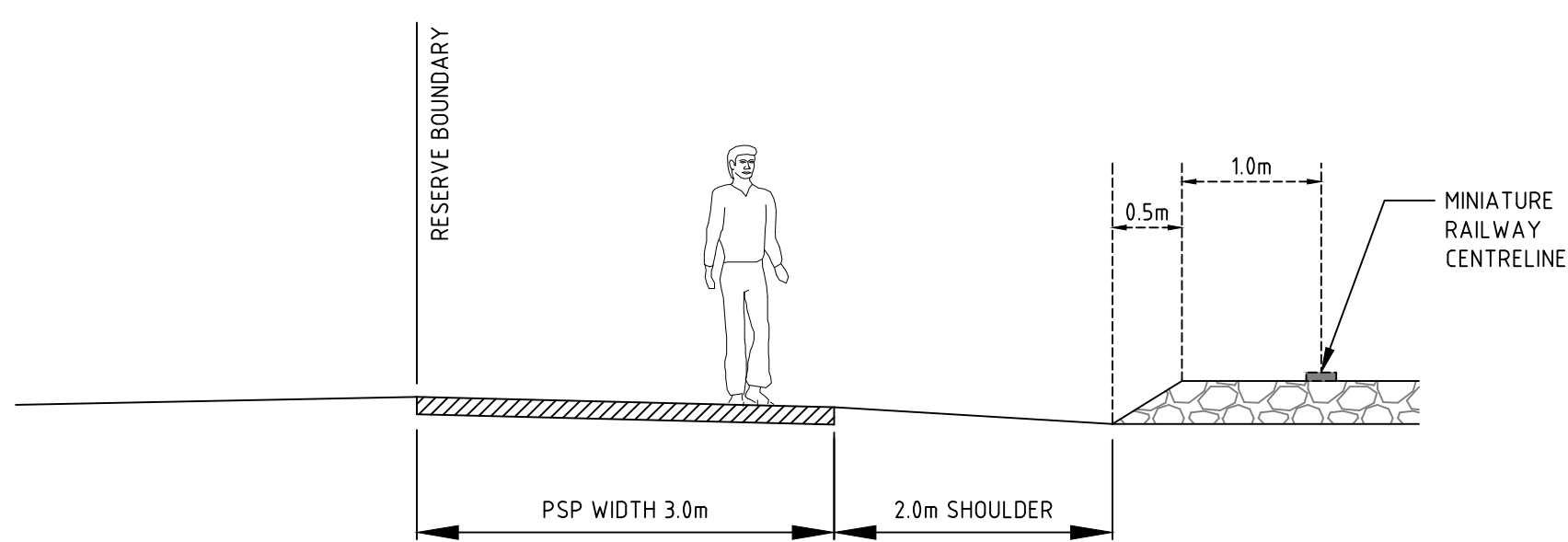
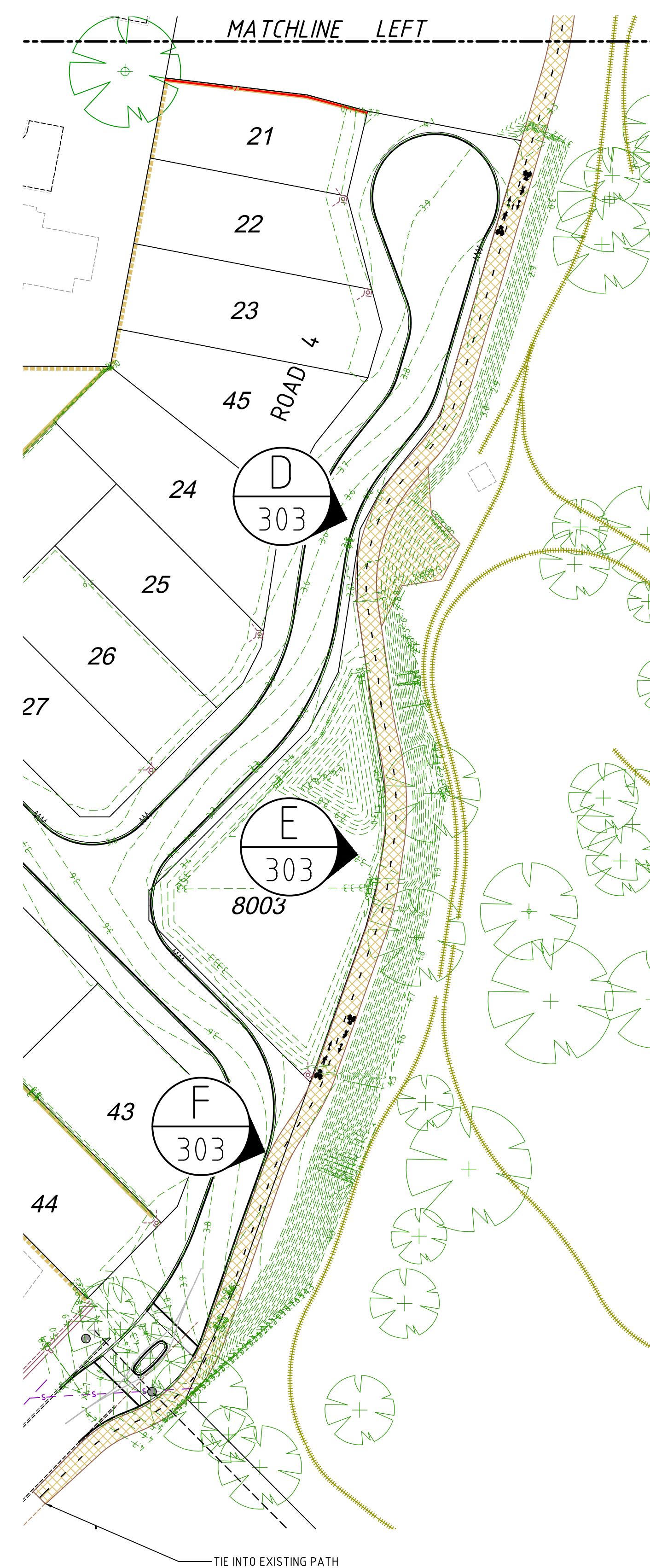
