

Dolbys Drive Structure Plan

Shire of Chapman Valley

24 April 2026





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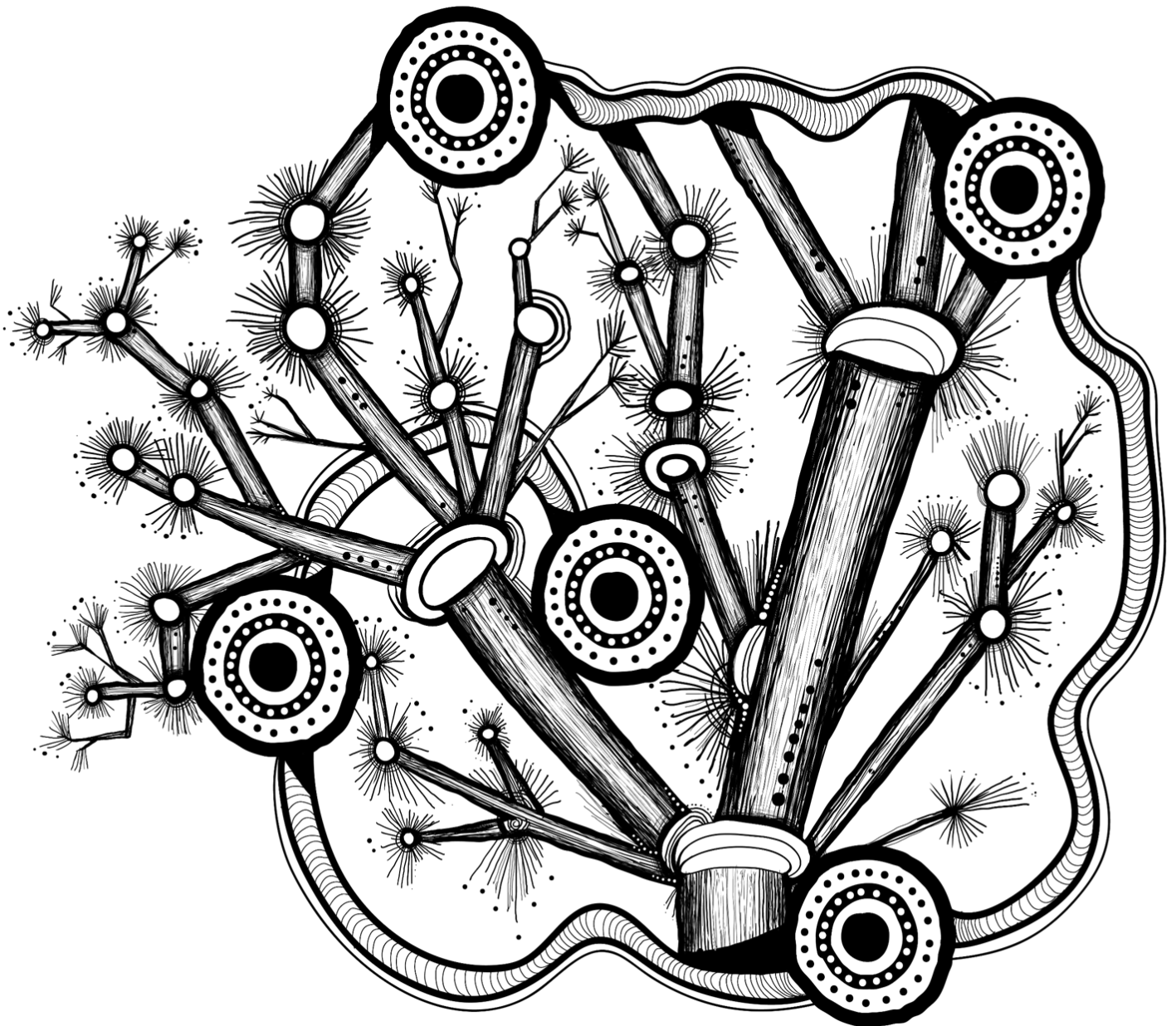
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Endorsement Page

This structure plan is prepared under the provisions of the Shire of Chapman Valley
Local Planning Scheme No. 2

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

15 AUGUST 2017

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

Date of Expiry:

15 AUGUST 2037

Table of Amendments

Amend No.	Summary	Date approved by the WAPC
1	– Conversion of Structure Plan to reflect required manner and form – Amendments to development provisions to reflect legislative changes – Updated Appendix – Technical Report (Bushfire Management Plan (Appendix B))	14 September 2026

Executive Summary

The Dolbys Drive Structure Plan has been prepared to coordinate future land use, subdivision and residential development within the Structure Plan Area, in a manner responsive to the site's location and environmental characteristics.

The Structure Plan was originally endorsed by the Western Australian Planning Commission on 15 August 2017. It provides for the creation of 30 rural residential lots of approximately 1 hectare to facilitate rural residential living. Due to the current land ownership and the access to the area, the Structure Plan proposes three options for access to the newly created lots. The preferred access option will be dependent on the staging of subdivision by landowners. The Structure Plan proposes the introduction of a foreshore reservation which covers Dolby Creek. This will ensure protection of the local environmental asset and provide appropriate buffers for development.

The Structure Plan comprises three components:

- **Part 1 – Implementation**, which includes the statutory implementation mechanisms and development requirements.
- **Part 2 – Explanatory**, which is to inform and guide the operation of the implementation requirements.
- **Appendices** – the Dolbys Drive Structure Plan is supported by a Local Water Management Strategy and a Bushfire Management Plan.

A summary of all key statistics and planning outcomes of the Structure Plan is outlined in the table below.

Table 1 Structure Plan summary

Item	Data	Structure Plan Ref (section no.)
Total area covered by the Structure Plan	38.0019 hectares	Structure Plan area and operation
Area of each land use proposed:	Hectares	Structure Plan Map
– Residential	– Rural Residential ~30 ha	
– Commercial	– Commercial 0 ha	
– Industrial	– Industrial 0 ha	
Total estimated lot yield	30 lots	3.2 Density and development
Estimated number of dwellings	30	3.2 Density and development
Estimated residential site density	1 dwelling per hectare	3.2 Density and development
Estimated population	81 persons	3.2 Density and development
Number of high schools	Nil	N/A
Number of primary schools	Nil	N/A
Estimated commercial floor space	Nil net lettable area	N/A
Estimated area and percentage of public open space given over to:		Structure Plan Map
– Regional open space	– Nil	
– District open space	– Nil	
– Neighbourhood parks	– Nil	
– Local parks	– Nil	
Estimated percentage of natural area	~ 8 ha, 21.05% (subject to variation dependent on foreshore reserve of Dolby Creek and preferred road access option)	Structure Plan Map

Contents

Table of Amendments	iii
Executive Summary	iv
Contents	v
Part 1 Implementation	ix
1. Implementation of Structure Plan	1
1.1 Structure Plan area and operation	1
1.2 Structure Plan purpose	1
2. Staging	3
3. Subdivision and development requirements	4
3.1 Land use zones and reserves	4
3.1.1 Zones	4
3.1.2 Road reserves	4
3.1.3 Foreshore reserve	4
3.2 Density and development	4
3.2.1 Density and residential development	4
3.2.2 Local Development Plans	4
4. Other requirements	5
4.1 Bushfire protection	5
4.2 Flood risk	5
4.3 Road and rail noise	5
5. Additional details	6
5.1 Information to be submitted with an application	6
5.2 Studies to be required under condition of subdivision approval	6
Part 2 Explanatory	0
1. Introduction	1
1.1 Purpose	1
2. Site and context analysis	2
2.1 Land description	2
2.1.1 Location	2
2.1.2 Area and land use	2
2.1.3 Legal description and ownership	2
2.2 Planning framework	4
2.2.1 Zoning and reservations	4
2.2.2 Strategic planning	4
2.2.3 Planning policies	5
2.2.3.1 State Planning Policy No 2.5 – Land Use Planning in Rural Areas (SPP2.5)	5
2.2.3.2 State Planning Policy No. 2.9 – Water (SPP2.9)	6
2.2.3.3 State Planning Policy No. 3 – Urban Growth and Settlement (SPP3)	6
2.2.3.4 State Planning Policy No. 3.4 – Natural Hazards and Disasters (SPP3.4)	6
2.2.3.5 State Planning Policy No. 3.7 – Bushfire (SPP3.7)	6
2.2.3.6 State Planning Policy No. 5.4 – Road and Rail Noise (SPP5.4)	6
2.2.4 Other relevant State planning documents	6
Operational Policy No. 1.1 - Subdivision of Land	6
Operational Policy 2.2 - Residential Subdivision	6

2.3	Environmental assets and constraints	7
2.3.1	Vegetation	7
2.3.2	Fauna	7
2.3.3	Landform and soils	7
2.3.4	Surface water and groundwater	7
2.3.5	Heritage	7
2.3.6	Foreshores	8
2.4	Opportunities and constraints analysis	9
2.4.1.1	Future primary regional road alignment	9
2.4.1.2	Dolby Creek	10
2.4.1.3	Surrounding development	10
2.4.1.4	Relationship to nearby settlements	10
2.4.1.5	Key opportunities	10
2.4.1.6	Key challenges	10
2.4.2	Pre lodgement consultation	10
3.	Design response	11
3.1	Residential	11
3.2	Movement network	13
3.2.1	Road hierarchy	13
3.2.2	Access scenarios	16
	Access scenario one	16
	Access scenario two	17
	Access scenario three	17
3.2.3	Pedestrian network	18
3.2.4	Traffic generation and management	18
3.3	Bushfire hazard	18
3.3.1	Hazard assessment	18
	3.3.1.1 Broader Landscape Assessment	19
	3.3.1.2 Bushfire Hazard Level	19
3.3.2	Bushfire protection criteria	23
3.4	Water management	24
3.5	Infrastructure coordination	24
3.5.1	Water	24
3.5.2	Wastewater	25
3.5.3	Power	25
3.5.4	Telecommunications	25
3.6	Development contribution arrangements	25
3.7	Implementation	25

Table index

Table 1	Structure Plan summary	iv
Table 2	Information to be submitted with an application	6
Table 3	Studies to be required under condition of subdivision approval	6
Table 4	Local street function and characteristics (Source: Draft Liveable Neighbourhoods, WAPC 2015)	13
Table 5	Summary of key bushfire protection criteria and development response	23

Figure index

Figure 1	Structure Plan Map	2
Figure 2	Post-development flood extent	7
Figure 3	Location	3
Figure 4	Local Planning Scheme No. 3	4
Figure 5	Greater Geraldton Structure Plan	5
Figure 6	Recreation improvements. In addition to providing a buffer for Dolby Creek, the foreshore reserve can be activated for community experience with a walking trail and facilities. (Picture courtesy of the Shire of Chapman Valley)	9
Figure 7	Indicative lot layout	12
Figure 8	Road Hierarchy (Main Roads WA)	14
Figure 9	Movement Network	15
Figure 10	Indicative road alignments – access scenario one	17
Figure 11	Walking trails within the foreshore reserve will provide an important link from the coast to the Moresby Range (Picture courtesy of the Shire of Chapman Valley)	18
Figure 12	Designated Bushfire Prone Areas	20
Figure 13	Pockets of scrub within Dolby Creek reflect an extreme bushfire hazard, to be retained in a future foreshore reserve.	21
Figure 14	Pockets of open woodland through Dolby Creek will increase in hazard level as restoration is undertaken.	21
Figure 15	Vegetation within the Primary Regional Road Corridor currently reflects a scrub vegetation class, and an extreme bushfire hazard. Vegetation would be reduced in the event the road alignment is constructed.	22
Figure 16	Outside of the immediate creek line, land within the Dolbys Drive Structure Plan reflects pasture. Being within 100 metres of other vegetation, it has a moderate bushfire hazard.	22

Appendices

Appendix A	Local Water Management Strategy
Appendix B	Bushfire Management Plan



Part 1 | Implementation

1. Implementation of Structure Plan

1.1 Structure Plan area and operation

The Dolbys Drive Structure Plan (Structure Plan) applies to the land contained within the 'Structure Plan Area' as depicted on Figure 1 – Structure Plan Map.

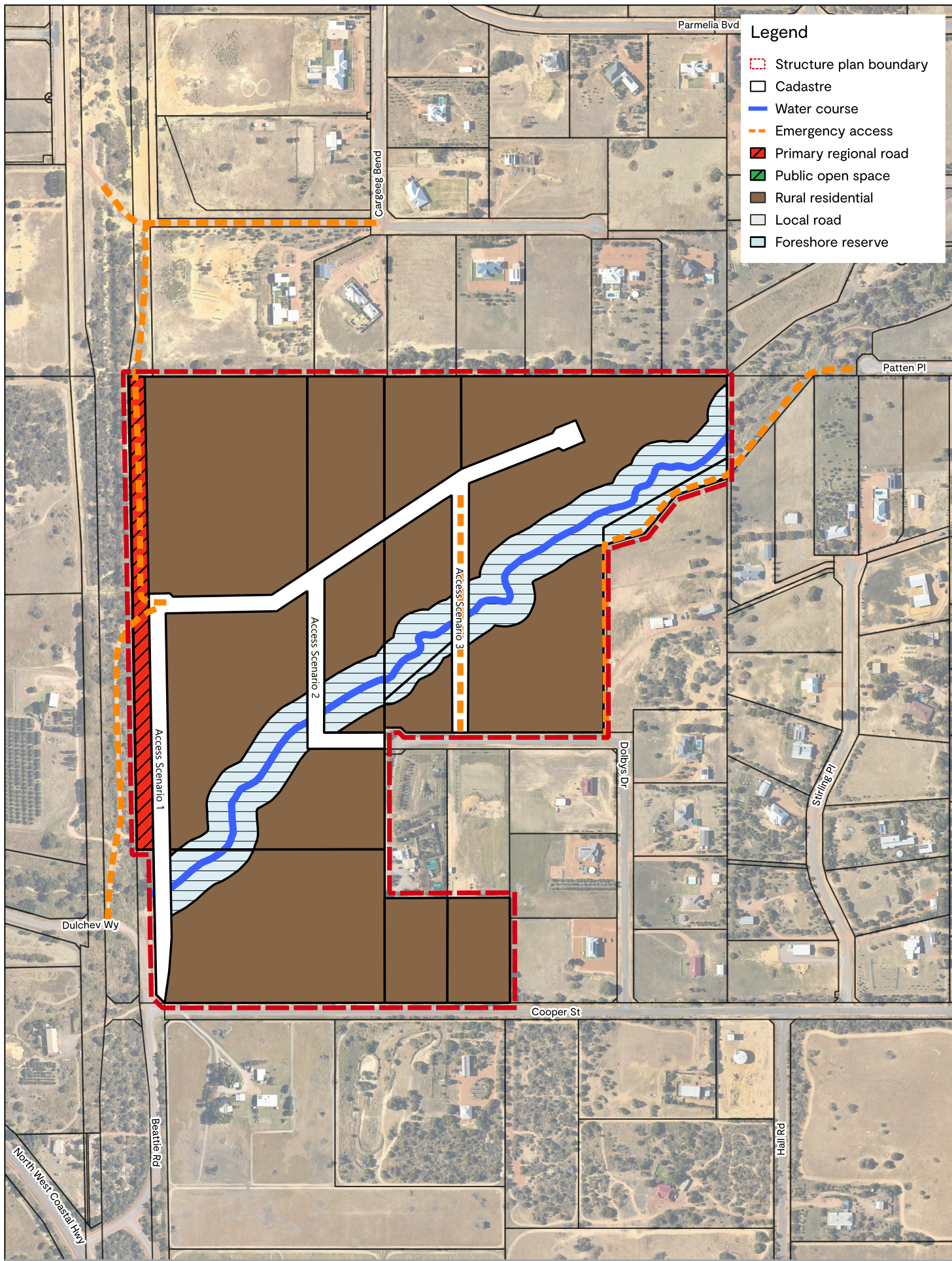
The Structure Plan, as amended, comes into effect from the date it is approved by the Western Australian Planning Commission (WAPC), as stated on the cover, and for a period of 10 years.

This Structure Plan is made pursuant to Part 4, Schedule 2 – Deemed Provisions for local planning schemes of the *Planning and Development (Local Planning Schemes) Regulations 2015* and is to be read in conjunction with the Scheme or any subsequent Scheme. In the event of any inconsistency between the Structure Plan and the Scheme, the Scheme shall prevail to the extent of the inconsistency. Pursuant to the Deemed Provisions, a decision maker of an application for development approval is to have due regard to the provisions of this Structure Plan, including the Structure Plan Map, Implementation Report, Explanatory Report and Technical Reports.

1.2 Structure Plan purpose

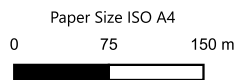
The objective of the Structure Plan is to provide a statutory planning framework that is responsive to the Structure Plan Area's location and environmental characteristics, facilitating coordinated subdivision and development for rural residential dwellings. The Structure Plan has been prepared with reference to:

- The Shire of Chapman Valley (the Shire) Local Planning Scheme No.3 (the Scheme), and the wider local planning framework, as well as Council policies.
- State Planning Policies, Position Statements and guidelines of the WAPC.



Legend

- Structure plan boundary
- Cadastre
- Water course
- Emergency access
- Primary regional road
- Public open space
- Rural residential
- Local road
- Foreshore reserve



Shire of Chapman Valley
Dolbys Drive Structure Plan Map

Project No. 12655719
Revision No. 0
Print Date. 20/4/2026

FIGURE 1

Data Sources: Local Planning Scheme – Zones and Reserves (DPLH-071),
Cadastre Address (LGATE-002), Road Network (MRWA), Locate Mosaic
(LGATE-322), OpenStreetMap, GHD

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxillary Sphere

2. Staging

The Structure Plan proposes three access scenarios to ensure flexibility in the plan and will allow development to occur independent of other landowners' development intentions.

Staging of the Structure Plan will be influenced by access and will radiate from access points according to market forces and aspirations of individual owners.

Each parent lot will represent a stage of subdivision; however, it is not expected in the outset that each lot will subdivide to the ultimate development layout through a single subdivision stage. Staged subdivision may retain large lots around existing houses and improvements, whilst providing for part development as an interim measure.

Areas with access from Cooper Street or Dolbys Drive will subdivide independently. Others will subdivide based on whichever access scenario can be achieved first. Then, lot by lot from the scenario achieved.

All access scenarios are able to be achieved subject to detailed design. Each scenario may require different construction specifications, particularly where the roads cross over Dolby Creek. Additional measures, such as demonstration of adequate sight lines and potential flood mitigation measures may also be required, depending on which scenario is progressed.

The Structure Plan and Local Water Management Strategy (LWMS) provide for coordinated stormwater management, with basins for the 100 year flood located within the Dolby Creek foreshore reserve. Subdivision stages occurring ahead of the development of the Dolby Creek foreshore reserve on other lots will need to incorporate temporary measures and areas for flood mitigation. The sizing, location, and decommissioning of temporary drainage infrastructure should be incorporated within Urban Water Management Plans prepared as a condition of subdivision.

The provision of infrastructure and roads will be determined at the time of subdivision.

There are no requirements for schools or additional social infrastructure within the Structure Plan Area.

3. Subdivision and development requirements

3.1 Land use zones and reserves

3.1.1 Zones

Figure 1 – Structure Plan Map designates the proposed zones and reserves applicable to land within the Structure Plan Area. Land use permissibility within the Structure Plan Area shall be in accordance with the corresponding zone or reserve under the Scheme.

Specific reference should be made to the additional site and development requirements relating to Rural Residential Zone RR1 prescribed under Schedule 6 of the Scheme.

3.1.2 Road reserves

The street network will be developed generally in accordance with Figure 1 – Structure Plan Map, noting that not all access scenarios will be required to facilitate access to the ultimate development layout.

Road reserves will be developed generally in accordance with the design provisions set out under Liveable Neighbourhoods.

3.1.3 Foreshore reserve

The Structure Plan Map (Figure 1) shows the extent of an indicative foreshore reserve for Dolby Creek.

For lots abutting Dolby Creek, the lot layout and extent of the reserve is to be confirmed at subdivision, with regard to existing remnant vegetation, opportunities for revegetation and the nature of the creekline. Reserves are to be ceded at subdivision with Management Orders issued to the Shire of Chapman Valley.

3.2 Density and development

3.2.1 Density and residential development

Lots are to generally be a minimum of 1.0 hectare in area. Variations may be considered where it can be satisfactorily demonstrated that the subdivision is in accordance with the general intent of the Structure Plan, the objectives of the Rural Residential zone and is consistent with orderly and proper planning.

All provisions, standards and requirements of the Rural Residential zone as set out in the Scheme shall apply.

Reticulated sewerage is not available within the Structure Plan Area. On-site effluent disposal will be required.

3.2.2 Local Development Plans

The Structure Plan does not require the preparation of local development plans.

4. Other requirements

4.1 Bushfire protection

This Structure Plan is supported by a Bushfire Management Plan (BMP), refer to Appendix B. Any development on land within the Structure Plan Area shall be constructed in accordance with the recommendations outlined in the BMP and shall comply with the requirements of Australian Standard 3959 – Construction of Buildings in Bushfire Prone Areas.