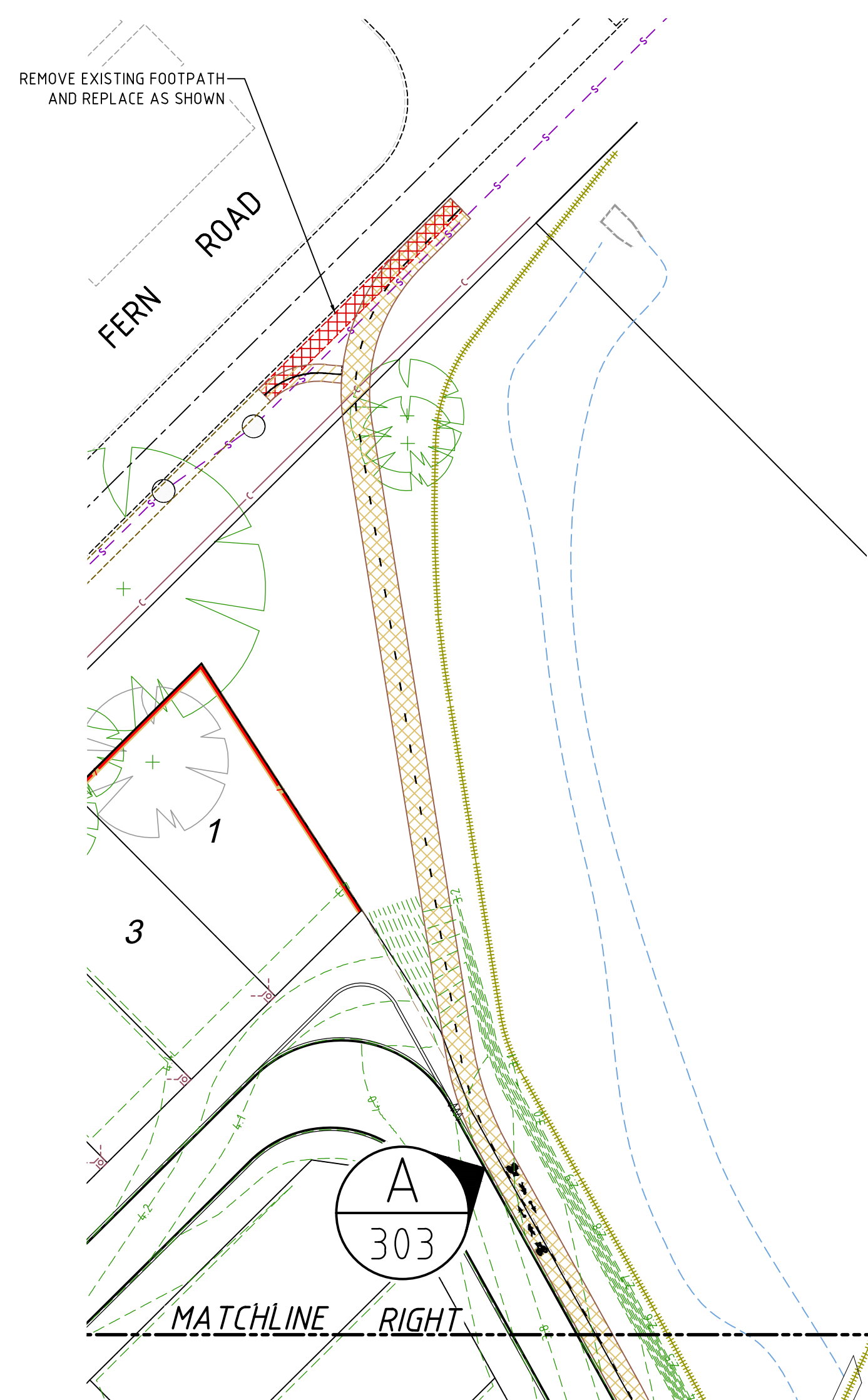


### NOTES

- 1.1 THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DRAWINGS AND SPECIFICATION.
- 1.2 THE CONSTRUCTION OF THE WORKS SHALL BE TO THE APPROVAL OF THE CITY OF CANNING.
- 1.3 ALL DIMENSIONS ARE IN METRES UNLESS SHOWN OTHERWISE.
- 1.4 ALL LEVELS SHALL BE DETERMINED FROM BENCHMARKS ESTABLISHED BY THE PROJECT SURVEYOR.
- 1.5 ALL TRANSITIONS TO EXISTING WORK SHALL BE SMOOTH AND OF NEAT APPEARANCE.
- 1.6 THE CONTRACTOR SHALL REPORT ANY DISCREPANCY OR CLASH WITH OTHER SERVICES TO THE SUPERINTENDENT.
- 1.7 PRINCIPAL SHARED PATH (PSP) TO BE CONSTRUCTED TO MRWA SUPPLEMENT TO AUSTRROADS GUIDE TO ROAD DESIGN - PART 6A
- 1.8 VEHICLE MANAGEMENT/CONTROL TO BE INSTALLED IN VERGE - REFER TO LANDSCAPE DESIGN

### LEGEND

- LIMIT OF WORKS BOUNDARY
- ▨ PRINCIPAL SHARED PATH (PSP)
- MINIATURE RAILWAY CENTRELINE
- -0.0- DESIGN CONTOURS (0.1m)



PRINCIPAL SHARED PATH (PSP) SETOUT (TYPICAL)

SCALE 1:100



WAPC No.

SCALE 1:500  
0 10 20 30 40 60  
1:100  
0 2 4 6  
A1

Printed By: jmorris File Date: 24/10/23 - 08:39 C:\pfiles\12195\subdiv\12195\12195-01-302-393.dwg

No.	DATE	DRAWN	APPROVED	AMENDMENT	No.	DATE	DRAWN	APPROVED	AMENDMENT
C	24.10.23	DN	BS	FOOTPATH CONNECTION TO PSP ADDED					
B	14.08.23	DN	BS	MINOR UPDATES					
A	20.03.23	DN	BS	ISSUED FOR REVIEW					

This plan shall not to be used for construction unless issued as rev O and signed as approved.

**COPYRIGHT**  
The concepts and information contained in this document are the Copyright of TABEC Pty. Ltd. Use or copying of the document in whole or part without the written permission of TABEC Pty. Ltd. constitutes an infringement of copyright.