In accordance with State Planning Policy 3.7: Bushfire (SPP3.7) and the Planning for Bushfire Guidelines November 2024, development applications within areas designated as bushfire prone on the Department of Fire and Emergency Services (DFES) Map of Bushfire Prone Areas, are to be accompanied by a compliance certificate to confirm that the indicative Bushfire Attack Levels (BALs) identified in the BMP remain accurate. If the pre-development BAL assessment indicates that the proposed habitable building(s) will have a potential radiant heat impact exceeding 29kW/m² then a bushfire management plan should accompany the development application.

4.2 Flood risk

Sites that are likely to experience inundation during the 100 year ARI event will be required to be raised a minimum 300 mm above the maximum inundation level. Sites which are not likely to be inundated will be required to be raised 150 mm above the lowest point. The required finished floor levels are depicted on Figure 2.

4.3 Road and rail noise

Subdivision within the 'Trigger Distance' specified under SPP5.4 shall be accompanied by a noise level contour map prepared in accordance with the road and rail noise implementation guidelines.

5. Additional details

5.1 Information to be submitted with an application

The following technical reports are to be prepared in support of applications for subdivision or development.

Table 2 Information to be submitted with an application

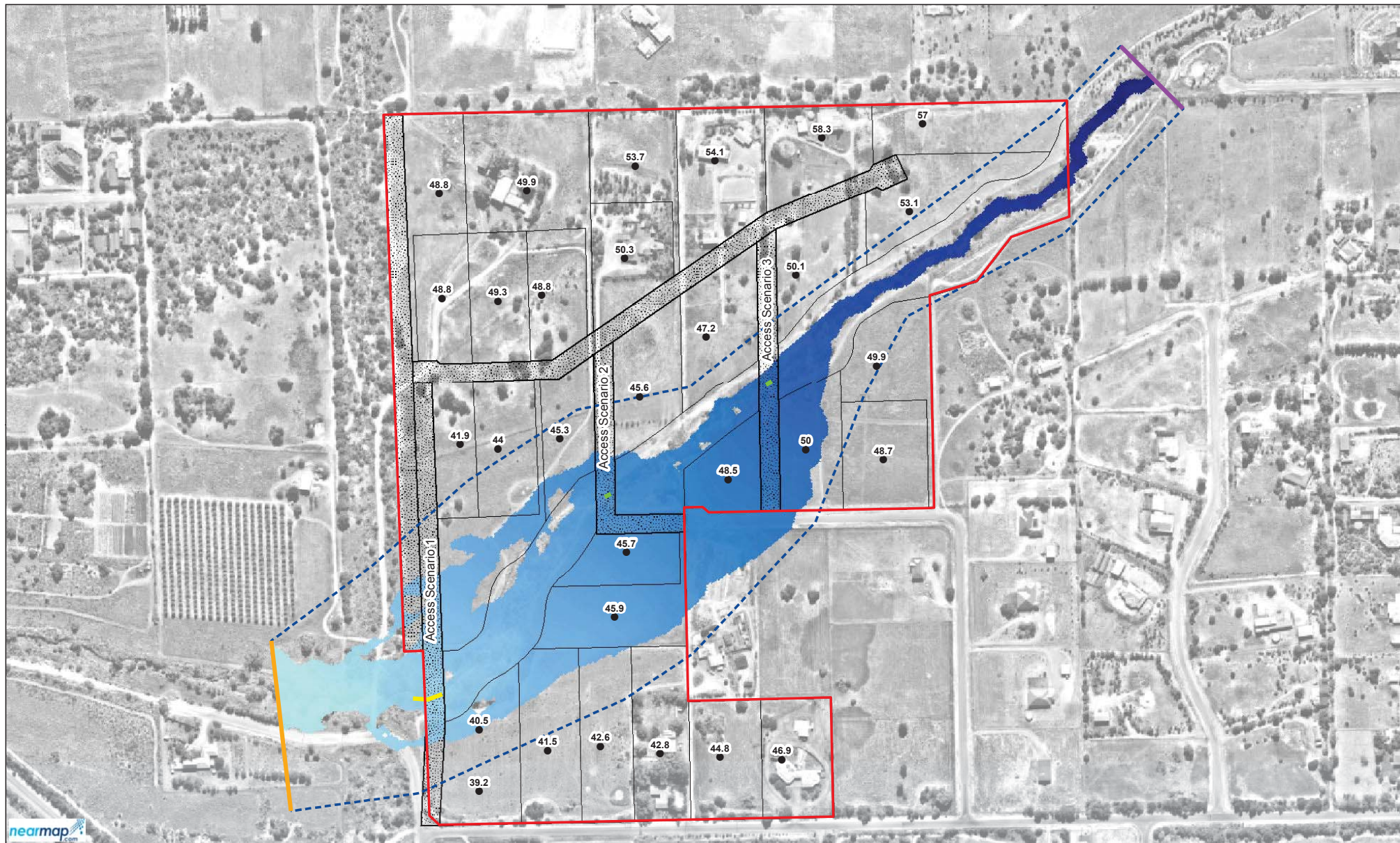
Additional information / purpose	Approval stage	Responsible agency
BAL Compliance Certificate Where a habitable building is proposed within an area identified as bushfire prone, a compliance certificate shall be prepared to confirm that the indicative BAL presented in the BMP (Appendix B) remains accurate.	Development	Shire DFES
Bushfire Management Plan Where a habitable building is proposed within an area identified as bushfire prone and a pre-development BAL assessment indicates that the proposed habitable building(s) will have a potential radiant heat impact exceeding 29kW/m ² then a bushfire management plan shall accompany the development application.	Development	Shire DFES
Water Management Report Where development is proposed that will alter the hydrology or drainage of the site.	Subdivision	Shire DWER
Foreshore Management Plan Where vegetation protection areas are required	Subdivision	Shire DWER
Noise Level Contour Map Where subdivision is proposed within the SPP5.4 Trigger Distance.	Subdivision	WAPC

5.2 Studies to be required under condition of subdivision approval

The following technical reports are to be required under condition of subdivision approval.

Table 3 Studies to be required under condition of subdivision approval

Conditions of approval	Approval stage	Responsible agency
Noise Management Plan or Quiet House Package (where subject to trigger distance under SPP5.4)	Subdivision	WAPC
Notification on Title: lots within the SPP 5.4 Trigger Distance	Subdivision	WAPC
Notification on Title: lots abutting Primary Distributor Road Reserve	Subdivision	WAPC



Paper Size A3
0 15 30 60 90 120
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- Proposed development
- Proposed culvert
- Modelling extent
- Lots
- Outflow boundary
- Existing culvert
- Inflow boundary
- Finished floor level (m)
- Road

Water level (m)
High : 57.794m
Low : 35.7m



Shire of Chapman Valley
Dolby's Drive Structure Plan LWMS
1 in 100 AEP
Post-Development Flood
Extent

Job Number 61-3302800
Revision 0
Date 31 Jul 2017

Figure 10

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Data source: Nearmap; Imagery, Extracted 31/07/2017 Captured 16/06/2017, Cadastre - 20160217; Roads - 20160217; GHD: Study Area - 20160217; Food Model; GHD, 2017. Created by: rskostab

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Part 2 | Explanatory

1. Introduction

The Dolbys Drive Structure Plan was prepared to coordinate land use, subdivision, and rural residential development in a manner responsive to the Structure Plan Area's location and environmental characteristics. The Structure Plan applies to an area of land zoned Rural Residential within the suburb of Waggrakine, defined by the 'Structure Plan Boundary' as depicted on Figure 1– Structure Plan.

The Structure Plan was originally endorsed by the WAPC on 15 August 2017, providing for the creation of 30 Rural Residential lots. As of January 2026, two subdivisions have occurred. As development and subdivision is not yet complete, the Structure Plan plays an ongoing and important role in guiding development of the Structure Plan Area.

The original content of Part 2 – Explanatory has largely been retained from the version endorsed in 2017, as it provides context and remains generally relevant in the context of the Structure Plan – noting that some sections contain dated terminology and references of the time of drafting. Adjustments to content of some sections within Part 2 – Explanatory have been made to provide an overview of development that has occurred to date, outline new supporting information, and discuss land use changes in the broader region, specifically the Oakajee Strategic Industrial Area (SIA).

It is noted that the Structure Plan was originally prepared under the Shire's Town Planning Scheme No. 2 (TPS2). The Shire has since adopted Local Planning Scheme Local Planning Scheme No. 3 (LPS3), gazetted on 23 July 2019, which is in effect at the time of writing. The Shire is currently preparing Local Planning Scheme No. 4 (LPS4).

1.1 Purpose

The purpose of the Structure Plan is:

- To coordinate access that aligns with future subdivision.
- To support conservation of environmental character and allow for low-key recreation opportunities through creation of a foreshore reserve along Dolby Creek.
- To facilitate proper and orderly planning that accommodates fragmented land ownership within the Structure Plan Area.

This Structure Plan report includes 3 main components: Part 1 - Statutory Section, Part 2 - Explanatory Section, and appendices.

Part 1 sets out statutory provisions that apply to all subdivision and development within the Structure Plan Area and includes the Structure Plan map. Part 2 is non-statutory. This section elaborates on the intent of Part 1 and provides additional guidance and examples for the future development of Dolbys Drive

Appendix A includes a Local Water Management Strategy, which explains how water and stormwater is to be managed in a coordinated way. The Local Water Management Strategy provides a basis for the development of more detailed Urban Water Management Plans to be prepared by developers at the time of subdivision.

Appendix B is a Bushfire Management Plan, prepared to demonstrate compliance under SPP3.7 and the accompanying Guidelines. Any development on land within the Structure Plan Area shall be constructed in accordance with the recommendations outlined in the BMP and shall comply with the requirements of Australian Standard 3959 – Construction of Buildings in Bushfire Prone Areas.

2. Site and context analysis

2.1 Land description

2.1.1 Location

The Structure Plan Area is located approximately 11 kilometres north of Geraldton's city centre, within the Shire of Chapman Valley. The Structure Plan Area abuts the City of Greater Geraldton local government area to the south and west. The Structure Plan Area is bounded by existing rural residential development to the north and east, Cooper Street, a local distributor road, and beyond that, existing rural residential development, to the south and future road reserve to the west. Dolby Creek cuts through the Structure Plan Area, from southwest to northeast. The location is shown in Figure 3.

Since the Structure Plan's original adoption in 2017, the Greater Geraldton area has experienced significant population growth, with accompanying urban development. Planning for the Oakajee Strategic Industrial Area (SIA), approximately 3 kilometres north of the Structure Plan at its closest point, has progressed – with land allocations to several proponents and early-phase construction commencing on some supporting infrastructure. The Oakajee SIA aims to attract industries such as renewable hydrogen production, advanced manufacturing, and downstream processing, likely leading to future employees and their families seeking housing and amenities within the Structure Plan Area.

2.1.2 Area and land use

The Structure Plan Area consists of primarily rural lifestyle land uses, including cleared areas, existing dwellings and remnant vegetation along Dolby Creek. The total area of the site is 38 hectares. The Structure Plan proposes lot sizes generally of 1 hectare. In some situations the lots are smaller where part of the lot has been ceded for foreshore reserve or for access.

The Structure Plan has been developed in line with the local planning scheme and maintains the land use in the area as rural residential. The provisions of the scheme and this Structure Plan only permit one dwelling per lot. In accordance with the proposed lot layout, the Structure Plan potentially yields 30 dwellings.

2.1.3 Legal description and ownership

The Structure Plan Area consists of eight freehold lots, all in separate private ownership.



Paper Size ISO A4
0 0.75 1.5 km

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere



Shire of Chapman Valley

Dolbys Drive Structure Plan Location Map

Project No. 12655719
Revision No. 0
Print Date. 20/4/2026

FIGURE 3

Data Sources: Local Planning Scheme - Zones and Reserves (DPLH-071),
Cadastre Address (LGATE-002), Road Network (MRWA), Locate Mosaic
(LGATE-322), OpenStreetMap, GHD

2.2 Planning framework

2.2.1 Zoning and reservations

The Shire of Chapman Valley Local Planning Scheme No.3 (LPS3) was gazetted on 23 July 2019. The subject land is zoned Rural Residential (with an additional designation of Rural Residential Area 1) as shown in Figure 4. According to the LPS3, the objectives of the Rural Residential Zone are to:

- To provide for lot sizes in the range of 1 ha to 4 ha.
- To provide opportunities for a range of limited rural and related ancillary pursuits on rural-residential lots where those activities will be consistent with the amenity of the locality and the conservation and landscape attributes of the land.
- To set aside areas for the retention of vegetation and landform or other features which distinguish the land.

LPS3 denotes a major road reserve to the western boundary of the Structure Plan Area as well as parks and recreation reserve to the north east of the Structure Plan Area along the existing Dolby Creek reserve, as shown in Figure 4.

Development within the Rural Residential Area 1 is to be in accordance with schedule 6 of the scheme text. Subdivision, development and land use is to generally be in accordance with a Structure Plan adopted by the local government and endorsed by the WAPC.

At the time of writing, the Shire is in the final stages of preparing Local Planning Scheme No. 4 (LPS). Under LPS4 the Structure Plan Area remains zoned predominantly Rural Residential. The area of land reserved for Public Open Space increases in LPS4, reflecting development progression in the area.

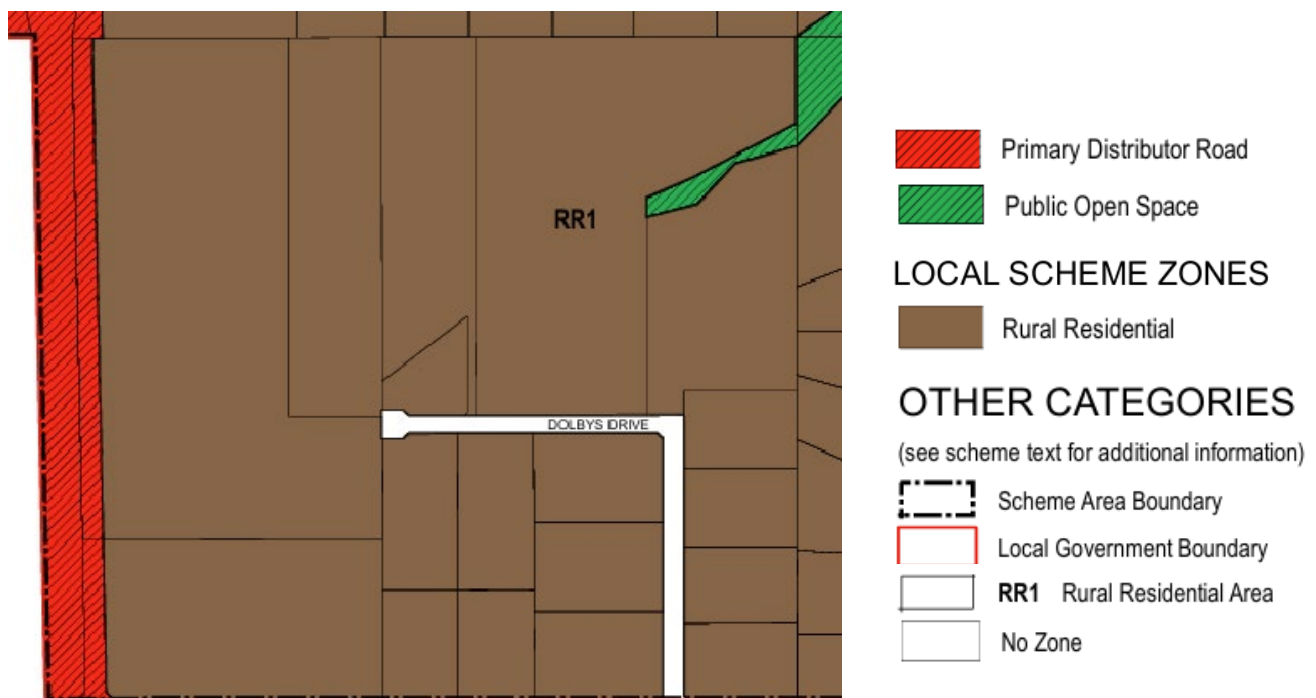


Figure 4 Local Planning Scheme No. 3

2.2.2 Strategic planning

Strategic planning for this area has identified the potential for rural residential development due to the proximity to Geraldton and the existing access to infrastructure.

The Shire of Chapman Valley Local Planning Strategy was endorsed by the Western Australian Planning Commission in 2007. The Strategy is primarily based around the precincts previously identified in the Shire's Local Rural Strategy, with a vision, overview, objectives and strategies outlined for each precinct. The Structure Plan Area

2.2.3.2 State Planning Policy No. 2.9 – Water (SPP2.9)

SPP2.9 provides a policy basis for planning proposals and decisions to respond to integrated water cycle management. The policy is supported by Planning for Water Guidelines. Together, SPP2.9 and the guidelines provide a framework to address water related management issues at various stages of planning and presents design objectives for water conservation, stormwater and groundwater management. A LWMS has been prepared (in accordance with the policy suite applicable at the time the Structure Plan was originally endorsed) to support the Dolbys Drive Structure Plan and can be viewed in Appendix A.

2.2.3.3 State Planning Policy No. 3 – Urban Growth and Settlement (SPP3)

SPP3 sets out principles and considerations when planning for urban growth and settlement in Western Australia. Section 3.1 refers to the management of rural residential growth through the application of SPP2.5. The application of SPP2.5 to the Dolbys Drive Structure Plan is discussed previously.

2.2.3.4 State Planning Policy No. 3.4 – Natural Hazards and Disasters (SPP3.4)

SPP 3.4 ensures planning for natural disasters as a fundamental element of the preparation of the Structure Plan to minimise adverse impacts of such an event. The Structure Plan responds to the policy, and provides a spatial and planning framework to address issues associated with bushfire risk as required by SPP 3.7. A reserve has been proposed for the Dolby Creek to manage drainage and potential flood risks.

2.2.3.5 State Planning Policy No. 3.7 – Bushfire (SPP3.7)

SPP 3.7 provides a policy framework to manage development within mapped bushfire prone areas within Western Australia. Policy provisions limit intensification of vulnerable land uses and development in areas of unacceptable bushfire risk. SPP 3.7 is supported by the Planning for Bushfire Guidelines. The guidelines provide the methodology to assess bushfire risk and sets out bushfire protection criteria for development in bushfire prone areas. Part of the Structure Plan Area is located within a mapped bushfire prone area, therefore bushfire hazards and compliance with bushfire protection criteria are outlined in section 3.3.

2.2.3.6 State Planning Policy No. 5.4 – Road and Rail Noise (SPP5.4)

SPP 5.4 provides a policy framework to manage conflicts that arise between sensitive land uses and road and rail transport noise. The North West Coastal Highway, which carries some freight vehicles, is a primary road distributor and state freight road. SPP5.4 requires consideration of planning related issues across a 15-20 year horizon. The realignment of the primary road distributor to the western boundary of the Structure Plan Area may present noise impacts to residential lots in the future. The proposed Primary Distributor Road alignment along the western boundary of the Structure Plan Area is contained within the former Geraldton to Northampton rail alignment which is now a reserve under the management of Main Roads WA. It should be noted that there is uncertainty over a timeframe for this alignment being constructed with it being a long term scenario. The timeframe for this alignment is likely to be further increased in the event that the Geraldton Outer Bypass/Oakajee Narngulu Infrastructure Corridor is constructed, in which case the alignment to the west of the Structure Plan would not be a significant heavy haulage route and would instead serve a more intra-Geraldton function for domestic vehicle trips and may even become a local government alignment rather than a Main Roads WA alignment. The lots proposed in the Structure Plan are considered to be of a large enough area to facilitate sufficient setbacks from this alignment.

2.2.4 Other relevant State planning documents

Operational Policy No. 1.1 - Subdivision of Land

DCP 1.1 sets out the general principles that are used by WAPC in determining applications for the subdivision of land. This will be applicable when future subdivision is undertaken.

Operational Policy 2.2 - Residential Subdivision

DCP 2.2 sets out the general principles that are used by WAPC in determining applications for the subdivision of residential land.

2.3 Environmental assets and constraints

2.3.1 Vegetation

Vegetation within the Structure Plan Area has for the most part been cleared, outside of the remnant vegetation existing along Dolby Creek. Remaining shrubland is located within the foreshore reserve and will not be affected by the Structure Plan.

2.3.2 Fauna

It is unlikely that the Structure Plan Area provides habitat for any fauna due to the lack and degraded nature of existing vegetation. The Structure Plan's proposed retention of remnant vegetation along Dolby Creek and the creation of a foreshore reserve will retain and potentially enhance its role as a wildlife corridor.

2.3.3 Landform and soils

The Structure Plan Area is located on a natural depression in the Spearwood Dune System, with the Dolby Creek running through the site from north east to south west (Land Insights 2016).

The Structure Plan Area reaches a maximum elevation of 65 metres AHD at the northern boundary, and falls south towards the Dolby Creek. The creek runs from the north east of the site at around 54 metres AHD to the south west of the site at around 37 metres AHD. In the most southern part of the site, the relief rises to 47 metres AHD.

The Structure Plan Area is located within the Central Coast region, which is comprised primarily of Tamala limestone and its products. The Tamala dune system comprises of lithified limestone overlain by deep yellow sands and red loams.

The Geological Survey of Western Australia (1971) mapping of surface geology identifies that the Structure Plan Area progresses from red and yellow sands to limestone from south to north. The dunal depression is dominated by alluvium, colluvium and miscellaneous soils.

The freely draining yellow sandplain overlying limestone makes up the bulk of the soils within the Structure Plan Area. Red Spearwood sands also occur over limestone, which are freely draining and more fertile than the yellow sandplain soils.

The soil characteristics at the Structure Plan Area should be confirmed prior to the preparation of Urban Water Management Plans to confirm the infiltration rate of soils within the Structure Plan Area.

Mapping by Landgate indicates there is a moderate to low risk of acid sulfate soils occurring within 3 metres of the surface in the Dolby Creek bed. This area will be protected with the establishment of a foreshore reserve.

2.3.4 Surface water and groundwater

A LWMS has been prepared to support the Structure Plan. The LWMS provides an overview of the surface and groundwater characteristics. These are summarised below and described further in the LWMS.

A creek runs through the centre of the Structure Plan Area from east to west. There are no permanent surface water features on the site. Surface water on the Structure Plan Area drains to Dolby Creek in the centre.

There is no groundwater quality data available for bores within the Structure Plan Area. A single bore, WIN Site ID 20002914, has a recorded Total Dissolved Solids (TDS) result of 1519 mg/L, however it is unknown when this sample was taken.

2.3.5 Heritage

A desktop analysis was undertaken to understand the heritage details for the Structure Plan Area. The desktop analysis revealed that the Structure Plan Area does not contain any Registered Aboriginal Sites. The Structure Plan Area does not contain any state or locally listed heritage properties. The western boundary of the Structure Plan

abuts the Geraldton-Northampton Railway Precinct which was identified by the Heritage Council WA staff for consideration for the State Register of Heritage Places in 2021. This proposal was objected to by all three local governments along the alignment (the Shire of Chapman Valley, Shire of Northampton and City of Greater Geraldton). The Structure Plan does not propose any development within this former rail alignment.

2.3.6 Foreshores

Dolby Creek flows through the Structure Plan Area. The Structure Plan identifies an indicative foreshore reserve for Dolby Creek. The extent of the indicative reserve was determined onsite with the (previously named) Department of Water as a nominal 30 metre reserve based on the current quality and extent of vegetation in the riparian zone, and reasonable opportunities for revegetation. This should be further refined and confirmed at subdivision, taking into account existing remnant vegetation, existing fence lines, and the nature of the creekline in certain locations. The foreshore reserve is to be ceded at the subdivision stage and vested with the Shire of Chapman Valley.

The foreshore reserve within the Structure Plan Area will link to existing foreshore reserve along Dolby Creek to the east, and further west. Development of the foreshore reserve, with a walking trail and facilities for rest and enjoyment, will provide for recreational opportunities in the area and, over time, link the coast to the Moresby Range.



Figure 6 *Recreation improvements. In addition to providing a buffer for Dolby Creek, the foreshore reserve can be activated for community experience with a walking trail and facilities. (Picture courtesy of the Shire of Chapman Valley)*

2.4 Opportunities and constraints analysis

The Structure Plan Area is located on the border of the Shire of Chapman Valley and City of Greater Geraldton local government areas.

2.4.1.1 Future primary regional road alignment

A potential primary distributor road alignment is identified by the GGSP 2011 along the western portion of the Structure Plan boundary. Main Roads WA is investigating and planning for the realignment of North West Coastal Highway further inland (east of the Moresby Range) to reduce the impact of freight movement on areas of Geraldton. The inland (Dongara – Geraldton – Northampton) route is being considered as the road component of the Oakajee-Narngulu Infrastructure Corridor.

In the event that the inland route is constructed, the alignment to the west of the Structure Plan Area would be used for domestic Geraldton vehicle movements rather than state heavy haulage and the timeframe for construction would likely be further delayed. Should the alignment along the former Geraldton – Northampton railway (immediately west of the Structure Plan Area) occur, land zoned as rural residential directly abutting the reserve may need to be acquired/ ceded. This may have implications for one of the access scenarios.

2.4.1.2 Dolby Creek

Dolby Creek runs diagonally through the Structure Plan Area. An indicative foreshore reserve has been incorporated into the Structure Plan, on advice from the Department of Water.

2.4.1.3 Surrounding development

The surrounding development is typically rural residential. The Structure Plan will facilitate subdivision in line with the existing surrounding rural residential area.

2.4.1.4 Relationship to nearby settlements

The Structure Plan Area is less than 2 kilometres east of the Drummond Cove urban area and approximately 11 kilometres north of Geraldton. The area is characterised by rural residential properties.

2.4.1.5 Key opportunities

The Structure Plan Area has a number of characteristics which positively contribute to the future development of the area. These are described below.

- Unique and extensive views to the coast, Geraldton port, and the Moresby Range
- Cooling southerlies providing natural airflow
- Access to existing walking trails along Dolby Creek
- Nearby coastline of Drummond Cove, and community and recreation facilities in Drummond Cove and White Peak
- Rural amenity and access to natural assets.

2.4.1.6 Key challenges

The development of the Structure Plan Area also has limitations and challenges which will influence the way in which it develops. These are described below.

- High level of fragmentation in land ownership
- Noise impacts of North West Coastal Highway and uncertainty on timing of future realignment of the Highway further inland
- Potential ceding of land for future realignment of Highway
- Protecting natural assets in a manner that provides development equity across multiple landholdings. • Foreshore reserve along Dolby Creek
- Bushfire risk posed by vegetation areas retained through the subdivision process and requiring attention to bushfire hazard assessment, analysis, fire management plans with attention to firebreaks and emergency access.

2.4.2 Pre lodgement consultation

The Structure Plan was advertised for public and State government agency comment for an extended period between 30 November 2016 - 31 January 2017. A total of 13 submissions were received, 9 from state government agencies, 3 from landowners in the Structure Plan Area and 1 from a community member.

Of the submissions received from landowners, 3 registered an objection on the submission form, although there was no objection to the overall intent of the Structure Plan. Key comments included:

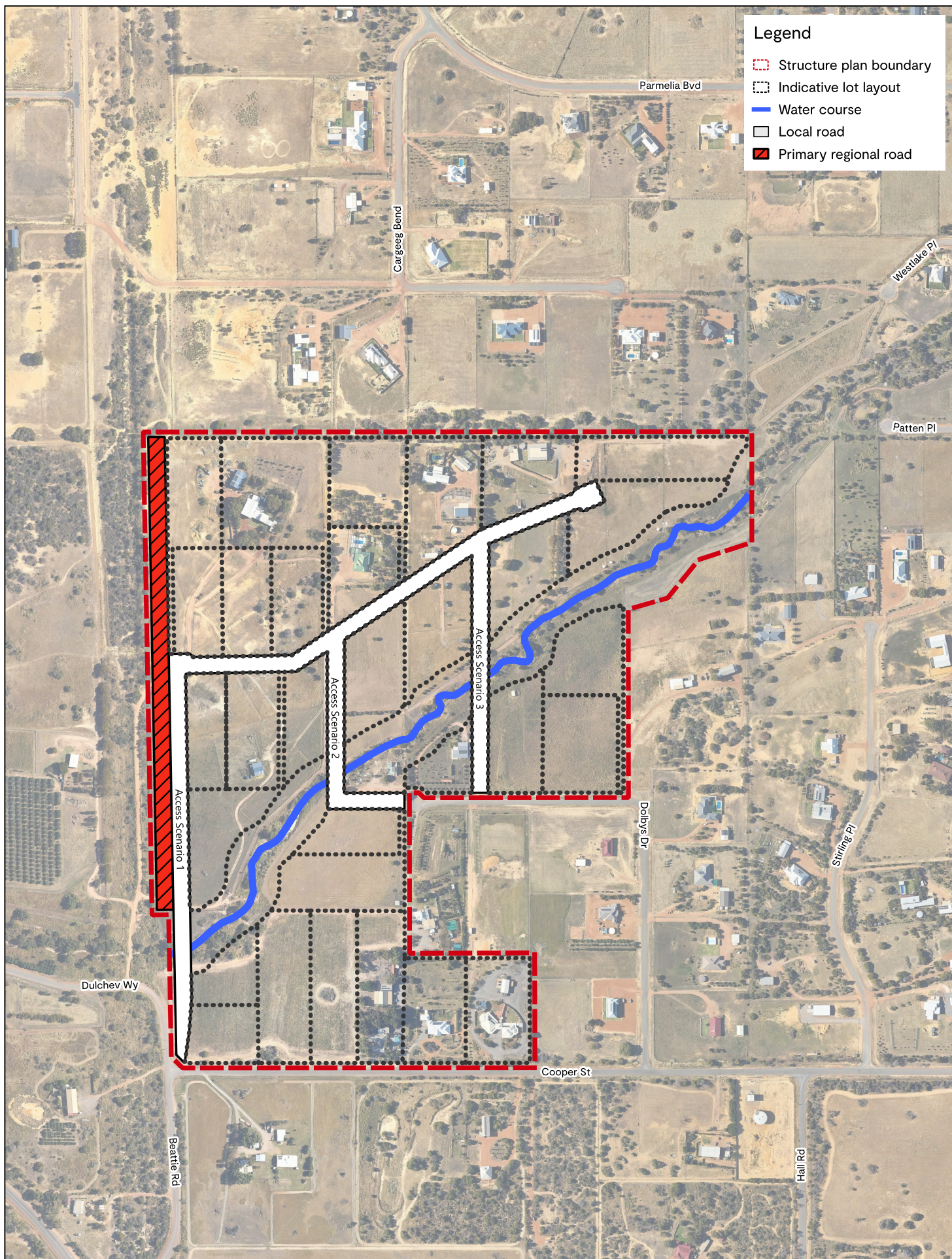
- Queries regarding potential lots sizes; and
- Comments relating to water and wastewater elements of the area.

The comments were reviewed and where appropriate, the Structure Plan was updated.

3. Design response

3.1 Residential

The Structure Plan proposes that lots are to generally be a minimum of 1.0 hectare in area (Figure 16). Variations may be considered where it can be satisfactorily demonstrated that the subdivision is in accordance with the general intent of the Structure Plan, the objectives of the Rural Residential zone and is consistent with orderly and proper planning. The lot layout provided in Figure 16 is indicative only. Access arrangements will be subject to further detailed design and the final lot layout will depend on which access scenario is developed.



Whilst every care has been taken to prepare this map, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind for any expenses, losses, damages and/or costs which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data Sources: Local Planning Scheme – Zones and Reserves (DPLH-071), Cadastre Address (LGATE-002), Road Network (MRWA), Locate Mosaic (LGATE-322), OpenStreetMap, GHD

3.2 Movement network

The Structure Plan proposes the creation of new access roads to enable the newly created lots to be accessed either from Dolbys Drive or Dulchev Way. These options are discussed in section 3.2.2 and shown on Figure 9.

All options require the creation of a new internal road which runs somewhat parallel to Dolby Creek to enable access to the newly created lots north of the creek. This road has a cul-de-sac in the north east corner of the site. The existing development and pattern of subdivision north of the Structure Plan does not provide an opportunity for road connections to the north. In addition, Dolby Creek precludes more than one north-south connection. The Structure Plan still enables emergency access points to all lots, should it be required. Therefore the presence of the cul-de-sac can be justified.

3.2.1 Road hierarchy

The current hierarchy of roads providing access to the Structure Plan Area are access roads as identified on the Main Roads WA website (Figure 7).

The existing roads are single carriageway with one lane in each direction, are unkerbed and approximately 6m wide, Cooper Street and Dolbys Drive are sealed.

The speed limit on Cooper Street east of Dolbys Drive is 80km/h and on Cooper Street west of Dolbys Drive is 50km/h. The speed limit on Dolbys Drive is 50km/h.

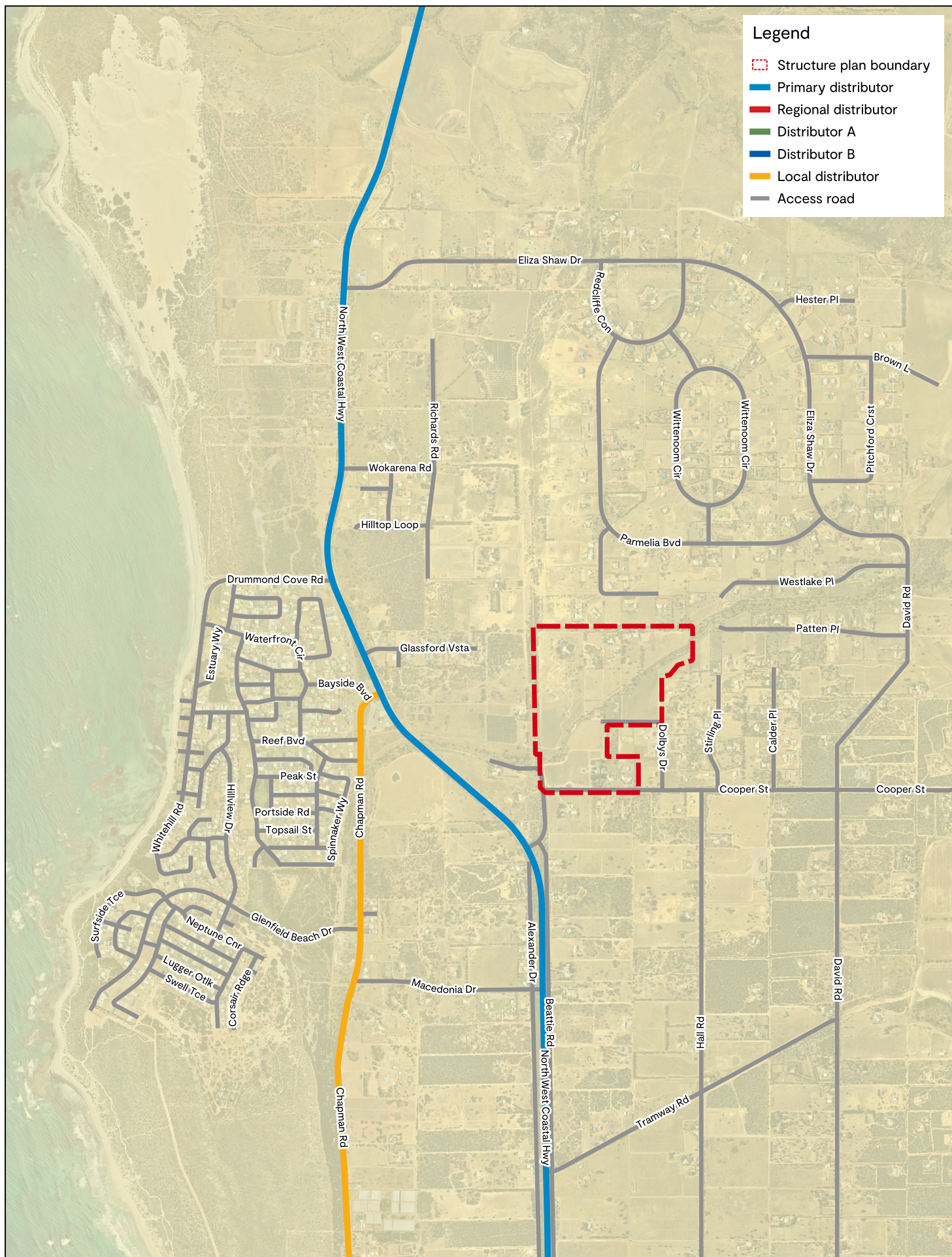
The proposed road hierarchy uses appropriate road types from Liveable Neighbourhoods (Table 1) and matches them to traffic and parking demands of the Structure Plan Area. Throughout the Structure Plan Area, vehicle movements are anticipated to be up to a total of 270 vehicles per day (30 dwellings x 9 trips per day) at the time of the completed subdivision and development.

Cooper Street and Dolbys Drive are proposed as the key access and egress connectors for the Structure Plan Area.

Access roads are designed to accommodate up to 300 vehicles per day likely to be generated by the Structure Plan Area. Cross sections for the Structure Plan access roads provide for safe road access and management of storm water. A reserve width of 16 metres will be required to achieve these functions. Should more substantial stormwater management measures be required, the reserve may need to be increased to an Access Street B with a 20 metre reserve width.

Table 4 Local street function and characteristics (Source: Draft Liveable Neighbourhoods, WAPC 2015)

Street Name	Projected maximum volume (vehicles per day)	Indicative street reserve width (m)	Maximum design/ target operating speed (km/hr)	Minimum street pavement width (m)	Typical residential density
Access street D – narrow yield or give way street	1,000	15.5	50-20	5.5 typical 5.5-6 range	Less than R30



- Legend**
- Structure plan boundary
 - Primary distributor
 - Regional distributor
 - Distributor A
 - Distributor B
 - Local distributor
 - Access road

Paper Size ISO A4
0 400 800 m



Shire of Chapman Valley

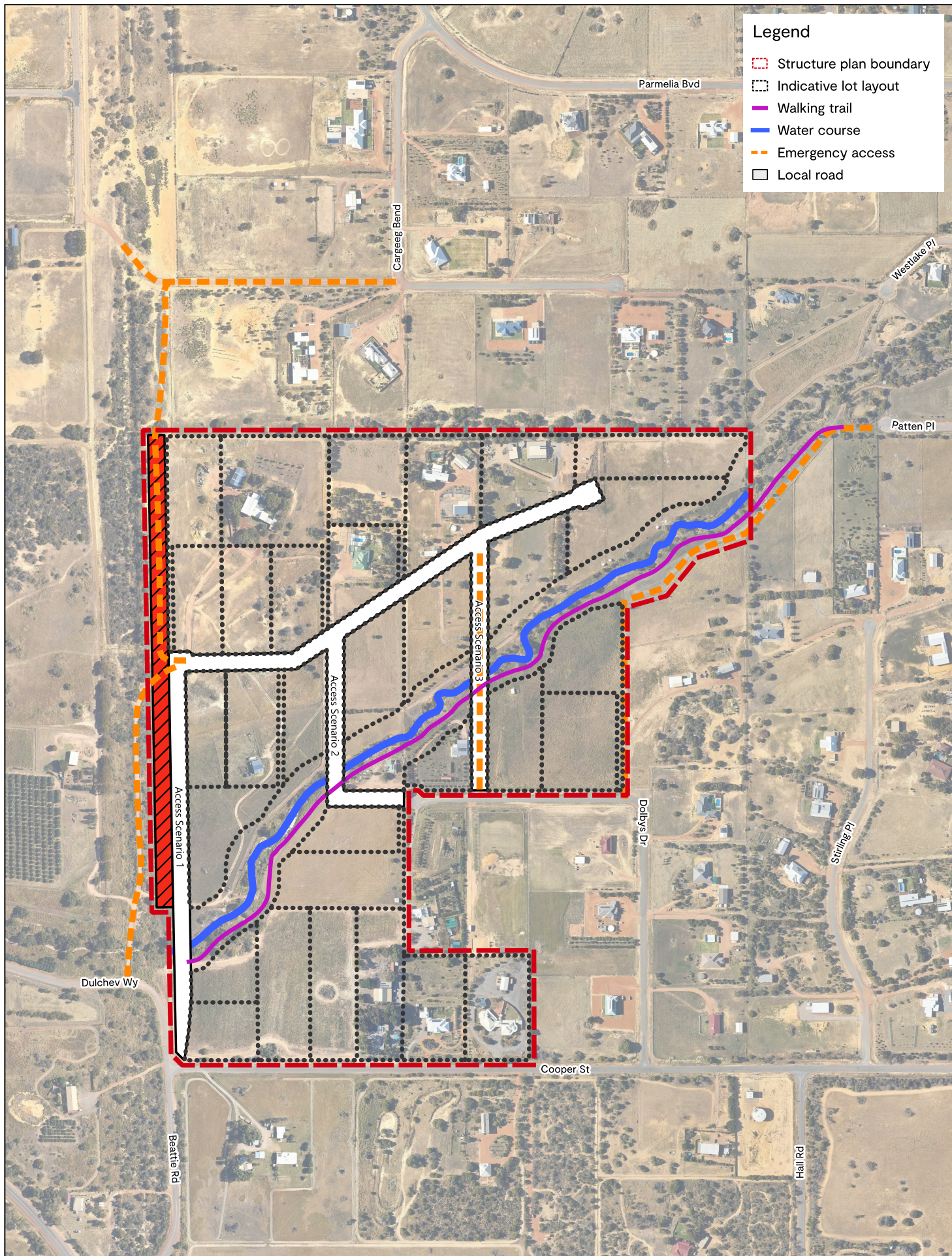
Dolbys Drive Structure Plan Road
Hierarchy (Main Roads WA)

Project No. 12655719
Revision No. 0
Print Date. 20/4/2026

FIGURE 8

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

Data Sources: Cadastre Address (LGATE-002), Road Network (MRWA), Locate Mosaic (LGATE-322)



- Legend**
- - - Structure plan boundary
 - . . . Indicative lot layout
 - Walking trail
 - Water course
 - - - Emergency access
 - Local road

Paper Size ISO A4
0 75 150 m



Shire of Chapman Valley

**Dolbys Drive Structure Plan
Movement Network**

Project No. 12655719
Revision No. 0
Print Date. 20/4/2026

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

FIGURE 9

Data Sources: Local Planning Scheme – Zones and Reserves (DPLH-071),
Cadastre Address (LGATE-002), Road Network (MRWA), Locate Mosaic
(LGATE-322), OpenStreetMap, GHD

3.2.2 Access scenarios

The Structure Plan proposes three access scenarios to provide options for access across Dolby Creek. The rationale for identifying three access options are:

- Fragmented ownership.
- Development timeframe aspirations of landowners differ, and will also change as there is likelihood that parcels may change hands (be sold) during the life of the Structure Plan.
- If only one access option is identified it may limit when other landowners can develop if they are dependent on others. The provision of access options will allow development to occur independent of other landowners' development intentions.
- A series of possible scenarios is presented as the most flexible approach.