CLIENT		
<b>RICHARD NOBLE</b> PRIORITY. INTEGRITY. COMMUNITY.		
DESIGNED	CHECKED	APPROVED
DN	BS	B. M. SMITH
DRAWN	CHECKED	DATE
DN	BS	

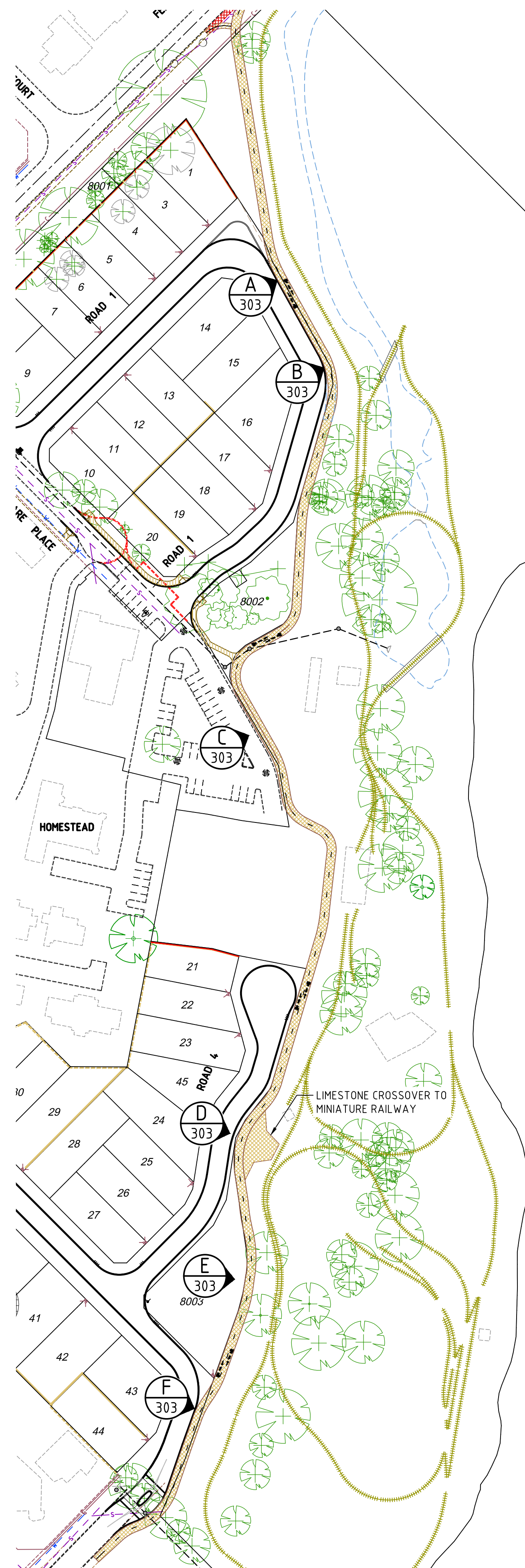
**TABEC**  
Civil Engineering Consultants

TABEC PTY LTD  
ACN 090 796 204

Level 2, 54-58 Havelock Street, West Perth WA 6005  
08 9425 5900 info@tabec.com.au www.tabec.com.au