The Structure Plan currently comprises eight lots and the Structure Plan access option will depend on which landowner chooses to subdivide first. Option one proposes an access way from Dulchev Way and options two and three propose access off Dolbys Drive. A fourth access point to the north-west of the Structure Plan Area is also shown to demonstrate potential emergency access via an easement along the western boundary.

Access scenario one

Access option runs parallel to the proposed North West Coastal Highway realignment. The proposed future highway alignment will run northwards in the old railway reserve. If the highway is constructed, it will be a dual carriageway, with one carriageway running either side of the abutments of the former railway bridge (just north of Dulchev Way). The highway reserve is approximately 40m wide (but varies), with provision for a 20m widening on the east side north of Cooper Street. Because of the need to preserve the old bridge abutments, the highway will not run directly up the centre of the reserve, but the carriageways will be deflected away from the centreline at the bridge location. This will have a greater impact on the west (northbound) carriageway as shown in Figure 9.

The indicative road layout shown in Figure 9 illustrates that access scenario one can occur even if the proposed new North West Coastal Highway alignment runs adjacent to the Structure Plan Area.

If access scenario one does not proceed, the Cooper Street/Beattie Road intersection will be a T-intersection rather than a 4-way intersection as the road running parallel to the highway north of Cooper Street will not be required

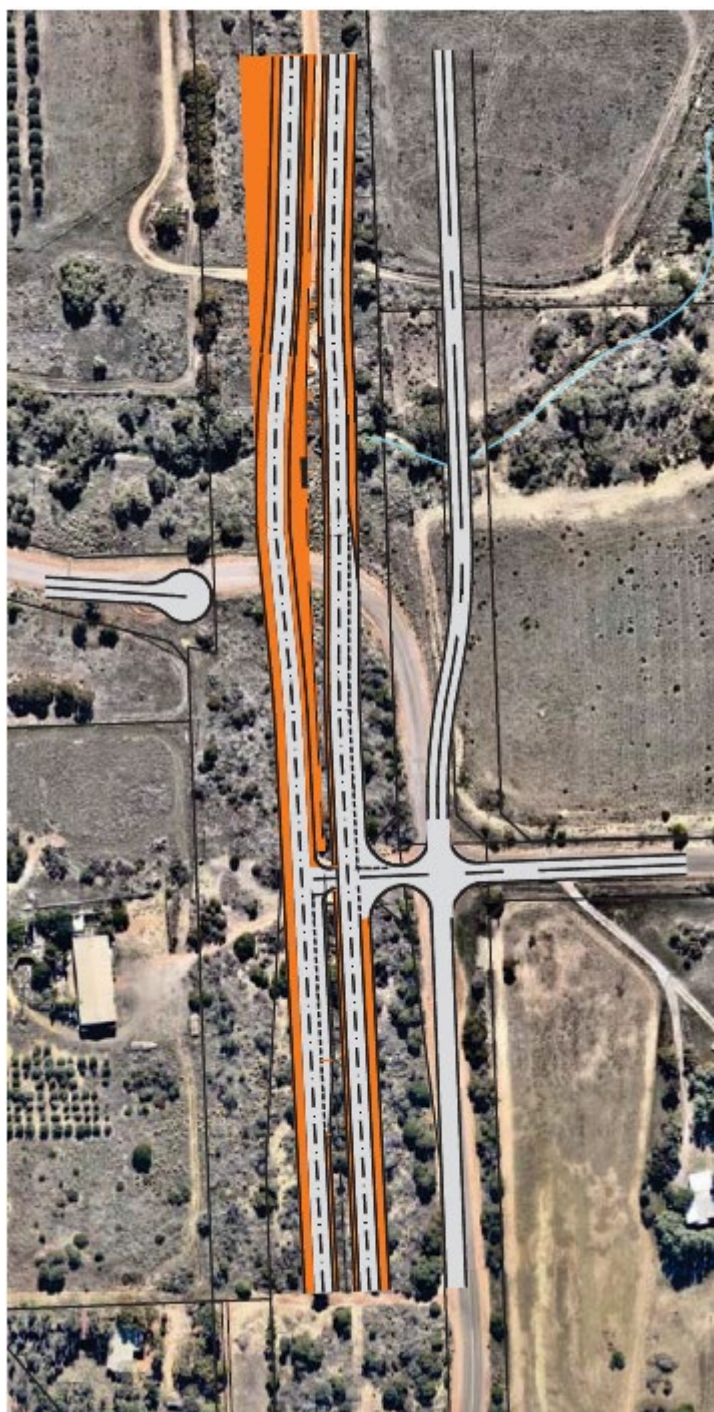


Figure 10 *Indicative road alignments – access scenario one*

Access scenario two

Access scenario two proposes an extension of Dolbys Drive to the west and perpendicular extension to the north to enable access over the foreshore. This facilitates development on the north side of Dolby Creek.

Access scenario two corresponds to an existing creek crossing. If this access scenario is not realised, the crossing will be retained with an easement to provide for emergency access.

Access scenario three

Access scenario three proposes the creation of a new road extending perpendicular from Dolbys Drive. This facilitates development on the north side of Dolby Creek by facilitating a point for crossing Dolby Creek.

Access scenario three corresponds to an existing creek crossing. If this access scenario is not realised, the crossing will be retained with an easement to provide for emergency access.

3.2.3 Pedestrian network

The nature of the development proposed by the Structure Plan will not generate pedestrian demand. Footpaths are not required for this form of development. Notwithstanding this, a regional pathway will provide linkages through the foreshore reserve, linking the coast to the Moresby Range over time.

3.2.4 Traffic generation and management

Traffic generation for 30 dwellings has been determined from the New South Wales Road and Traffic Authority's Guide to Traffic Generating Developments, Version 2.2 (October 2002). According to this guide, using the rate for dwelling houses, 30 dwellings would generate 270 vehicles per day (30 dwellings x 9 daily trips per day). The generated daily traffic volumes are considered to be very low and can be managed through the existing and proposed road network.



Figure 11 *Walking trails within the foreshore reserve will provide an important link from the coast to the Moresby Range (Picture courtesy of the Shire of Chapman Valley)*

3.3 Bushfire hazard

3.3.1 Hazard assessment

Portions of the Structure Plan Area are designated as bushfire prone, as shown in Figure 11. In order to demonstrate compliance with SPP3.7, a Bushfire Management Plan (BMP) has been prepared (Appendix B).

As the lot layout (and final access scenario) is still to be finalised, a Broader Landscape Assessment (BLA) has been undertaken, and pre-development Bushfire Hazard Level (BHL) Map has been prepared.

3.3.1.1 Broader Landscape Assessment

A simplified BLA has been undertaken, reflecting the lower risk of landscape scale bushfire in the wider context. The Broader Landscape Type (BLT) is determined to be BLT A. The BLT outcome demonstrates compliance with Element 1: Location of SPP3.7.

3.3.1.2 Bushfire Hazard Level

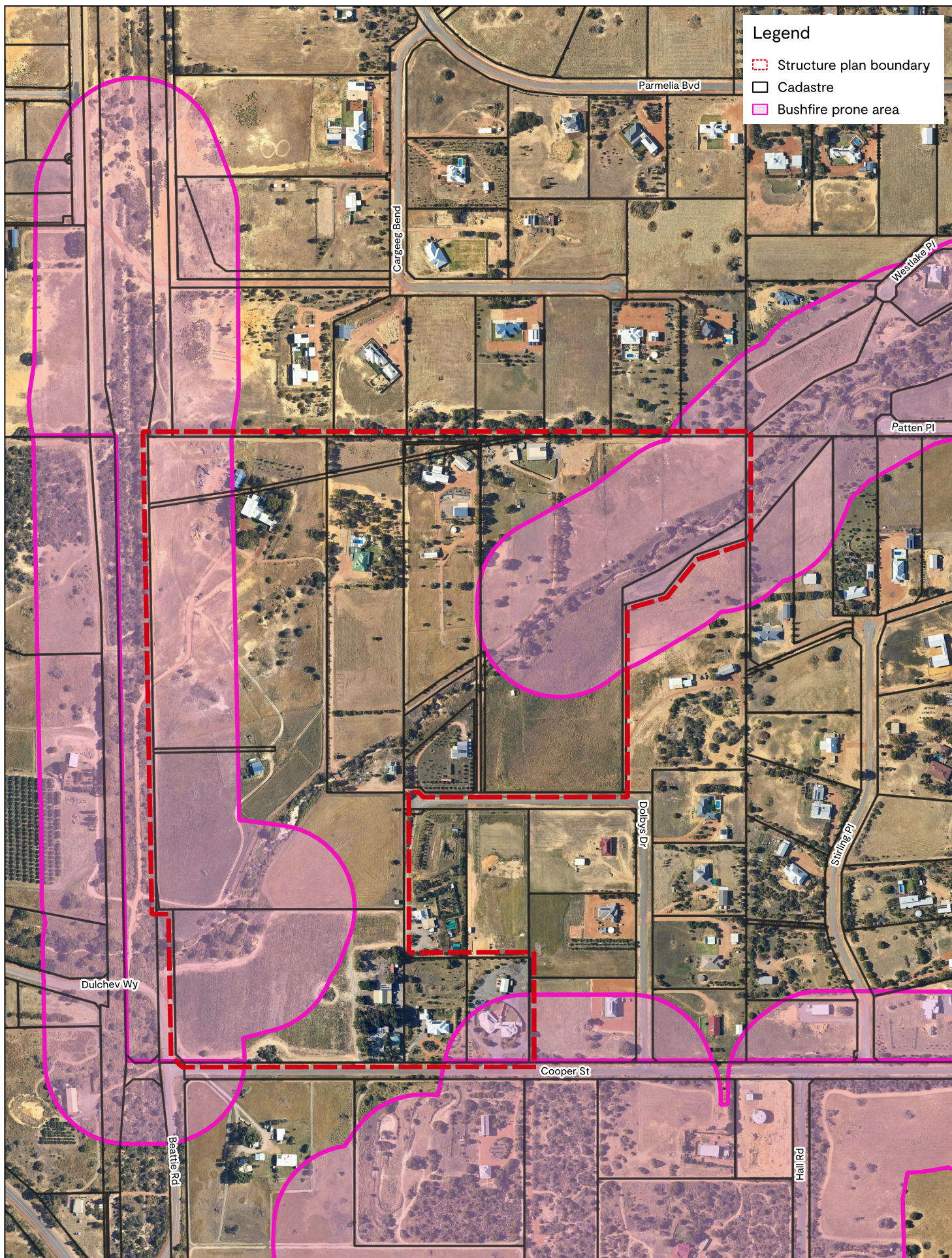
Four classified vegetation types have been identified across the Structure Plan Area; Glass G Grassland, Class C Shrubland, Class D Scrub and Class B Woodland. The extent of the vegetation types and the resultant hazard level is mapped within the BMP at Appendix B.

The Structure Plan does not propose any intensification of land use within areas of extreme bushfire hazard; stands of remnant vegetation are predominantly retained within the foreshore reserve.

It is possible that bushfire hazard level may increase with restoration of Dolby Creek. Figure 13 illustrates areas of the Structure Plan that may have an increased bushfire hazard level in future as a result of creek restoration.

Within bushfire prone areas, SPP3.7 and deemed provisions of the local planning scheme require that a bushfire attack level (BAL) assessment is undertaken. Bushfire Attack Level (BAL) is described in the Australian Standard 3959 Construction of Buildings in Bushfire-Prone Areas (AS 3959), as referenced in the Building Code of Australia (as amended). BAL provides a category of the level of exposure of a development to bushfire risk.

In line with provision 7.3 of SPP 3.7 there is a presumption against the development of habitable buildings in areas with a BAL-40 or BAL-FZ. Within the Structure Plan Area, there is sufficient land on all proposed lots where a BAL of 29 or less can be achieved. To achieve this, based on the topography of the site (downslope >0-5 degrees), a sufficient setback from areas of woodland (creek line) and scrub (western boundary) will be required, with an appropriate Asset Protection Zone maintained around each habitable building. Due to the size of the lots, these setbacks can be easily achieved by all lots.



Legend

- Structure plan boundary
- Cadastrate
- Bushfire prone area



Shire of Chapman Valley

Dolbys Drive Structure Plan
State Planning Policy 3.7 Bushfire

Project No. 12655719
Revision No. 0
Print Date. 20/4/2026

FIGURE 12

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

Data Sources: Bush Fire Prone Areas 2025 (OBRM-024)(DFES), Cadastre Address (LGATE-002), Road Network (MRWA), Locate Mosaic (LGATE-322),



Figure 13 *Pockets of scrub within Dolby Creek reflect an extreme bushfire hazard, to be retained in a future foreshore reserve.*



Figure 14 *Pockets of open woodland through Dolby Creek will increase in hazard level as restoration is undertaken.*



Figure 15 *Vegetation within the Primary Regional Road Corridor currently reflects a scrub vegetation class, and an extreme bushfire hazard. Vegetation would be reduced in the event the road alignment is constructed.*



Figure 16 *Outside of the immediate creek line, land within the Dolbys Drive Structure Plan reflects pasture. Being within 100 metres of other vegetation, it has a moderate bushfire hazard.*

3.3.2 Bushfire protection criteria

Appendices to the Planning for Bushfire Guidelines include bushfire protection criteria to assist in the assessment of planning proposals in areas of bushfire risk. The following provides a summary of the assessment against the criteria (acceptable solutions) as relevant to the Structure Plan. The full assessment is contained within the BMP at Appendix B.

Table 5 Summary of key bushfire protection criteria and development response

Bushfire protection criteria – acceptable solutions		Development response
Location		
A1.1a Broader Landscape Type A The subject site is located in an area that is a Broader Landscape Type A. This location satisfies the policy outcome for Element 1: Location and no additional consideration is required.		A Broader Landscape Assessment has been conducted. The determined Broader Landscape Type for the project area, is BLT A.
Siting and design		
A2.1 Siting and design The areas of the subject site(s) identified for intensification and/or the future development site(s) achieve a pre- or post-development bushfire hazard level of moderate or low.		Pre-development hazard levels across the project area have been identified as Low, Moderate and Extreme. Lot sizes within the Structure Plan Area are sufficient to maintain a sufficient asset protection zone of 10 to 25 metres (dependant on the location and nearest vegetation class which ranges from woodland to grassland) and achieve BAL-29 or less.
A2.3 Clearing of native vegetation The strategic planning proposal avoids, or where unavoidable, minimises the clearing of native vegetation.		The majority of the project area has been previously cleared to facilitate the existing rural land use. The limited remnant native vegetation along the creek line is unlikely to be modified.
Vehicular access		
A3.1 Public roads Public roads, including perimeter roads should meet the technical requirements in Appendix B.3, Table 10		The existing public roads outside the project area, namely Dolbys Drive, Cooper Street, Dulchev Way and Beattie Road, are sealed two-way roads that appear to be compliant and sufficient for occupant egress and emergency services access.
A3.2 Access routes Public road access should be provided in two different directions, to two different suitable destinations; and with an all-weather surface.		There are currently no existing public roads within the Structure Plan Area. The proposed internal road network can be configured to produce a compliant access network with the final network dependent upon the staging of development.

A3.3a No-through roads If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints, the public road access is to be a maximum of 200 metres from the subject site boundary to an intersection where two-way access is provided. The no-through road may exceed 200 metres if it is demonstrated that an alternative access, including an emergency access way, cannot be provided due to site constraints, and the following requirements are met: – the no-through road travels towards a suitable destination; and – the balance of the no-through road that is greater than 200 metres from the subject site, is wholly within BAL-LOW, or is within a residential built-out area, or is within Area 1 (Figure 29). A3.3b No-through road requirements A no-through road is to meet all the following requirements: – requirements of a public road (Appendix B.3, Table 10, Column 2); and – turn-around area/head (Figure 30).	Access to most of the Structure Plan Area is currently via a con-compliant no-through road. The proposed access network is capable of providing a compliant outcome.
Water	
A4.1 Reticulated areas The subdivision, development or land use is provided with a reticulated water supply in accordance with the specifications of the relevant water supply authority and Department of Fire and Emergency Services.	The existing development within the project area is connected to reticulated water supply. In line with the servicing strategy, all lots will be provided with a reticulated water supply.

3.4 Water management

A separate LWMS has been prepared for the Structure Plan and provided as Appendix A in accordance with the policy suite applicable at the time the Structure Plan was originally endorsed. This document forms part of the structure plan and should be utilised by developers and planning authorities in designing and considering applications for subdivision and the delivery of subdivisional works.

The LWMS states that the key to integrated urban water management are:

- Minimise total water use in the development area
- Protect infrastructure and assets from inundation and flooding
- Manage groundwater levels to protect infrastructure and assets
- Protect environmental values of receiving water bodies

The LWMS provides recommendations for water conservation and efficiency, wastewater management, stormwater management and groundwater management.

Subdivision and Development Water Management Reports (WMR) will be required to be prepared as a condition of subdivision.

The preparation of a Subdivision and Development WMR, where required, should include undertaking relevant site investigations to confirm suitability of on-site effluent disposal. In addition, the WMR should confirm that there will be no detrimental upstream or downstream impacts on other properties.

3.5 Infrastructure coordination

3.5.1 Water

All lots within the Structure Plan will need to be connected to reticulated water at the time of subdivision. This is to be undertaken at the cost of the subdivider.

3.5.2 Wastewater

No reticulated wastewater scheme is generally proposed for the development area, with onsite treatment and disposal of effluent through aerobic treatment units on individual lots permitted by the proposed lot sizes and relevant Government wastewater policy.

3.5.3 Power

At the time of subdivision, developers will be required to liaise with Western Power to determine the appropriate distribution augmentation requirements.

3.5.4 Telecommunications

All lots in the Structure Plan Area have NBN service available (nbnco, 2026).

3.6 Development contribution arrangements

There are no developer contributions within the Structure Plan Area.

3.7 Implementation

Implementation of the Structure Plan will be through application of the provisions of Part 1 of the Structure Plan through subdivision processes.

Appendix A

Local Water Management Strategy



Shire of Chapman Valley

Dolbys Drive Structure Plan

LWMS

July 2017

Executive summary

GHD Pty Ltd was commissioned by the Shire of Chapman Valley to prepare a Local Water Management Strategy (LWMS) for the Dolbys Drive Structure Plan (the site).

The Dolbys Drive Structure Plan is located approximately 7 km north of Geraldton, east of the North West Coastal Highway, in the suburb of Waggrakine. The site is bounded by the suburb of Glenfield to the west, Cooper Street and Dolbys Drive to the south and the suburb of White Peak to the north.

The Dolbys Drive Structure Plan is approximately 38 ha in size.

This Local Water Management Strategy (LWMS) has been prepared in accordance with Better Urban Water Management (Western Australian Planning Commission, 2008).

Principles

The key principles of integrated urban water management for the Dolbys Drive development area are:

- Minimise total water use in the development area
- Protect infrastructure and assets from inundation and flooding
- Manage groundwater levels to protect infrastructure and assets
- Protect environmental values of receiving water bodies

Water conservation and efficiency

To make the Dolbys Drive development a leading example of water efficiency the following measures are recommended:

- Require all new buildings to incorporate certified water efficient appliances, as set out in the Criteria for Waterwise Homes developed by the Water Corporation
- No potable water is to be used outside of homes and buildings

Wastewater management

The site will not be connected to a centralised sewage treatment plant so the proposed rural residential lots are to be serviced by onsite effluent disposal systems, such as aerobic treatment units (ATUs) to treat and dispose of all household sewage.

Stormwater management

The proposed stormwater management strategy employs the following principles for managing water quantity:

- For the 1 year ARI event lot and road runoff will be infiltrated as close to source as practical using water sensitive urban design (WSUD) measures such as infiltration devices. These include soakwells (lots) and swales (roads).
- Events greater than the 5 year ARI event and up to and including the 100 year ARI event will be collected and conveyed via road side swales to Dolby Creek. These swales have been sized to accommodate major events up to the 100 year ARI event.

Groundwater management

To ensure that existing groundwater levels and quality is maintained, the quality of the stormwater infiltration to groundwater will be maximised through use of WSUD and best management practices (BMPs) to ensure that stormwater is infiltrated as close to the source as practical.

Table of contents

1.	Introduction.....	1
1.1	Total water cycle management.....	1
1.2	Planning background	2
1.3	Previous studies.....	3
1.4	Purpose of this report.....	3
1.5	Scope and limitations.....	3
2.	Proposed development	4
3.	Design criteria	5
3.1	Water conservation and efficiency.....	5
3.2	Stormwater quantity.....	5
3.3	Groundwater quantity.....	5
3.4	Stormwater and groundwater quality	6
3.5	Disease vector management	6
3.6	Commitment to best management practices	6
4.	Pre-development environment.....	7
4.1	Study area.....	7
4.2	Climate.....	7
4.3	Topography.....	7
4.4	Geology and soils	7
4.5	Aboriginal heritage	13
4.6	Environmental assets.....	13
4.7	Surface water	13
4.8	Groundwater	17
5.	Water use sustainability	18
5.1	Water conservation and efficiency.....	18
5.2	Potable water	19
5.3	Water supply – fit for purpose strategy	19
5.4	Wastewater management.....	21
6.	Stormwater management strategy	23
6.1	Catchments.....	23
6.2	Surface water quantity management.....	23
6.3	Surface water quality management	30
7.	Groundwater management strategy	31
7.1	Groundwater levels	31
7.2	Groundwater quality.....	31
7.3	Impact on Groundwater Dependant Ecosystems	31
7.4	Matters to be addressed in UWMPs	31

8.	Implementation framework.....	32
8.1	Monitoring	32
8.2	Requirements for future planning and development.....	32
8.3	Responsibilities	33
9.	References	35

Table index

Table 1	Mean monthly rainfall Geraldton Town	7
Table 2	WIN groundwater level	17
Table 3	Single lot storage volumes.....	24
Table 5	Roles and responsibilities	33

Figure index

Figure 1	Framework for integrating water planning with land planning	2
Figure 2	Locality	9
Figure 3	Topography	10
Figure 4	Surface geology	11
Figure 5	Acid sulfate soils and Heritage	12
Figure 6	Peak flow estimates	14
Figure 7	Existing 1% AEP flood depth	16
Figure 8	Recommended drainage plan.....	25
Figure 9	Roadside swales within indicative road cross sections	27
Figure 10	Post-development 1% AEP flood extent.....	29

Appendices

Appendix A – Dolbys Drive Structure Plan and Northern Geraldton District Structure Plan
Appendix B – 5 Star Plus Building Standards
Appendix C – Waterwise Criteria
Appendix D – Groundwater bore fact sheet
Appendix E - Modelling Summary

1. Introduction

GHD Pty Ltd was commissioned by the Shire of Chapman Valley to prepare a Local Water Management Strategy (LWMS) for the Dolbys Drive Structure Plan (the site).

The Dolbys Drive Structure Plan is located approximately 7 km north of Geraldton, east of the North West Coastal Highway, in the suburb of Waggrakine. The site is bounded by the suburb of Glenfield to the west, Cooper Street and Dolbys Drive to the south and the suburb of White Peak to the north.

The Dolbys Drive Structure Plan is approximately 38 ha in size with the Dolby Creek running through the site from north east to south west. Of this, approximately 30 ha is proposed for development as 'Rural Residential' lots (GHD 2016).

1.1 Total water cycle management

Total water cycle management, also referred to as integrated water cycle management, 'recognises that water supply, stormwater and sewage services are interrelated components of catchment systems and therefore must be dealt with using a holistic water management approach that reflects the principles of ecological sustainability' (DoW 2004-2007, *Stormwater Management Manual for Western Australia*).

The *State Planning Policy 2.9: Water Resources* (WAPC 2004) outlines the key principles of integrated water cycle management as:

- Considerations of all water resources, including wastewater in water planning.
- Integration of water and land use planning.
- The sustainable and equitable use of all water sources, having consideration of the needs of all water users, including the community, industry and the environment.
- Integration of human water use and natural water processes.
- A whole of catchment integration of natural resource use and management.

The principles and objectives for managing urban water as stated in the *Stormwater Management Manual for Western Australia* (DoW 2004-2007) are as follows;

- **Water Quality:** to maintain or improve the surface and groundwater quality within the development areas relative to pre development conditions
- **Water Quantity:** to maintain the total water cycle balance with the development areas relative to pre development conditions
- **Water Conservation:** to maximise the reuse of stormwater
- **Ecosystem Health:** to retain natural drainage systems and protect ecosystem health
- **Economic Viability:** to implement stormwater management systems that are economically viable in the long term
- **Public Health:** to minimise the public risk, including risk from injury or loss of life, to the community
- **Protection of Property:** to protect the built environment from flooding and water logging
- **Social Values:** to ensure that social, aesthetic and cultural values are recognised and maintained when managing stormwater

- **Development:** to ensure the delivery of best practice stormwater management through planning and development of high quality developed areas in accordance with sustainability and precautionary principles.

1.2 Planning background

In accordance with state government planning framework as outlined in Better Urban Water Management (WAPC 2008), a LWMS is required to accompany the structure plan. Urban water management plans (UWMPs) will be required to accompany the subsequent development applications where further information is required to support development (Section 8).

This LWMS has been prepared in accordance with *State Planning Policy 2.9: Water Resources* (WAPC 2004) and *Better Urban Water Management* (WAPC 2008a), on advice from the Department of Water (DoW) and Shire of Chapman Valley. *Better Urban Water Management* (WAPC 2008a) provides a model for developers to address water related management issues at various stages of planning and presents design objectives for water conservation, stormwater and groundwater management.

The planning framework for land and water planning is illustrated in Figure 1.

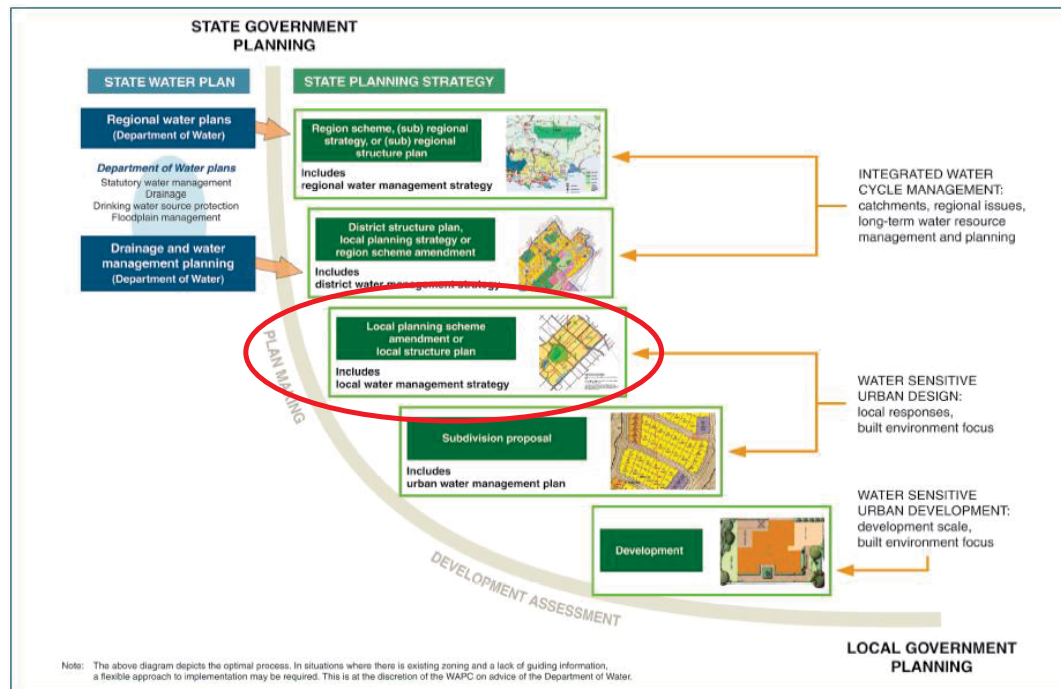


Figure 1 Framework for integrating water planning with land planning

The preparation of this LWMS is not supported by a preceding District Water Management Strategy (DWMS) or Regional Water Management Strategy (RWMS).

The strategies presented in this LWMS have been prepared to be consistent with the requirements of the following key documents:

- Better Urban Water Management (WAPC 2008a)
- Liveable Neighbourhoods: Edition 4 (2007)
- State Planning Policy 2: Environmental and Natural Resources (2003)
- State Planning Policy 2.9: Water Resources (2006)

- Geraldton Region Plan Final (WAPC 1999)
- Draft North Geraldton District Structure Plan (WAPC 2006)
- Shire of Chapman Valley Local Planning Strategy (WAPC 2008b)
- Land Development Specifications (City of Geraldton-Greenough 2007), which has been adopted by the Shire of Chapman Valley as a Local Planning Policy

1.3 Previous studies

In addition to the planning documents identified in Section 1.2, the following investigations undertaken in the Dolbys Drive locality have been used to inform the water management principles and design criteria outlined in this LWMS:

- *Coastal Management Strategy and Action Plan* (Land Insights 2016)
- *Geraldton rural-residential land capability study* (Dye et al. 1990)
- *Shire of Chapman Valley Local Planning Scheme No. 2 Environmental Review* (GHD 2010)
- *Dolbys Drive Local Structure Plan, Waggrakine Western Australia* (GHD 2016)

1.4 Purpose of this report

This LWMS has been prepared to support new development and redevelopment within the Dolbys Drive Structure Plan area (GHD 2016). The strategy identifies characteristics of the study area, and identifies key principles, design criteria and development requirements, and additional guidance to support development in the study area.

1.5 Scope and limitations

This report: has been prepared by GHD for Shire of Chapman Valley and may only be used and relied on by Shire of Chapman Valley for the purpose agreed between GHD and the Shire of Chapman Valley as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Shire of Chapman Valley arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Shire of Chapman Valley and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including omissions in the report which were caused by errors or omissions in that information.

2. Proposed development

The Dolbys Drive Structure Plan covers a 38 ha area of land located approximately 7 km north of Geraldton. The site is bounded by the suburb of Glenfield to the west, Cooper Street and Dolbys Drive to the south and the suburb of White Peak to the north.

The site consists of primarily rural lifestyles land uses, including cleared areas, existing houses, ancillary buildings and remnant coastal bushland. The site consists of 6 freehold lots, all in private ownership.

The Shire of Chapman Valley Local Planning Scheme No. 2 (LPS2), zones the 6 lots as 'Rural Residential 1'. The proposed development as identified in the Dolbys Drive Structure Plan (Appendix A) will likely consist of:

- 1 ha residential lots;
- New access roads; and
- Dolby Creek foreshore reserve.

The study area is also identified within the Greater Geraldton Structure Plan (2011) as 'Rural Living', with a 'primary distributor road' identified along the western boundary of the site.

3. Design criteria

The design criteria adopted for this LWMS have been based on the design criteria objectives outlined in *Better Urban Water Management* (WAPC 2008). This criteria is outlined below:

3.1 Water conservation and efficiency

Principle

Achieve the sustainable management of all aspects of the water cycle within the Dolbys Drive Structure Plan and ensure that potable water use is efficient as possible.

Objectives

- Minimise total water use. The Western Australian State Water Plan (Government of Western Australia, 2007) sets a target of 100 kL/person annual water consumption, including not more than 40 – 60 kL/person/year scheme water use;
- Minimise potable water use outside of buildings;
- Substitute drinking quality water with fit-for-purpose water for non-drinking uses;
- Meet 5 Star Plus requirements; and
- Promote the use of native plants.

3.2 Stormwater quantity

Principle

Maintain post development annual discharge peak flows relative to pre development conditions, unless otherwise established through determination of ecological water requirements for sensitive environments.

Objectives

- **Ecological protection** – retain and / or infiltrate runoff from constructed impervious surfaces generated by the critical 1 year average recurrence interval (ARI) even using soakwells, rain water tanks, vegetated swales or bottomless pits in piped systems;
- **Serviceability of roads and infrastructure in minor ARI events** – runoff from the entire catchment generated by up to the 5 year ARI event should be managed within stormwater conveyance systems and landscaped areas such as swales, basins, living streams or constructed wetlands; and
- **Flood management** – manage the catchment runoff for up to the 1 in 100 year ARI event in the development area to pre development peak flows, unless otherwise indicated in an approved strategy or as negotiated with the relevant drainage service provider.

3.3 Groundwater quantity

Principle

Manage and minimise changes in groundwater levels following development.

Objectives

- Protect groundwater as a resource;
- Protect infrastructure and assets from flooding and inundation by high seasonal groundwater levels, perching and/or soil moisture; and

- Protect groundwater dependent ecosystems (GDEs) from the impacts of urban runoff.

3.4 Stormwater and groundwater quality

Principle

Maintain surface and groundwater quality at pre development levels (winter concentrations) and if possible, improve the quality of water leaving the development area to maintain and restore ecological systems.

Objectives

- Ensure that all runoff contained in the drainage infrastructure network receives treatment prior to discharge to a receiving environment consistent with the *Stormwater Management Manual (Department of Water 2004-7)*.

3.5 Disease vector management

To reduce health risks from mosquitoes, retention and detention treatments should be designed to ensure that between the months of November and May stationary stormwater is fully infiltrated in less than 72 hours. Detention and infiltration areas should be free of depressions and potholes to avoid immobile water.

The proponent must ensure that onsite mosquito breeding is minimised through effective design and maintenance of water-holding infrastructure.

The 'Chironomid midge and mosquito risk assessment guide for constructed water bodies' (Midge Research Group, 2011) should be referred to during the early stages of planning to ensure that the potential for on-site mosquito breeding is minimised.

Objectives

- No permanent water bodies will be constructed on site

3.6 Commitment to best management practices

In order to meet the design criteria outlined above, the following best management practices will be employed:

- Implement controls at or near source to prevent pollutants entering the system;
- Install in-transit measures to treat stormwater and mitigate pollutants that have entered the system; and
- Implement end-of-pipe controls to treat stormwater, addressing any remaining pollutants prior to discharging to the receiving environment.

4. Pre-development environment

4.1 Study area

The Dolbys Drive Structure Plan is a 38 ha area of land located approximately 7 km north of Geraldton (Figure 2). The site is bounded by the suburb of Glenfield to the west, Cooper Street and Dolbys Drive to the south and the suburb of White Peak to the north.

The site consists of primarily rural lifestyle land uses, including cleared areas, existing houses, ancillary buildings and remnant creek vegetation. The Dolby Creek runs through the study area from north east to south west.

4.2 Climate

The site is located in the mid-west of Western Australia, which has a Mediterranean climate consisting of hot, dry summers and cool, wet winters. The closest weather station with complete rainfall record for recent years is located 13 km away at Geraldton Town (Site ID 008050).

Mean annual rainfall is 451.6 mm, and average monthly rainfall is shown in Table 1.

Table 1 Mean monthly rainfall Geraldton Town

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean rainfall (mm)	5.9	8.5	13.2	23.3	68.9	113.0	90.2	64.9	30.4	18.0	7.9	3.7

4.3 Topography

The site is located on a natural depression in the Spearwood Dune System, with the Dolby Creek running through the site from north east to south west (Land Insights 2016).

The site reaches a maximum elevation of 65 m AHD at the northern boundary, and falls south towards the Dolby Creek. The creek runs from the north east of the site at around 54 m AHD to the south west of the site at around 37 m AHD. In the most southern part of the site, the relief rises to 47 m AHD (Figure 3).

4.4 Geology and soils

The Dolbys Drive Structure Plan is located within the Central Coast region, which is comprised primarily of Tamala limestone and its products. The Tamala dune system comprises of lithified limestone overlain by deep yellow sands and red loams.

The Geological Survey of Western Australia (1971) mapping of surface geology identifies that the study area progresses from red and yellow sands to limestone from south to north (Figure 4). The dunal depression is dominated by alluvium, colluvium and miscellaneous soils (Figure 4).

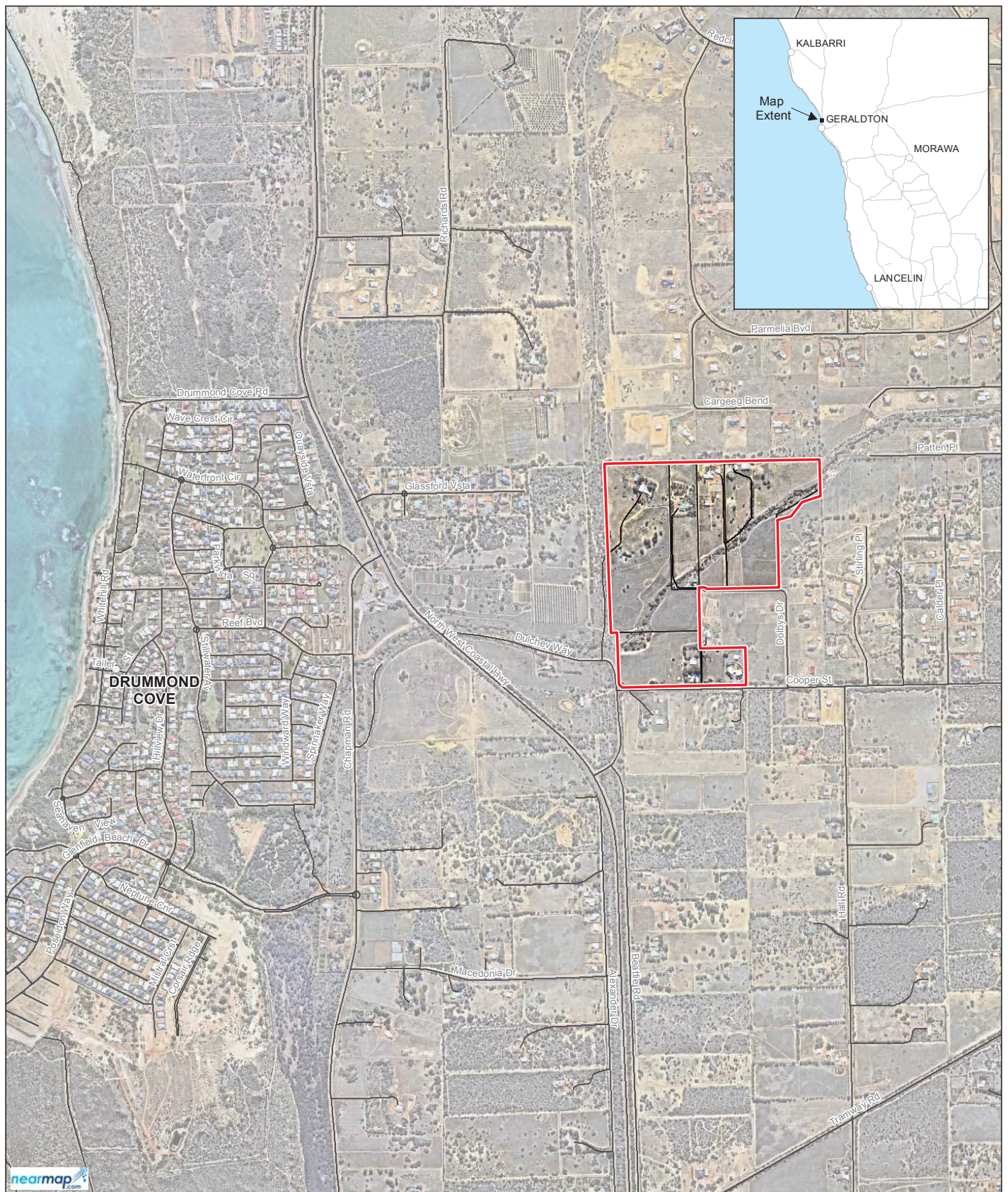
The freely draining yellow sandplain overlying limestone makes up the bulk of the soils within the study area. Red Spearwood sands also occur over limestone, which are freely draining and more fertile than the yellow sandplain soils.

The soil characteristics at the site should be confirmed prior to the preparation of Urban Water Management Plans so confirm the infiltration rate of soils within the study area.

4.4.1 Acid sulfate soils

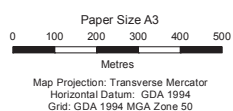
The presence of acid sulfate soils has been recognised as an issue of concern in Western Australia since 2003. Proponents of developments that involve the disturbance of soil or the change of groundwater levels in areas susceptible to acid sulfate soils are required to conduct desktop and field based investigations. Adequate investigations are required prior to soil disturbance to determine the potential risks and to allow for the formulation of appropriate management strategies.

Mapping by Land Gate indicates there is a moderate to low risk of acid sulfate soils occurring within 3 m of the surface in the Dolby Creek bed (Figure 5). This area will be protected under the conceptual Structure Plan (Appendix A) and the establishment of a foreshore reserve.