PROJECT		DRAWING NUMBER	ISSUE
CASTLEDARE SUBDIVISION			
TITLE			
PRINCIPAL SHARED PATH RECONSTRUCTION PLAN			

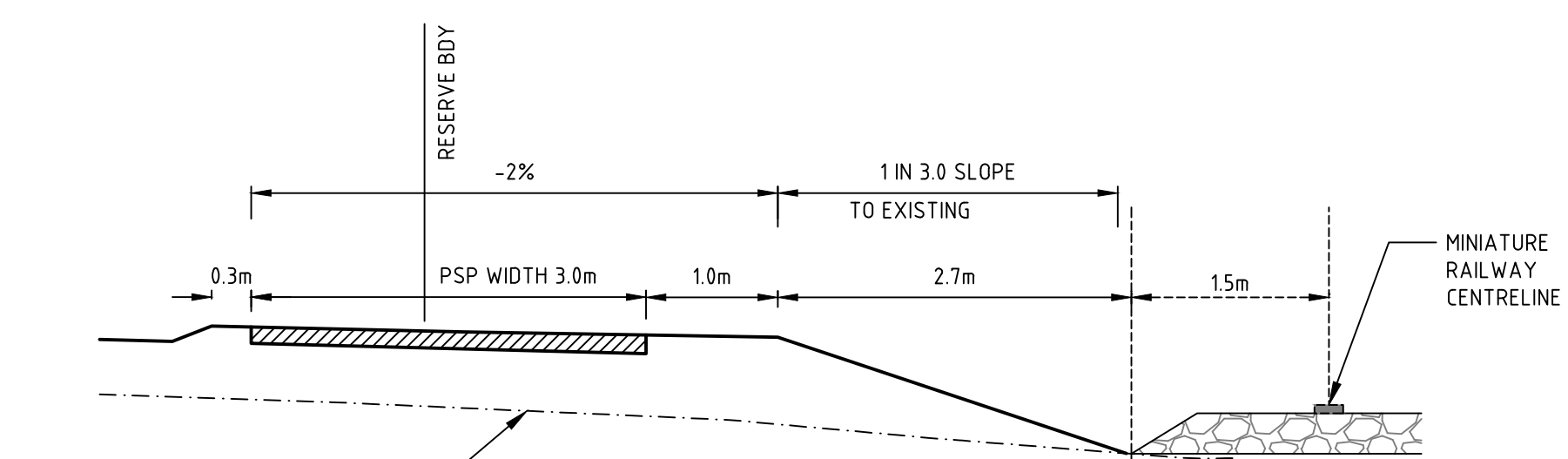




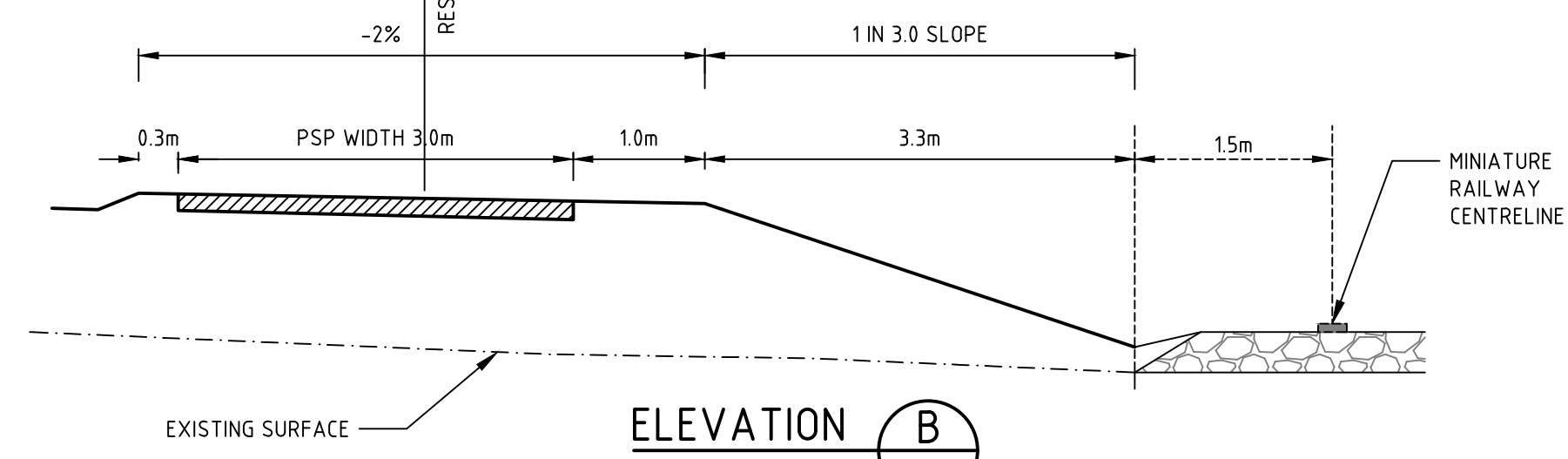
**FENCING REQUIREMENTS FOR PATH NEAR BATTER SLOPE WITHOUT OBSTACLES**  
NTS

	X (m)	Z (m)
Fence not required	<1 1 to 5	>8 >3
Partial barrier fence required	<5	1 to 3
Full barrier fence required	<5	<1