LEGEND

-  Road
-  Structure Plan Boundary
-  Cadastral



Shire of Chapman Valley
Dolby's Drive Structure Plan

Job Number 61-3302800
Revision 0
Date 31 Jul 2017

Locality Map

Figure 2



Paper Size A3
0 20 40 80 120 160
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- Study Area
- Elevation
- Watercourse
- Road
- X Creek Crossing



Shire of Chapman Valley
Dolby's Drive Structure Plan LWMS

Job Number	61-3302800
Revision	0
Date	31 Jul 2017

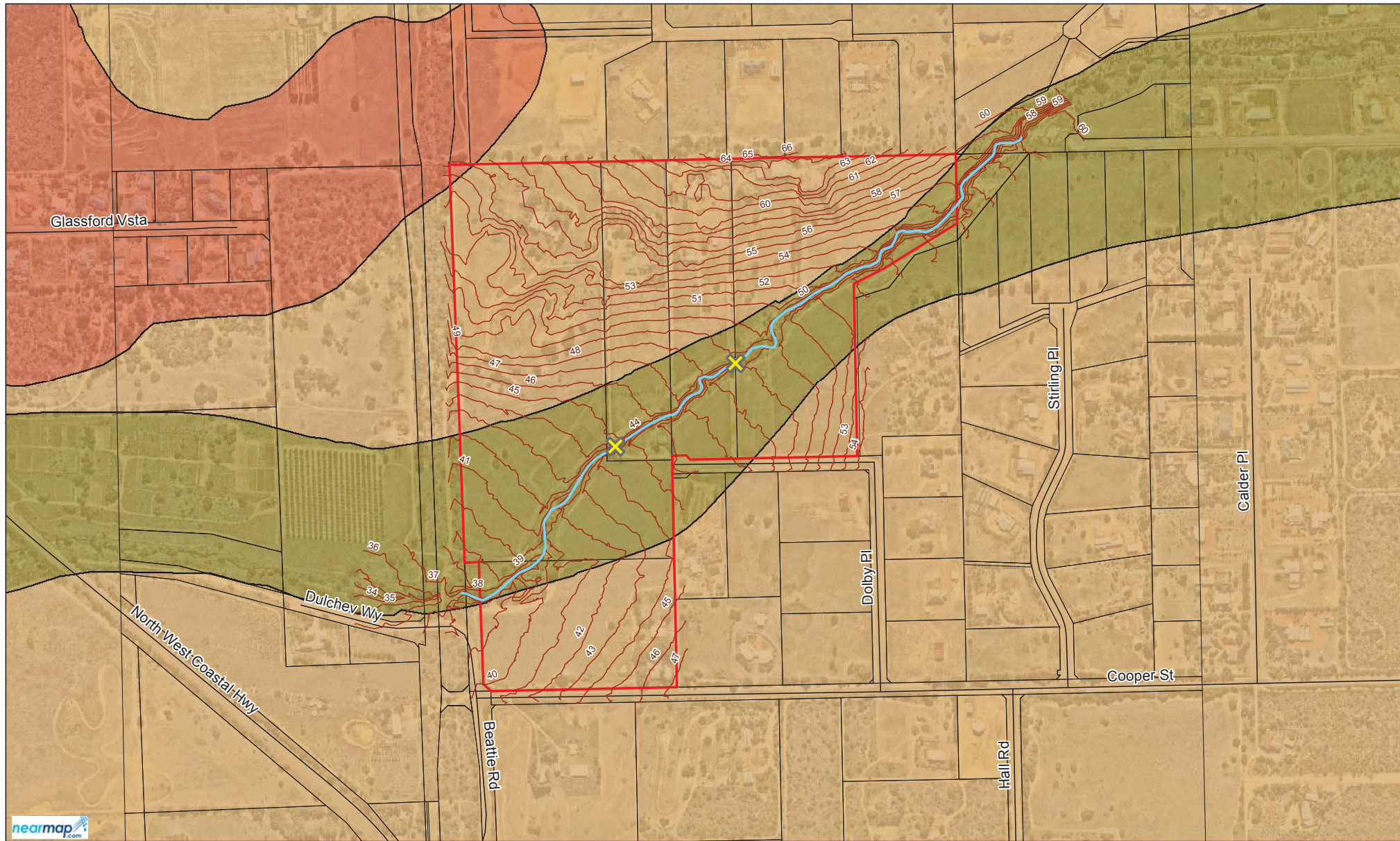
Topography

Figure 3

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Data source: Nearmap; Imagery, Extracted 31/07/2017 Captured 16/06/2017, Cadastre - 20160217, Roads - 20160217, GHD: Study Area - 20160217. Created by:nkostraby

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Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- Watercourse
- Elevation
- Study Area
- Cadastre



Creek Crossing

Geology

- Limestone
- Red and yellow sand
- Other



Shire of Chapman Valley
Dolby's Drive Structure Plan LWMS

Job Number	61-3302800
Revision	0
Date	31 Jul 2017

Surface Geology

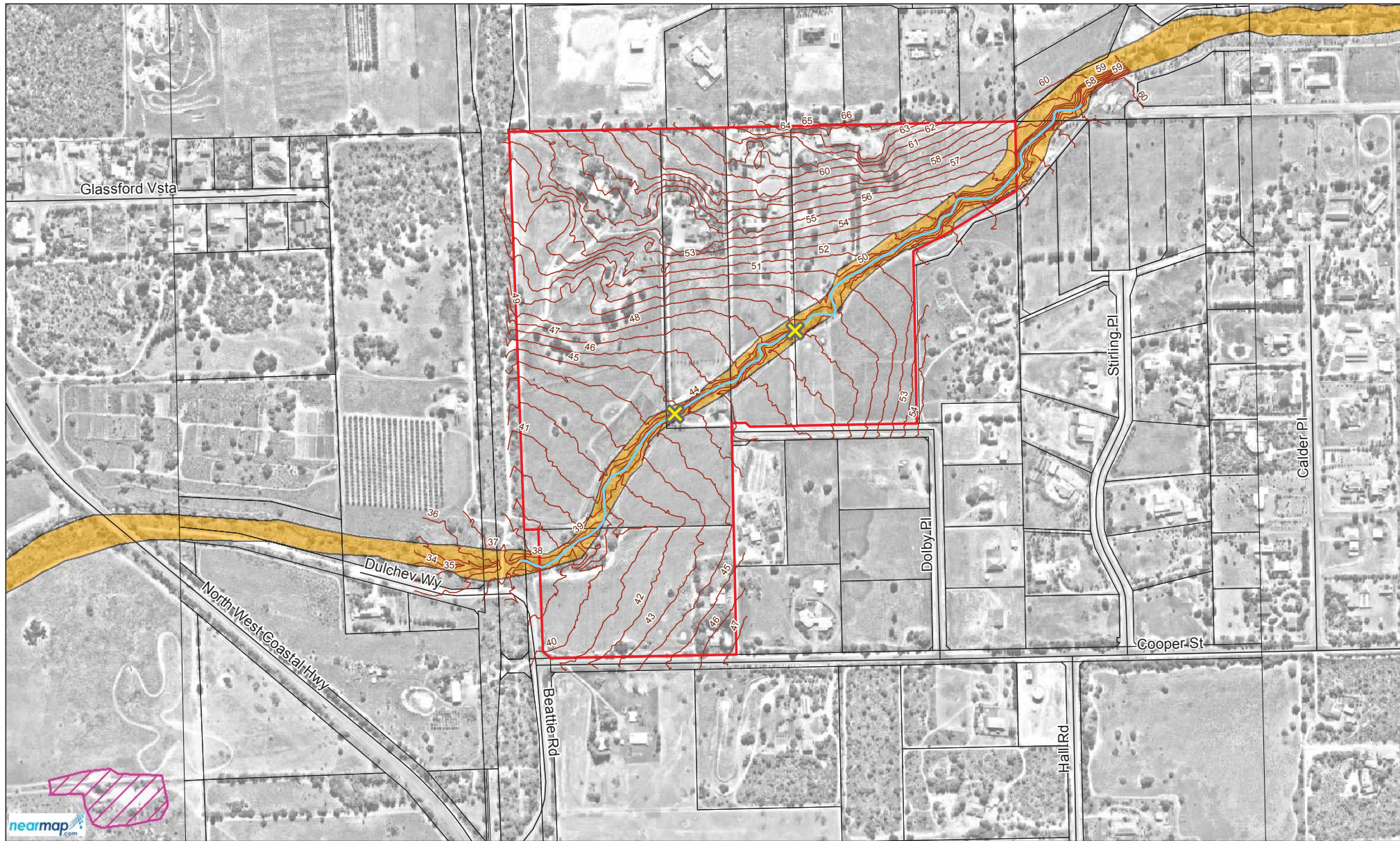
Figure 4

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Data source: DMP: Geology - 20111202; Nearmap; Imagery, Extracted 31/07/2017 Captured 16/06/2017, Cadastre - 20160217, Roads - 20160217, GHD: Study Area - 20160217. Created by: rkostraby

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Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

Watercourse
Elevation
Study Area
Cadastre



Aboriginal Heritage Sites

Acid Sulfate Soils
Moderate to low
ASS disturbance
risk (<3m from
surface)



Shire of Chapman Valley
Dolby's Drive Structure Plan LWMS

Job Number	61-3302800
Revision	0
Date	31 Jul 2017

ASS and Heritage

Figure 5

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Data source: Landgate - 20160217; Roads - 20160217; DIA: Aboriginal Heritage Sites - 20111202; DER: Acid Sulfate Soils - 20111202; GHD: Study Area - 20160217; Nearmap: Imagery, Extracted 31/07/2017 Captured 16/06/2017. Created by rkostraby

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4.5 Aboriginal heritage

There are no registered Aboriginal heritage sites within the Dolbys Drive Structure Plan (Figure 5).

Site 2947 (Dulchev Way) is located outside of the structure plan area to the south-west, across North West Coastal Highway. The site is registered as 'artefacts/ scatter', has open access off of Chapman Road and Dulchev Way, and is not restricted.

4.6 Environmental assets

4.6.1 Environmentally sensitive areas

There are no environmentally sensitive areas within the Dolbys Drive Structure Plan.

4.6.2 Vegetation and flora

The site is part of the Greenough System within the Irwin District of the South-Western Botanical Province (Speck 1958). The majority of the Structure Plan area is cleared land with remnant vegetation in the waterway and proposed foreshore reserve. No detailed study has been undertaken however nearby areas have been found to contain the following vegetation types (GHD 2008):

- Dune Blowout – primarily bare sand.
- Coastal scrub / heath – includes foredune vegetation, and first stabilised dune.
- *Acacia rostellifera* / *Lycium ferocissimum* shrubland.
- *Frankenia* / *pauciflora* on saline flats.
- *Melaleuca cardiophylla* mixed heath on limestone ridge.
- Degraded riparian Low woodland – associated with the Buller River tributary.
- Pasture/Improved vegetation.
- Mixed degraded vegetation.

The Dolbys Drive Structure Plan is covered under the Shire of Chapman Valley *Coastal Management Strategy* which was prepared to guide sustainable coastal development, and manage development pressure from competing land uses (Koltasz Smith 2007). This document was recently updated by Land Insights, May 2016. The Site is up stream of the Drummond Cove coastal management sector (Land Insights 2016).

An on-site inspection of Dolby Creek by the DoW in February 2016 recognised African boxthorn, Agave and Crown Beard vegetation to be present.

4.7 Surface water

The Dolbys Drive Structure Plan is located 1.9 km from the coast. A creek runs through the centre from east to west. There are no permanent surface water features at the site.

Surface water runoff across the Site predominantly drains to Dolby Creek in the centre of the site, which drains to the south west.

4.7.1 Hydrology

The catchment for Dolby Creek measures 4.96 km², consisting of cleared agricultural land, sandy soils with low clay content. The longest flow path measures 4.7km with a gradient of

24m/km. Aerial imagery indicates light to medium vegetation in the streamlines. In the absence of a flow gauge, three regional peak flow estimates were calculated for the catchment:

- Probabilistic Rational Method (Pilgrim, 1987) for Wheatbelt Region with loamy soil catchments 75-100% cleared, notated as ARR PRM 1987
- Regional Flood Frequency Procedure (Flavell, 2012)
- Regional Flood Frequency Estimation Model (Rahman, et al., 21 June 2012), notated as ARR RFFE 2015, derived from nearby gauging stations

Referring to Figure 6, the methods were calculated for various probability events. The ARR RFFE 2015 method includes confidence intervals in dashed lined, and the ARR PRM 1987 method was extrapolated to the 1% AEP.

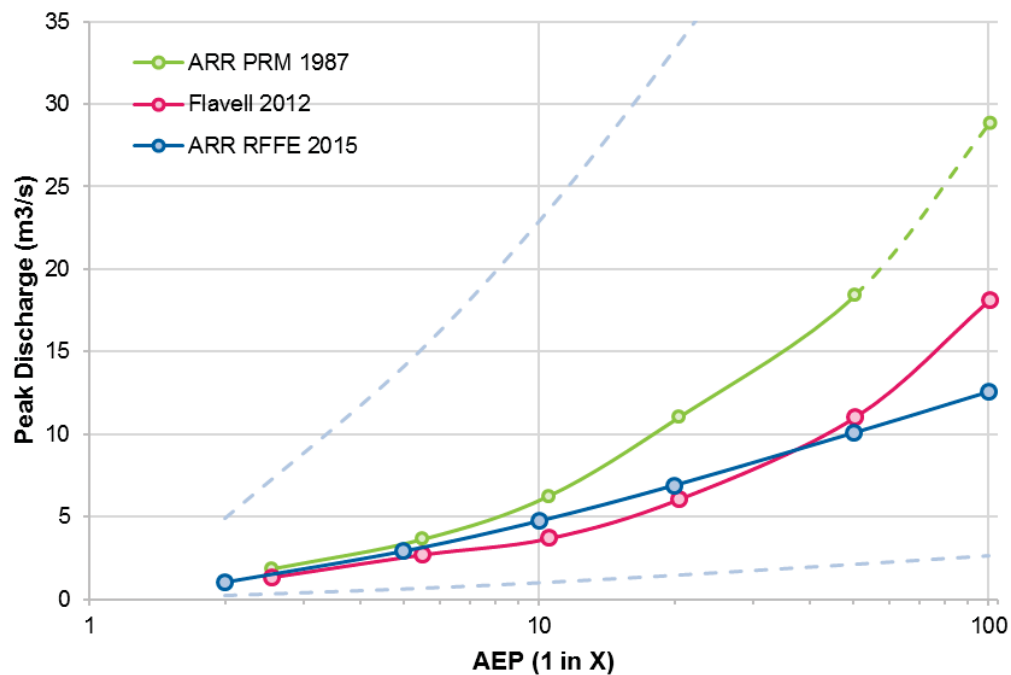


Figure 6 Peak flow estimates

The RFFE2015 method is known to have limited application in cleared agricultural catchments and is therefore discarded. The wide bands of this estimate are indicative of the range of soil types in the region and lack of gauging stations. Given the hydrologic properties of this particular catchment (particularly soils and slope) compared to other catchments in the region, the peak is likely to be in the lower half of the range. The Flavell method is based on data from larger catchments and is also discarded. Therefore, the extrapolated ARR1987 value of 29 m³/s has been adopted for the project to for the 1% AEP flood, and represents the most conservative estimate of all methods.

4.7.2 Hydraulics

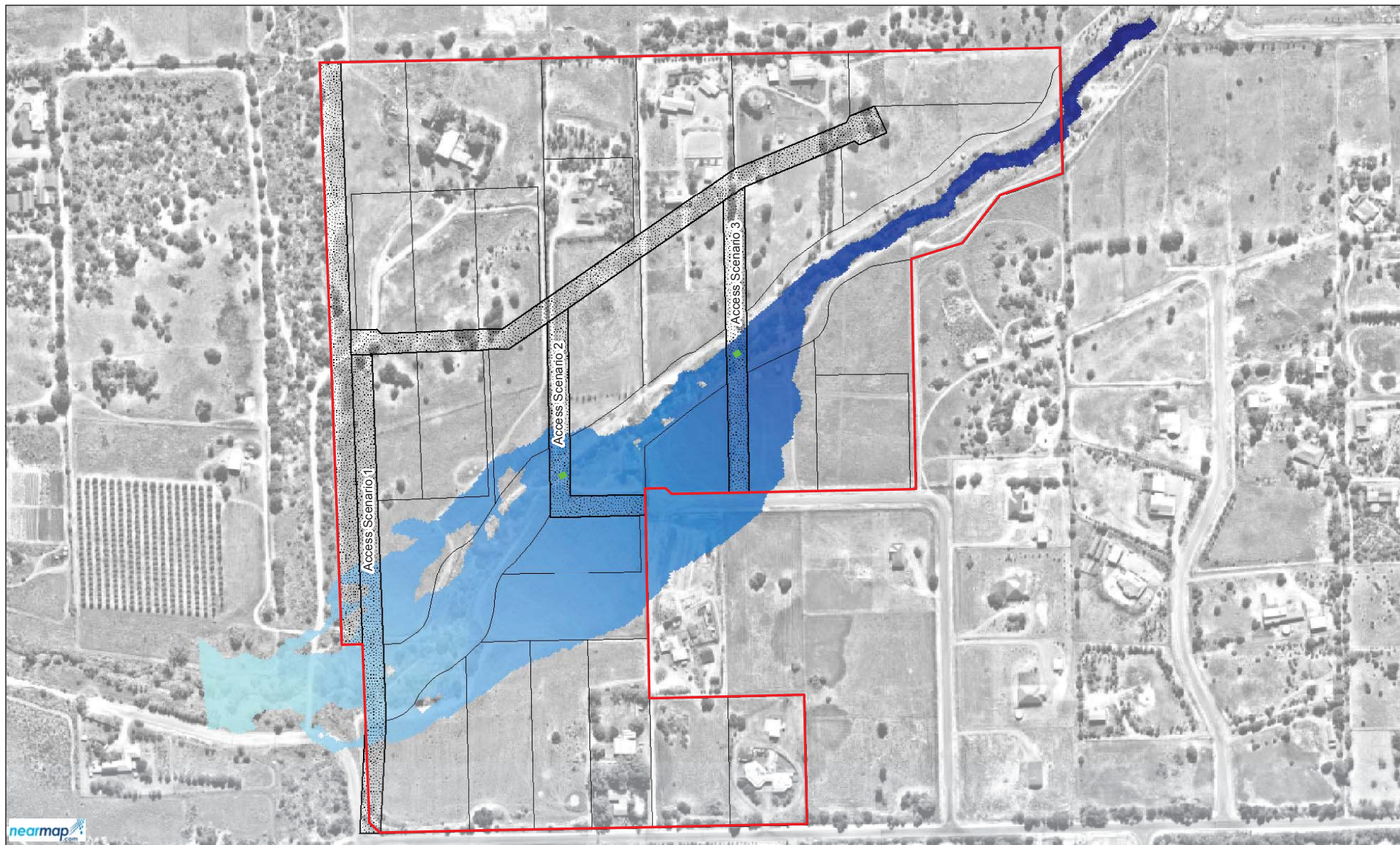
Dolbys Creek was simulated in a two-dimensional hydraulic model. TUFLOW was adopted as the modelling platform to undertake this work. TUFLOW is a computer program for simulating depth-averaged, two and one-dimensional free-surface flows such as occurs from floods and tides. It solves the full two-dimensional, depth averaged, momentum and continuity equations for free-surface flow.

The model is based on the following inputs:

1. Topographic data obtained from the UAV survey
2. Culvert dimensions and levels based on field measurements
3. Surface roughness derived from aerial imagers, ranging from 0.018 to 0.040 (Manning's "n")
4. Peak inflow obtained from the hydrologic calculation
5. A nominal tailwater depth located downstream of the site

4.7.3 Results

The existing flood depth and extent are illustrated in Figure 7. Floodwaters are contained within the channel banks for the upper reach of Dolbys Creek, up to a maximum depth of approximately 1.5m. A breakout occurs part-way through the site, forming a shallow floodplain up to approximately 150mm deep. The breakout is partially caused by the existing culvert having insufficient capacity for the 1% AEP flood.



Paper Size A3
0 15 30 60 90 120
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- Existing culvert
- Proposed development
- Lots

Road

Water level (m)
High : 57.794m
Low : 35.7m



Shire of Chapman Valley
Dolby's Drive Structure Plan LWMS

Job Number	61-3302800
Revision	0
Date	31 Jul 2017

Pre-Development Flood Extent
for 1 in 100 year Event

Figure 7

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Data source: Nearmap; Imagery, Extracted 31/07/2017 Captured 16/06/2017, Cadastre - 20160217, Roads - 20160217, GHD: Study Area - 20160217, Food Model; GHD, 2017. Created by: skatrabay

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4.8 Groundwater

4.8.1 Groundwater level

The Department of Water WIN database identifies no bores within the site, however there are five bores located 1.5 km to the east of the site boundary (23043481, 23043480, 20002998, 20003000 and 23043803). Each of these had just one sample taken, and for two it was unknown what date the level was measured. All results were in m BGL, and are presented in Table 2.

Table 2 WIN groundwater level

WIN Site ID	Date level measured	Groundwater Level (mBGL)
20002998	1/01/1900	4.572
20003000	01/01/1900	5.1816
23043480	16/06/2000	3.96
23043481	23/06/2000	3.45
23043803	09/02/2007	4.07

Due to the sandy nature of soil on the site and the ephemeral nature of Dolby Creek, it is anticipated that there will be little interaction with groundwater in the structure plan area however geotechnical investigations are recommended prior to any earthworks at the site due to the lack of historical groundwater data.

4.8.2 Groundwater quality

There is no groundwater quality data available for bores within the site boundary. A single bore, WIN Site ID 20002914, has a recorded Total Dissolved Solids (TDS) result of 1519 mg/L, however it's unknown when this sample was taken.

5. Water use sustainability

5.1 Water conservation and efficiency

The Dolbys Drive Structure Plan will manage all aspects of the water cycle sustainably and ensure that the use of potable water is as efficient as possible.

5.1.1 In-house water efficiency

Water use efficiency is part of the “business as usual” approach and is enabled through the use of technology and by changing behaviour to use less water. The Western Australian Government has introduced a range of measures to ensure that new houses built in Western Australia meet minimum standards for energy and water efficiency. The 5 star Plus Building Standards (Appendix B) introduced in September 2007 is now an addition under the *Western Australian Appendix to the Building Code of Australia (BCA)* and require:

- All tap fittings must be minimum 4 stars WELS rated
- All showerheads must be minimum 3 stars WELS rated
- All sanitary flushing systems must be a minimum 4 stars WELS rated dual flush
- Home water heaters to be located within 5 m of major hot water using points.

5.1.2 Ex-house water efficiency

Irrigation is the single most significant water use within residential households and public spaces. Thus irrigating efficiently can have a major impact on the water consumption of a whole development.