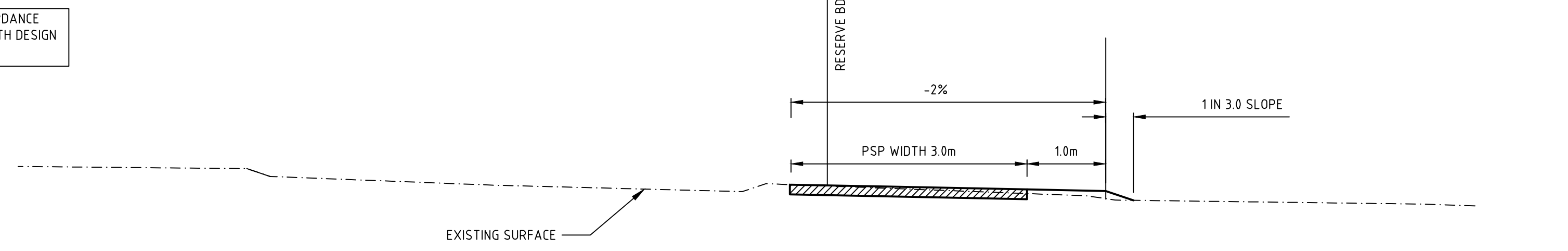
CONSTRUCTION TO BE IN ACCORDANCE WITH DoT/WALGA SHARED PATH DESIGN STANDARDS TABLE ABOVE.



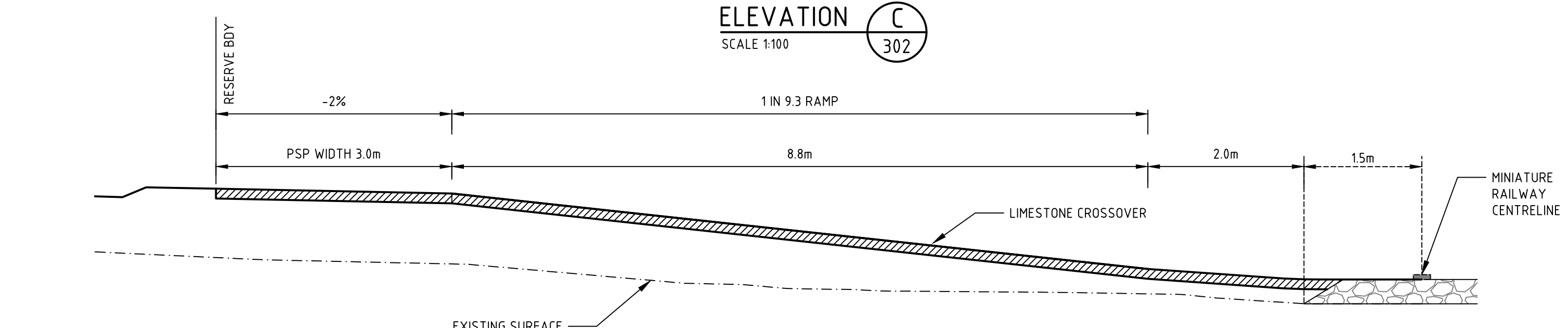
ELEVATION A  
SCALE 1:100  
302



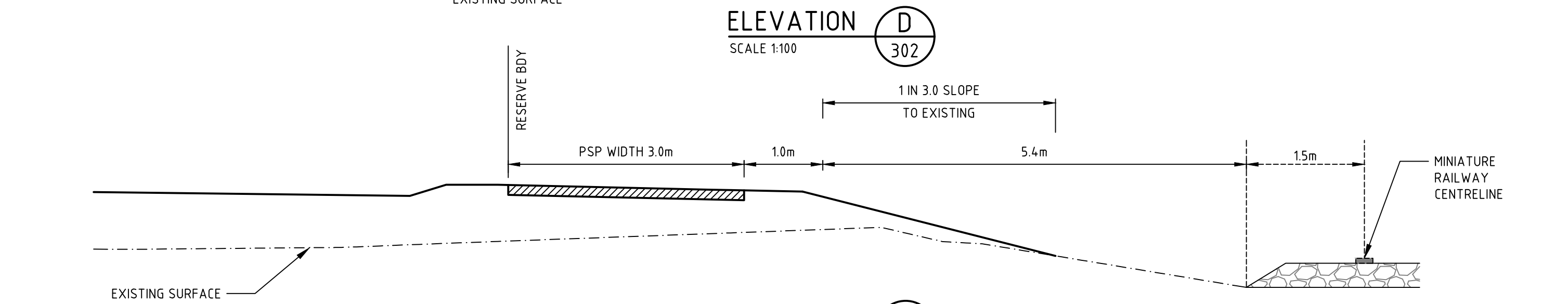
ELEVATION B  
SCALE 1:100  
302



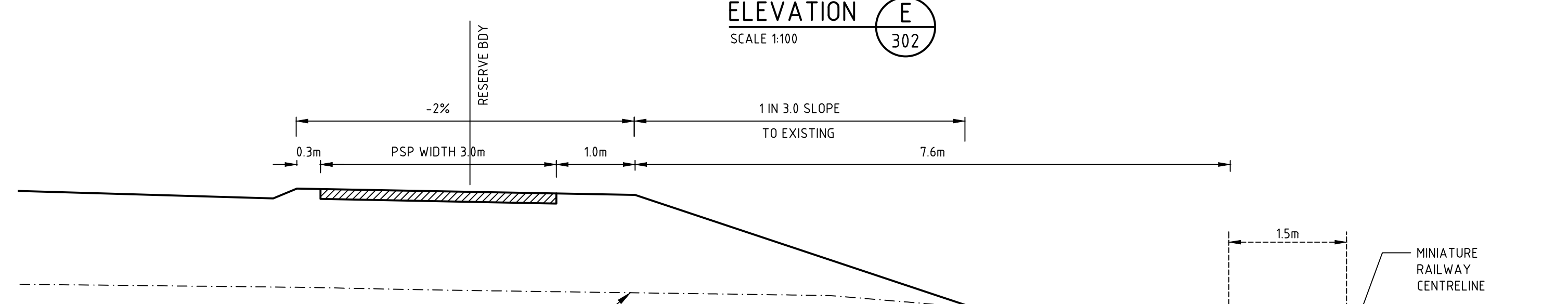
ELEVATION C  
SCALE 1:100  
302



ELEVATION D  
SCALE 1:100  
302

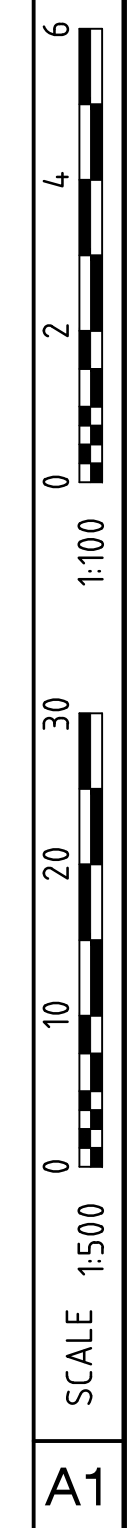


ELEVATION E  
SCALE 1:100  
302



ELEVATION F  
SCALE 1:100  
302

WAPC No.



Printed By: jsmith File Date: 24/10/23 - 08:39 C:\p\1025\subdiv\1025-01\2069-01\2069-01-302-303.dwg

No.	DATE	DRAWN	APPROVED	AMENDMENT
C	24.10.23	DN	BS	SECTIONS UPDATED
B	14.08.23	DN	BS	MINOR UPDATES
A	20.03.23	DN	BS	ISSUED FOR REVIEW

This plan shall not to be used for construction unless issued as rev 0 and signed as approved.

**COPYRIGHT**  
The concepts and information contained in this document are the Copyright of TABEC Pty. Ltd. Use or copying of the document in whole or part without the written permission of TABEC Pty. Ltd. constitutes an infringement of copyright.

CLIENT		
<b>RICHARD NOBLE</b> PROFESSIONAL ENGINEERS		
DESIGNED	CHECKED	APPROVED
DN	BS	B.M. SMITH
DRAWN	CHECKED	DATE
DN	BS	

**TABEC**  
Civil Engineering Consultants

TABEC PTY LTD  
ACN 090 796 204

Level 2, 54-58 Havelock Street, West Perth WA 6005  
08 9425 5900 info@tabec.com.au www.tabec.com.au

PROJECT	CASTLEDARE SUBDIVISION
TITLE	PRINCIPAL SHARED PATH CROSS SECTIONS
DRAWING NUMBER	2069-01-303
ISSUE	C