The following waterwise measures will be encouraged at the individual property scale:

- Water efficient irrigation systems (deliver water evenly, to near the root zone, at specified rate).
- Waterwise garden design/landscaping.
- Native vegetation with low water demand.
- Group plants with similar water requirements.
- Minimise irrigated lawn/turf area.
- Soil improvers, to reduce infiltration loss below root zone.
- Mulch, to reduce evaporative loss.

Whilst not mandatory, these strategies are required to meet the Water Corporation *Criteria for Waterwise Homes* (Appendix E), and are recommended water and nutrient efficient practices that both save water and maintain water quality of existing and downstream environments.

5.1.3 Public open spaces

The nature of the land use zoning, with larger residential lots enables the creation of private open space, therefore reducing the need for formal public open space.

Public open spaces in the Dolbys Drive Structure Plan are intended to provide a range of passive and unstructured active recreational opportunities, incorporating protection of conservation areas and water sensitive urban design.

The designated public space areas will retain existing native vegetation. Any landscaping within these areas will be undertaken with water conservation in mind incorporating the following:

- Use of native species that require a local climate based low water-use and nutrient use regime.
- Any planting will be watered during establishment phase only.

5.2 Potable water

The potable water for the Dolbys Drive Structure Plan will be provided by Water Corporation. The Geraldton Water Scheme Planning and Management Strategy identifies that rural residential water supply may be difficult (ENV & Essential Environmental 2014). Options such as rainwater tanks and private bores to supplement potable water, and replace for non-potable uses, is recommended.

5.3 Water supply – fit for purpose strategy

In conjunction with water efficiency measures, supplying fit-for-purpose water can also reduce the demand for potable water. This involves substituting drinking quality water with fit-for-purpose water for non-drinking uses. Potential non-drinking water uses are;

- In-house non-drinking water such as toilets and washing machines
- Irrigation for private (domestic gardens) and public (public open spaces and road reserves) areas
- Aquifer recharge

Substituting potable water with an alternative source of non-potable water can make significant savings in potable water demand and the associated chemicals and energy required treating and delivering water to drinking water standard. Alternative water supply sources include rainwater, groundwater, stormwater and wastewater.

5.3.1 Rainwater

Rainwater tanks can be used to meet non-potable indoor and outdoor uses to reduce demand on potable water. It is important to note that rainwater supply is more suited to support in house non-portable water consumption, such as toilets and washing machine rather than irrigation demand. This is due to the fact that irrigation demands peak at the opposite time of year to peak rainfall, therefore requiring impractical tank volumes to store rainfall until it is needed..

The *Guidance on Use of Rainwater Tanks* (Australian Government 2004) estimate tank sizes to meet forecast demands. Adopting a roof size of 200 m², annual rainfall of 452 mm, and non-potable demand of 100 L per day, a domestic rainwater tank of 5.5 kL capacity is required to achieve 90% reliability.

The major potential risk associated with the use of rainwater tanks is the risk to public health due to poor water quality if the tank system is not maintained and managed appropriately. Rainwater quality is generally considered to be of a high standard if regular maintenance and appropriate system management is undertaken. Appropriate maintenance and management of rainwater tank systems includes;

- Installation of first flush diverters

- Prevention of access to any vermin or disease vectors
- Filter to minimise the entry of large particles and leaves
- Regular desludging to avoid build-up of sediments at the base of the tank
- Regular inspection and maintenance of gutters and downpipes

With appropriate maintenance and management, it is considered that the rainwater quality would be of a sufficient standard to be used for non-potable in-house use without further treatment.

5.3.2 Groundwater

Shallow groundwater is considered to be the easiest and usually most cost effective method of providing an alternative to scheme water for irrigation. The use of groundwater presents small risk in terms of water quality. With respect to irrigation, the presence of significant iron concentrations, hardness, alkalinity, nutrients or salinity can impact upon the receiving vegetation and soils and/or contribute to the scaling or scour of irrigation pipework.

The extraction of shallow groundwater via private bores is supported by the Shire of Chapman Valley, and will be at the expense of the landowner.

There is no information available on the quality of groundwater at the Dolbys Drive Structure Plan.

The Department of Water categorises the groundwater salinity according to the salt content and its application for public drinking, irrigation, stock water etc. Brackish groundwater of salinity 1000-3000 mg/L TDS can be used for parkland irrigation, and more saline groundwater with salinity greater than 3000 mg/L can be used for industry and stock watering (up to 10,000 mg/L TDS).

Garden bores provide a fit-for-purpose water supply for domestic irrigation that reduces demand on potable water. Private home owners will have the option of installing a garden bore in line with relevant government regulations and should refer to the Department of Water fact sheet in Appendix D.

5.3.3 Stormwater

Stormwater runoff increases during land development due to the introduction of impermeable surfaces. The increase in stormwater runoff at the Dolbys Drive Structure Plan is expected be minimal due to the low proportion of impermeably surfaces associated with the predominantly rural residential and conservation land uses proposed for the area.

Stormwater can be harvested via infiltration to the superficial aquifer at, or close to, source followed by abstraction from private bores. Collection and storage of stormwater for reuse other than by aquifer storage is considered impractical due to the small amounts of stormwater expected at the Dolbys Drive Structure Plan, and inefficient due to the need to construct large water collection infrastructure.

5.3.4 Wastewater

Wastewater includes grey water and black water. Grey water is wastewater generated from domestic activities such as laundry, dish washing and bathing, and can be reused with minimal treatment for applications such as irrigation, toilet flushing and washing machines. Black water is wastewater generated from sewage, and must undergo extensive treatment before reuse.

The Rural Residential of the Dolbys Drive Structure Plan lots will be serviced by onsite effluent disposal systems to treat and dispose of all household sewage.

The Department of Health (2010) requires that in unsewered areas the primary onsite wastewater system should be sized to receive the total wastewater flow in case any additional grey water system fails. Furthermore, the removal of grey water from the primary sewage system may adversely impact on the proper operation of that system. Therefore, land owners may find it impractical to install an additional grey water system as well as the required effluent disposal system.

The *National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water* (Agriculture and Resource Management Council of Australia 2000) applies to effluent from municipal (i.e. community) wastewater plants, and has been adopted by the Department of Health for application to individual household systems, as stated in the *Code of Practice for the Design, Manufacture, Installation and Operation of ATUs*. The strategy outlines the potential applications for black water and the level of treatment, water quality, monitoring and control requirements.

5.4 Wastewater management

The wastewater management methodology differs according to zoning and density.

5.4.1 Proposed 1 ha lot sizes

No reticulated wastewater is proposed for the 1 ha zoned lot areas, and the proposed rural residential lots are to be serviced by onsite effluent disposal systems to treat and dispose of all household sewage.

Individual lots within the rural residential development can be serviced by on-site effluent disposal systems such as Aerobic Treatment Unit (ATU) systems with the condition that use of an ATU meets the requirements outlined in Sections 5.1 and 5.7 of WAPC's Statement of Planning Policy No 2.1, and Section 5.2.2 of the *WAPC Government Sewerage Policy: Perth Metropolitan Region* (1995). The selection of an appropriate ATU for the individual lots is the responsibility of the landowner, and the unit must comply with the Department of Health Code of Practice for the *Code of Practice for the Design, Manufacture, Installation and Operation of ATUs* (Department of Health 2011).

Effluent from ATU's is able to be disposed of via irrigation areas. Disposal to surface irrigation is not considered for a suitable option for this rural residential development due to risks associated with surface disposal such as public health risks, risk of runoff, risk of surface ponding, and disinfection.

Effluent shall be disposed of via sub-surface irrigation (eg closely spaced and pressurised subsurface dripper pipework installed at a depth of 100 mm below the ground level) of a vegetated or landscaped disposal area. The sub-surface irrigation disposal area will be required to comply with setback requirements for buildings and other infrastructure.

The following measures are required to manage the risk nutrient runoff into the surrounding environment:

- Subsurface irrigation (closely spaced and pressurised subsurface dripper pipework installed at a depth of 100 mm below the ground level) is required to dispose of the effluent over a vegetated or landscaped disposal area;
- Construction of an irrigation disposal area with a minimum area of 150 m² which includes a layer of imported fill incorporating material that reduces phosphorus export; and
- The irrigation pad requires a minimum 1.2 m vertical separation to from the groundwater, in areas of minimal separation to groundwater, fill is required to ensure adequate separation is achieved.

- The ATU is required to be at least 6 m away from any well, bore, dam or water course that supplies domestic water or any proclaimed water catchment.
- The ATU should be situated downslope of the building wherever possible, to remove the need for diversion trenches.

The Shire of Chapman Valley and Department of Health guidelines stipulate that each onsite effluent disposal system is to be assessed individually to determine site specific characteristics and requirements. Builders and owners of the property will have to design the onsite effluent disposal system to suit local conditions and submit an “*Application to construct or install an apparatus for the treatment of sewage*” to the Shire of Chapman Valley. If the application is approved the effluent disposal system should be installed according to the conditions of approval and must then be inspected by an Environmental Health Officer and a *Permit to Use* issued before the system can be used. Additional applications and approvals are required to reuse treated blackwater.

It is the responsibility of the individual landowner and/or developer to receive approval from appropriate regulatory agencies to install an appropriate ATU system and ensure that quarterly servicing of the system is conducted by a contractor approved by the Department of Health.

5.4.2 Higher density areas

Residential densities higher than R5 may require wastewater reticulation as per advice from the Water Corporation, however the Dolbys Drive Structure Plan area does not have any current plans for high density areas with low density (1 ha) proposed lot sizes.

6. Stormwater management strategy

The post development annual discharge volumes and peak flows are to be maintained relative to pre-development conditions. To achieve this principle, the following criteria will be applied:

- To manage flows for ecological protection and manage the serviceability of roads and other infrastructure, lot and road runoff for minor rainfall events will be either captured in rainwater tanks or infiltrated as close to the source as practical. Due to the low density nature of the development it is expected that all post development stormwater runoff in excess of pre development flows for all storm events up to and including 1 year ARI events will be accommodated at the lot scale.
- The post-development area should retain all catchment runoff exceeding the pre-development level, up to and including the 100 year ARI event, while protecting infrastructure and assets from flooding.

6.1 Catchments

The Dolbys Drive Structure Plan area has an external upstream catchment to the northwest of around 496 ha, otherwise known as Dolbys Gully.

The study area consists of one pre-development catchment based on pre-development water pathways and roads depicted in the Structure Plan. This catchment directs all water into the Dolby Creek, which enters the site at the north east boundary and exits along the south west boundary. For the post-development flows, Dolbys Gully was divided into 6 sub-catchments draining to open swales, plus the remaining area which drains directly to Dolby Creek (Figure 8).

6.2 Surface water quantity management

Up to 1 year ARI event

The typically sandy soil types which are prevalent in the area are ideally suited to the promotion of infiltration at, or close to source. This has the advantage of maintaining recharge into the aquifer as well as minimising the need for drainage infrastructure. As such the most efficient and effective option for managing and reusing stormwater within the Dolbys Drive Structure Plan is infiltration of stormwater to the groundwater system at (or close to) source. However, on site soil permeability testing is recommended prior to development.

No infiltration testing has been conducted within the proposed development. An infiltration rate of 1 m/day (consistent with industry standards for long term unmaintained basins) was assumed as the preliminary infiltration rate used in design. The infiltration rate and storage required should be revised during subsequent UWMP's based on more detailed infiltration rates for the site.

Lot and road runoff for minor rainfall events up to and including 1-year ARI event will be kept on site, either captured in rainwater tanks or infiltrated to the aquifer as close to the source as practical, using water sensitive urban design (WSUD) measures such as soakwells (lots) and riffles in roadside swales (roads).

Table 3 gives the single lot storage volumes required to retain 1-year ARI events for the typical lot size (10,000 m²). The storage is calculated as the product of the rainfall intensity and the impervious area of the lot (30% for R5 lot density (Department of Planning 2013)). Roadside swales will be designed to infiltrate the 1 year ARI event.

Table 3 Single lot storage volumes

Rainfall Event	1 year ARI, 1 hr
Rainfall Intensity (mm/hr)	17.5
Storage required (m ³ /ha)	52.5

1-year ARI up to 5-year ARI

For this range of storm events, the objective is to provide drainage serviceability in accordance with the engineering requirements of the Shire of Chapman Valley. Roadside swales and table drains will collect and convey stormwater safely to Dolby Creek whilst maintaining road serviceability.

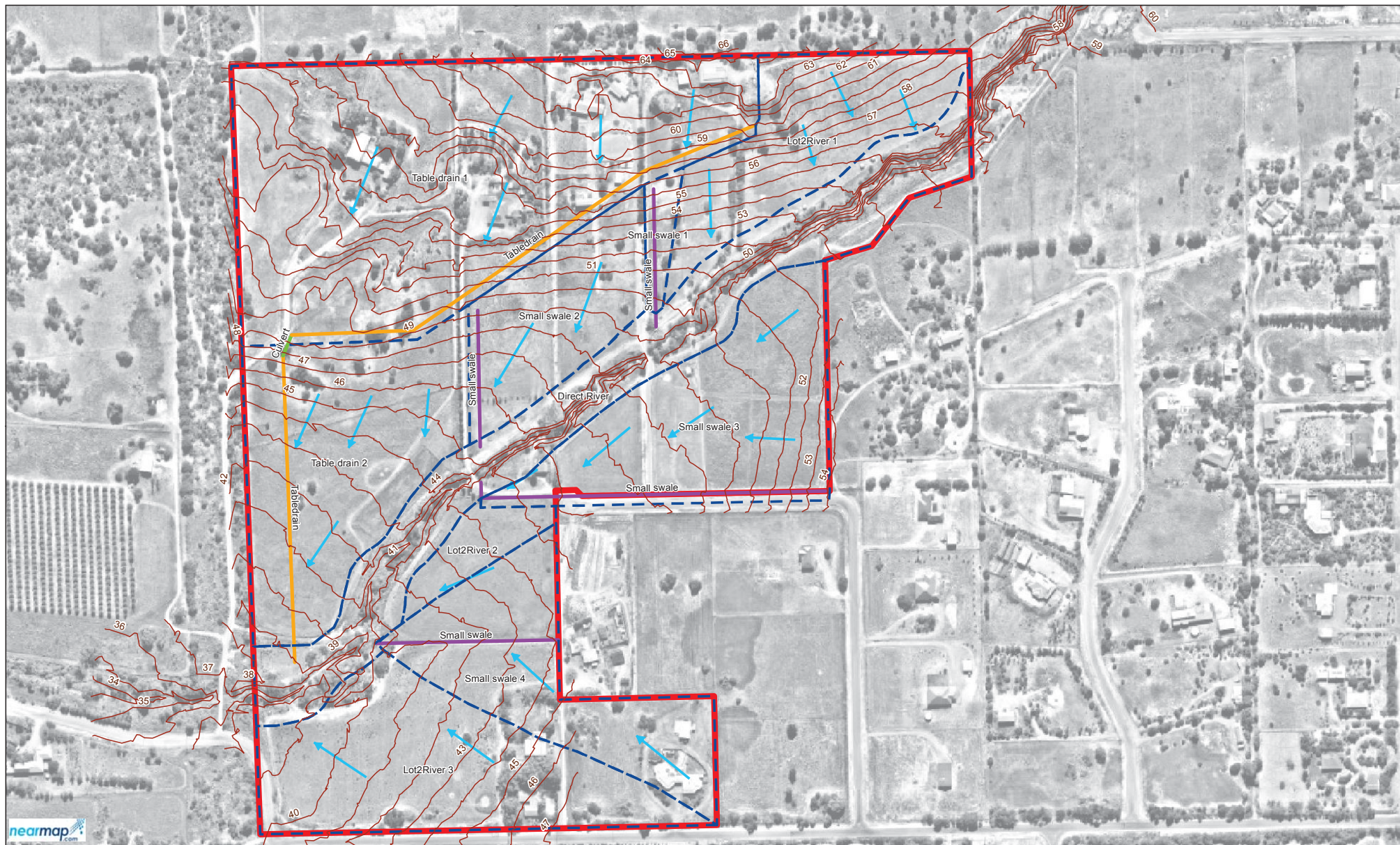
5 year up to 100 year ARI event

Events greater than the 5-year ARI event and up to and including the 100 year ARI event will be collected and conveyed via the road reserve into Dolby Creek, located within the centre of the site. Figure 8 shows the sub-catchment and drainage layout.

The proposed swales are to have 1 in 4 side slopes.

Opportunities for infiltrating road runoff, using infiltration areas and infiltration swales will be investigated within the subsequent UWMP's so as to distribute the required storage throughout the catchment.

As noted previously no infiltration testing has been conducted within the proposed development. An infiltration rate of 1 m/day (consistent with industry standards for long term unmaintained basins) was assumed as the preliminary infiltration rate used in design. It is likely a higher infiltration rate would be expected for the sands present at this site and as such total storage volumes should be revised during subsequent UWMP's based on more detailed infiltration rates for the site.



Paper Size A3
0 15 30 60 90 120
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND
— Elevation
— Culvert
— Small swale
— Tabledrain
→ Post-development flow path
— Post-development catchment
Study Area



Shire of Chapman Valley
Dolby's Drive Structure Plan LWMS

Job Number	61-3302800
Revision	0
Date	31 Jul 2017

Drainage plan

Figure 8

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Data source: Nearmap; Imagery, Extracted 31/07/2017 Captured 16/06/2017, Cadastre - 20160217; Roads - 20160217; GHD: Study Area - 20160217; Drainage Plan, GHD, 2017. Created by: nikostraby

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Road drainage

The road drainage system will comprise shallow roadside swales to infiltrate small events and convey larger events from the paved surface.

Peak flows resulting from the 100 year ARI event will result in overland flow occurring through lots. Therefore habitable floors are required to be at least 300 mm above the 100 year ARI flood or storage level at all locations. It is noted that this is unlikely to be an imposition on landowners as it is standard practice in this area for a 500 mm sand pad to be placed on-site prior to residence construction by local builders.

The swales will be bunded at regular intervals to ensure that they do not concentrate the flows. Where kerbing is required at roundabouts and intersections, soakwells may be used in conjunction with kerb openings.

Swales may be landscaped with appropriate native vegetation to ensure high nutrient control, low/no water usage and easy maintenance.

Figure 9 provides typical sections of road reserves within the Dolbys Drive Structure Plan area, showing the conceptual location of the roadside swales. To size the road reserve, two swale designs have been prepared depending on the contributing catchment size. Small swales have a top width of 4 m, whilst large swales have a top width of 7 m. Individual swale widths should be determined through preparation of Urban Water Management Plans at the time of subdivision.

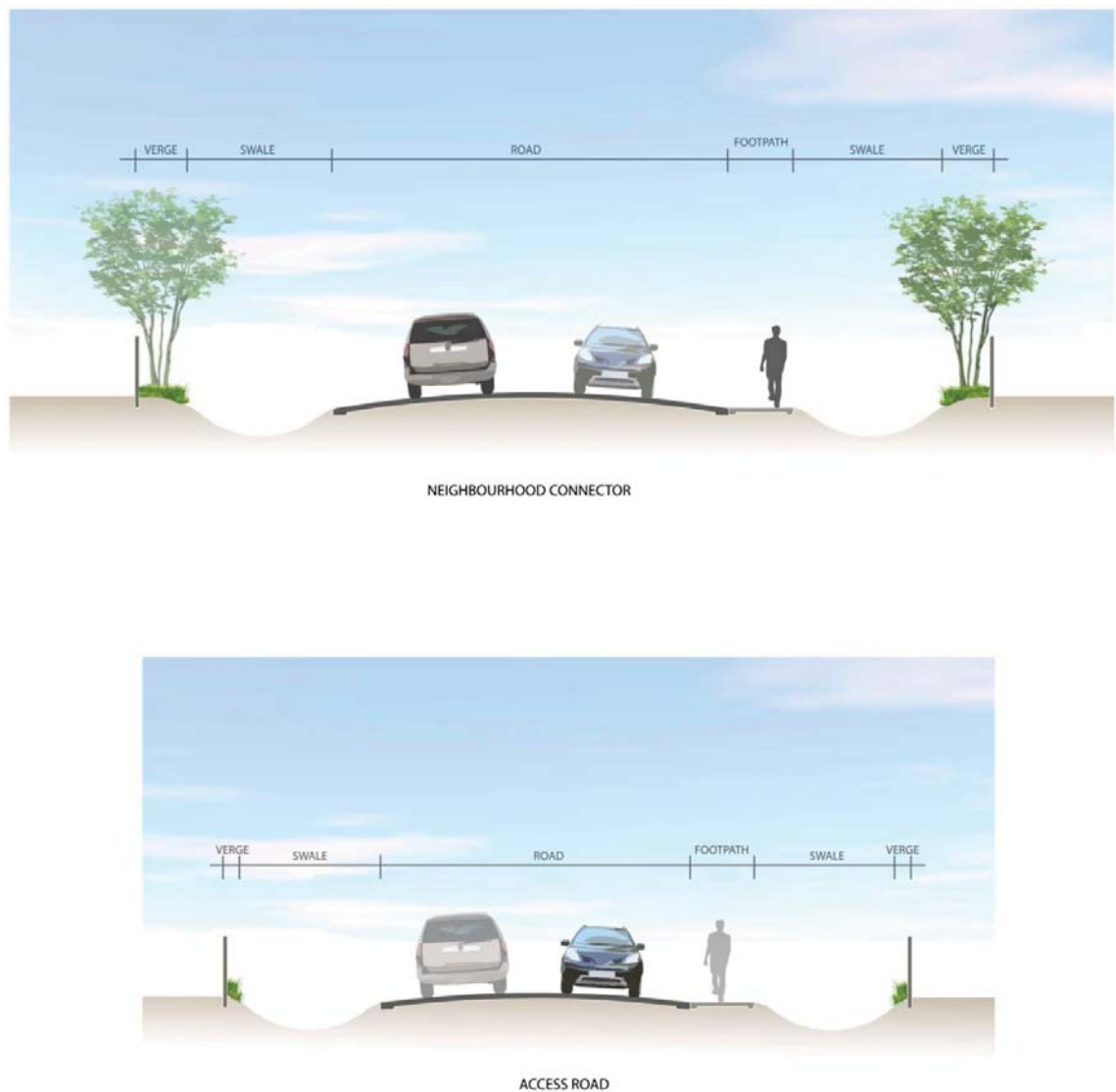


Figure 9 Roadside swales within indicative road cross sections

6.2.1 Dolby Creek

Model Setup

The two dimensional hydraulic model used for the existing scenario was modified to simulate the 10 and 100 year ARI post-development scenarios. The model consists of 2 m grids and modelling time step of 0.5 seconds. The model has one inflow boundary on the east and one outflow boundary on the west as shown in Figure 10. The inflow used for the model was described in Section 4.7.1. The outflow boundary has a constant water level is set at 35.7 m.

Culverts

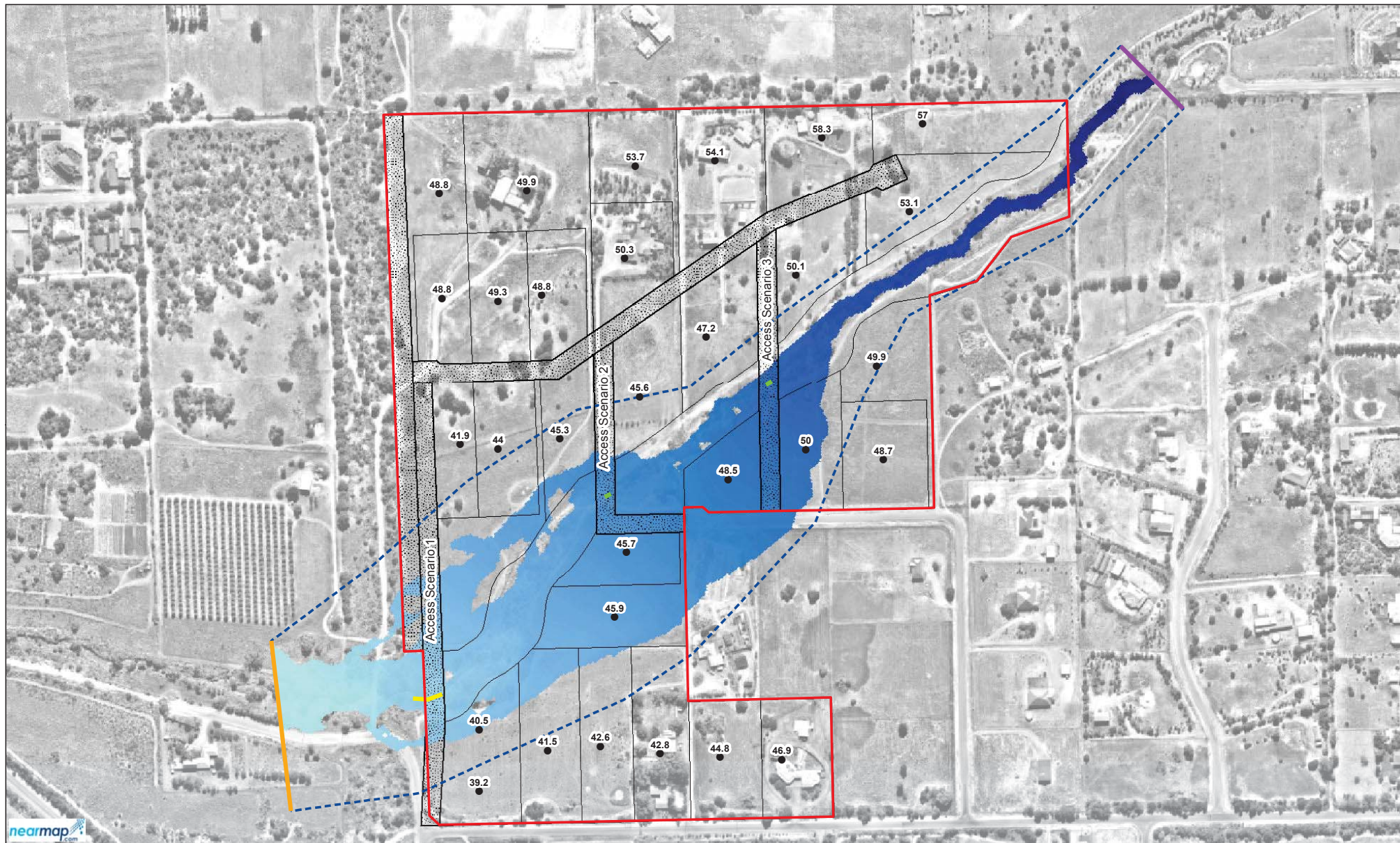
Culverts are being represented as one dimensional network in TUFLOW, which is linked to the 2D domain. Currently, there are two culverts that cross Dolby Creek. These culverts are combined with road floodways to convey flows exceeding the capacity of the culverts. If the western access road (Access Scenario 1) proceeds, it is proposed that a third culvert/floodway

will be built downstream of the two existing culverts, rendering the existing culverts redundant. To represent the worst case scenario, the model was simulated with all three culverts in place. Whichever crossing progresses, it is recommended that redundant culverts are removed to improve the hydraulic performance of the waterway and potentially lower flood levels.

To maintain similar flood levels and provide a 10-year ARI level of service, it is suggested to construct three circular culvert barrels with a diameter of 900 mm, under a floodway crossing with a capacity of 26 m³/s. The 10-year ARI level of service is adopted based on Main Roads WA standards for bridges and culverts, where wet serviceability of minor roads is defined as 200 mm of floodway flow in the 10-year ARI event. Further detailed analysis and design of any future Dolby Creek crossing will be required at UWMP stage to ensure that any impact on flood levels from the proposed culvert and floodway configuration is reflected in flood hazard mapping and finished floor levels.

Finished floor levels

The finished floor levels (FFLs) of each proposed lot was derived with the assumptions that sites that are likely to be inundated during the 100-year ARI event will be raised a minimum 300 mm above the maximum inundated level whereas sites that are not likely to be inundated will have a minimum FFL of 150 mm above the surrounding topography. The FFLs of each lot is shown in Figure 10.



Paper Size A3
0 15 30 60 90 120
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- Proposed development
- Proposed culvert
- Modelling extent
- Lots
- Road
- Existing culvert
- Outflow boundary
- Inflow boundary

Water level (m)
High : 57.794m
Low : 35.7m



Shire of Chapman Valley
Dolby's Drive Structure Plan LWMS
1 in 100 AEP
Post-Development Flood
Extent

Job Number 61-3302800
Revision 0
Date 31 Jul 2017

Figure 10

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Data source: Nearmap; Imagery, Extracted 31/07/2017 Captured 16/06/2017, Cadastre - 20160217; Roads - 20160217; GHD: Study Area - 20160217; Food Model; GHD, 2017. Created by: rskostabry

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6.3 Surface water quality management

The post-development water quality is to be maintained at pre-development levels (winter concentrations) and if possible, the quality of water leaving the development area is to be improved to maintain and restore ecological systems. To achieve this principle, the following criteria will be applied:

- Ensure that all surface and groundwater contained in the drainage infrastructure network receives treatment prior to discharge to receiving environment consistent with the Stormwater Management Manual for Western Australia (Department of Water, 2004- 2007).

Urban runoff is a significant source of nutrients and other contaminants that are discharged to the shallow aquifer. Runoff water quality from roads and other paved surfaces can be variable and is dependent on local soil types, land use and climate. Maintaining pre-development discharge rates and volumes from developed catchments is expected to prevent the majority of contaminants from reaching the receiving environment by ensuring that the majority of flows from high-frequency events are retained or infiltrated on site.

Provided that the initial flow of more significant events is subject to the same retention and treatment received by high-frequency events, surface runoff that occurs during more significant events represents a lower risk to water quality. This is because nutrients and other contaminants that represent a threat to water quality are typically transported within the 'first flush' of an event.

Managing water quality has been divided into categories: Structural measures and non-structural measures.

6.3.1 Structural measures

Use WSUD elements and best management practices (BMPs) promoting retention, infiltration and treatment of events up to the 1 year ARI events as close to the source as practical, in accordance with the Stormwater Management Manual for Western Australia (Department of Water, 2004- 2007).

The key WSUD element to be incorporated into the design of the development area is grassed swales, with infiltration as close to source as possible. Bunds within the drain will allow infiltration of the 1 year 1 hour event.

6.3.2 Non-structural measures

Nutrient control and landscaping

- Implement the swales relatively early to avoid temporary facilities and allow new vegetation to establish before housing construction of the developed lots is completed.

Sediment and litter control and construction management

- Require all development construction projects, including lot development, road and infrastructure construction, to implement sediment and erosion control measures.
- Ensure that drainage basins area cleared biannually to ensure functionality.

7. Groundwater management strategy

7.1 Groundwater levels

To ensure that existing groundwater levels are maintained, stormwater runoff will be infiltrated as close to source as practical using WSUD and BMPs. The specification for groundwater separation for residential lots greater than 800 m² is “no criteria, with the expectation that design of lots will include site specific consideration of appropriate levels of amenity” (IPWEA 2016). As such, this should be addressed at the UWMP stage. Where lots are 400 m² to 800 m², 300 mm of coarse sand will need to be applied to anticipated garden areas in the rear of lots above the 50% AEP phreatic surface.

7.2 Groundwater quality

The post development groundwater quality is to be maintained at pre-development levels (winter concentrations) and, if possible, the quality of water leaving the site is to be improved to maintain and restore ecological systems.

To ensure that existing groundwater quality is maintained, the quality of the stormwater infiltration to groundwater will be maximised by using WSUD and BMPs to ensure that stormwater is infiltrated as close to source as possible.

7.3 Impact on Groundwater Dependant Ecosystems

Since there is no groundwater dependent ecosystem (GDE) within or adjacent to the site and it is proposed to contain stormwater runoff within the site there will be no impact on GDEs.

7.4 Matters to be addressed in UWMPs

Infiltration testing should be carried out in conjunction with geotechnical investigations to confirm that the site is suitable for the proposed infiltration methods and to identify appropriate infiltration rates to enable further refinement of modelling at the UWMP stage, where required.

8. Implementation framework

As the Dolbys Drive study area features fragmented ownership it is anticipated that implementation of this local water management strategy will occur over extended time frames and on an ad-hoc basis, as development proposals are approved and constructed.

8.1 Monitoring

Surface water

Stormwater generated on site drains to Dolby Creek. Surface water quality monitoring is recommended at the upstream and downstream ends of Dolby Creek.

Monitor upstream and downstream; nutrients, physicals, heavy metals etc,

Groundwater

No groundwater level monitoring was conducted as part of this LWMS. There is no existing groundwater quality or level data for the site. As the proposed lot size is above 800 m² and this will not require separation from groundwater, no monitoring is proposed. (take reasons for no GW monitoring from GW section)

Exemption from groundwater monitoring should be discussed in consultation with the Department of Water. Where groundwater at the site is indicated to be within 5 m of ground level, it is recommended that site specific groundwater monitoring be undertaken to confirm local groundwater levels. This information will inform potential requirements for fill and will be required to design and assess operation of onsite effluent disposal systems.

Groundwater monitoring should occur prior to the preparation of UWMPs, where required, to confirm groundwater levels in the area.

8.2 Requirements for future planning and development

This local water management strategy provides guidance on water management within the Dolbys Drive study area.

Urban water management plans are not anticipated to be required to support development of single lots across the majority of the study area.

Urban water management plans may be required to support urban development where:

- Local Development Plans are required for vegetation protection areas as identified in the Dolbys Drive Local Structure Plan (Appendix A).
- Development is proposed that will significantly alter the hydrology or drainage of a site or is unable to meet the design criteria identified in Section 3.

Where an urban water management plan is required it should be consistent with the requirements of the Department of Water's *Urban water management plans: Guidelines for preparing plans and complying with subdivision conditions* (DoW 2008). The urban water management plan should demonstrate that water management within the subdivision will meet the objectives and criteria in the local water management strategy, except where alternative agreement has been reached with the Department of Water and the Shire of Chapman Valley.

8.2.1 Subdivision

Small scale subdivision should be undertaken in accordance with the structure plan and the objectives, strategies and design criteria in this local water management strategy. An urban water management plan will generally not be required unless the Department of Water or Shire of Chapman Valley require additional information to demonstrate compliance with this local water management strategy, or where proposed development may have an impact on significant resources.

Developers subdividing land for residential development are required to provide a stormwater drainage system. The drainage system should consider the total contributing catchment area, ensuring that the ultimate design is capable of carrying the ultimate design flow from the upstream catchment. Developers whose land shares a common drainage catchment have a shared responsibility for ensuring that the whole of the catchment, including roads, is drained.

8.3 Responsibilities

Table 4 sets out the roles and responsibilities for the actions outlined for the future planning for the development area. This strategy is based on the concept Dolbys Drive Structure Plan prepared by GHD in July 2016. Should the Structure Plan be altered, the LWMS will be reviewed.

Table 4 Roles and responsibilities

Role	Responsibility	Requirement and Period
Prepare an urban water management plan	Developer/ landowner if required	Prior to commencement of subdivision works.
Design and construction of surface drainage system demonstrating compliance with this LWMS	Developer	Prior to commencement of subdivision works. Maintain infrastructure for a minimum of 2 years after practical completion, until successful handover to Shire of Chapman Valley.
ATU's/rainwater tanks: <i>Requirements</i>	Shire of Chapman Valley	Ensure lots meet requirements relating to ATUs and rainwater tanks
ATU's/rainwater tanks: <i>Implementation and maintenance</i>	Developer/ landowner	Ensure onsite water and wastewater infrastructure is installed by a licensed contractor and appropriately maintained.
Structural control compliance	Shire of Chapman Valley after practical completion	Drainage structures to be cleared biannually for a period of two years from practical completion and monitored to ensure functionality
Non-structural controls <i>Land use and management</i>	Developer	Sediment and erosion control during construction
Non-Structural Controls: <i>Public awareness</i>	Shire of Chapman Valley	Sustainability information packs, including educational information

<i>campaigns</i>		regarding non-structural control measures, such as fertiliser application, native gardens, herbicide use, weed control and waste management, to be provided at settlement.
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9. References

- Australian Government (2004) *Guidance on Use of Rainwater Tanks*
- Department of Health (2010) *Code of Practice for the Reuse of Greywater in Western Australia* 2010, Perth
- Department of Health (2011) *Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs)*, Perth
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- ENV & Essential Environmental (2014), *Greater Geraldton Water Planning and Management Strategy*, prepared for the City of Greater Geraldton, November 2013, updated by City of Greater Geraldton January 2014
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- GHD (2014) *Dongara – Port Denison District Structure Plan District Water Management Strategy*, Report for Shire of Irwin, October 2014
- Institute of Public Works Engineering Australia (IPWEA) (2016) *Specification separation distances for groundwater controlled urban development*, prepared by the Land development in groundwater constrained landscapes Steering Group, Version 2 February 2016
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- (WAPC) Western Australian Planning Commission (2008a) *Better Urban Water Management*, Perth
- (WAPC) Western Australian Planning Commission (2008b) *Shire of Chapman Valley Local Planning Strategy*, Perth (unpublished)

Appendices

Appendix A – Dolbys Drive Structure Plan and Northern Geraldton District Structure Plan

RECOMMENDATIONS

COASTAL

- (R1)** Coastal Foreshore Reserve / Setback subject to more detailed assessment of Local Structure Planning stage in accordance with SPZ 2.
- (R2)** Promote showrooms along road frontages with warehouse type uses on larger lots located closer to Waste Water Treatment Plant. No development or subdivision to take place within the West Business Area until a development guide plan is prepared and endorsed by the State and WAPC.
- (R3)** Future High School site to incorporate existing remnant vegetation for conservation purposes. This vegetation forms part of a green linear link to extend south through mixed use and district centre sites.
- (R4)** Investigate the possibility of linking the coastal access road between Whiplash Road and the new part of Drummond Cove in the vicinity of the existing park.
- (R5)** This area is subject to further community consultation and planning to determine the potential for the retention of bushland values based on current household arrangements and to resolve other related development issues.
- (R6)** This area is proposed to be developed in the medium term for residential purposes. A Local Structure Plan will be required to be endorsed by the State of Chapman Valley and the WAPC over this area prior to any development taking place. There will be a need to provide appropriate linkages to the north and south ensuring an integrated pattern of development.
- (R7)** The area will be developed in the long term for the purpose of single lot urban and low rise type uses. There may be a need for lower density development along the northern edge of the Buller Locality. A neighbourhood centre, an adjacent mixed use area and government primary school may be developed in this area, depending on demand being established for these uses. An integrated Local Structure Plan will be required to be endorsed by the State of Chapman Valley and the WAPC over this area prior to any development taking place.
- (R8)** The area comprises an existing dune / coastal area that will require detailed assessment to determine land capability for road (proposed coastal access road) and house construction that will include (but not be limited to) investigation of past dune movements.
- (R9)** Outcrop Included Buffer Area.

GLENFIELD

- (R10)** The area is not a special residential zone. For this reason, a residence should not be approved as an incidental use. Uses other than a residence will need to demonstrate compatibility with a residential environment. Commercial uses (such as fast food outlets, showrooms, off licence convenience stores and shops) would not be permitted. Development objectives, preferred land uses and development standards will be determined through a Special Use zoning.
- (R11)** Main Roads approved intersection point with North West Coastal Highway.
- (R12)** This is the preferred location for an intersection with North West Coastal Highway. Main Roads approval is still required to confirm the suitability of this intersection location. In this report, Main Roads will undertake a traffic study to determine the location of new Main Roads approved intersections and the future design and signage requirements for all Main Roads approved intersections along the Broad North West Coastal Highway route through Greater Geraldton.
- (R13)** Alexander Road and proposed north-south local distributor road to be designed with various traffic calming devices and associated localised POS to ensure these roads do not detract from the function of Chapman Road and North West Coastal Highway.
- (R14)** The development of a private school, government primary school and church are dependent on future occupation of land by private educational institutions/religious organisations and the WA Department of Education and Training.
- (R15)** A minimum lot size of 2000m² will be required along land adjoining Chapman Road and Alexander Road, as shown on the District Structure Plan. Any subdivision Plan would need to show building envelopes that delineate setback dwellings from Chapman Road and the North West Coastal Highway to protect the residential amenity of the area.
- (R16)** All landowners within the Glenfield Structure Plan Area will be required to contribute 10% public open space to meet for local use. Where a landowner is required to contribute more than 10% of land to POS in accordance with the District Structure Plan, then the owner will be duly compensated for the land value in excess of 10% from cash or in-kind contributions from other owners within Glenfield Structure Plan Area.

RURAL RESIDENTIAL AND CREEKLINE

- (R17)** No subdivision is to be approved until Local Structure Plans have been endorsed by Council and the WAPC. The Local Structure Plans are to be supported by a visual impact assessment in terms of the Moresby Range.
- (R18)** There is a need for a buffer or foreshore reserve (where adjoining residential development) on both sides of the creek line. The actual width of the buffer or reserve is to be determined through individual site survey in the manner outlined in Section 4.7.4 of the NGOSP Report. As a guide the buffer or reserve should be in the order of 30m on both sides of the river (ie 60m).
- (R19)** The Waggrakine Rural Residential Structure Plan needs to be finalized before subdivision can occur. Retention of remnant vegetation, revegetation and a conservation signed bufferline for any planning purposes that will be incorporated into that structure plan. The State will also investigate the merits of a "Conservation through Subdivision" scheme for the area, whereby subdividers would contribute towards a fund to purchase particular areas containing remnant vegetation in the locality.
- (A)** As a guide a lot size range of 1.5ha to 4ha is recommended in Area A.*
- (B)** As a guide a lot size range of 1ha to 3ha is recommended in Area B.*

NORTHERN WHITE PEAK AND RIVER

- (R20)** The Rural Small Holdings Area reflects the existing land use and subdivision pattern and as such there is a general presumption against further subdivision. Re-evaluating this, any future development (such as dwellings or small buildings) and/or subdivision proposals, if justified, are to be supported by a visual impact assessment in terms of the Moresby Range.
- (R21)** There is a preference for a Service Station/Roadhouse/Track Stop to be located at the North West Coastal Highway / Outcrops intersection further north of the Study Area.
- (R22)** There is a need for a buffer or foreshore reserve (where adjoining residential development) on both sides of the river. The actual width of the buffer or reserve is to be determined through individual site survey in the manner outlined in Section 4.7.4 of the NGOSP Report. As a guide the buffer or reserve should be in the order of 50m on both sides of the river (ie 100m).

WAGGRAKINE URBAN

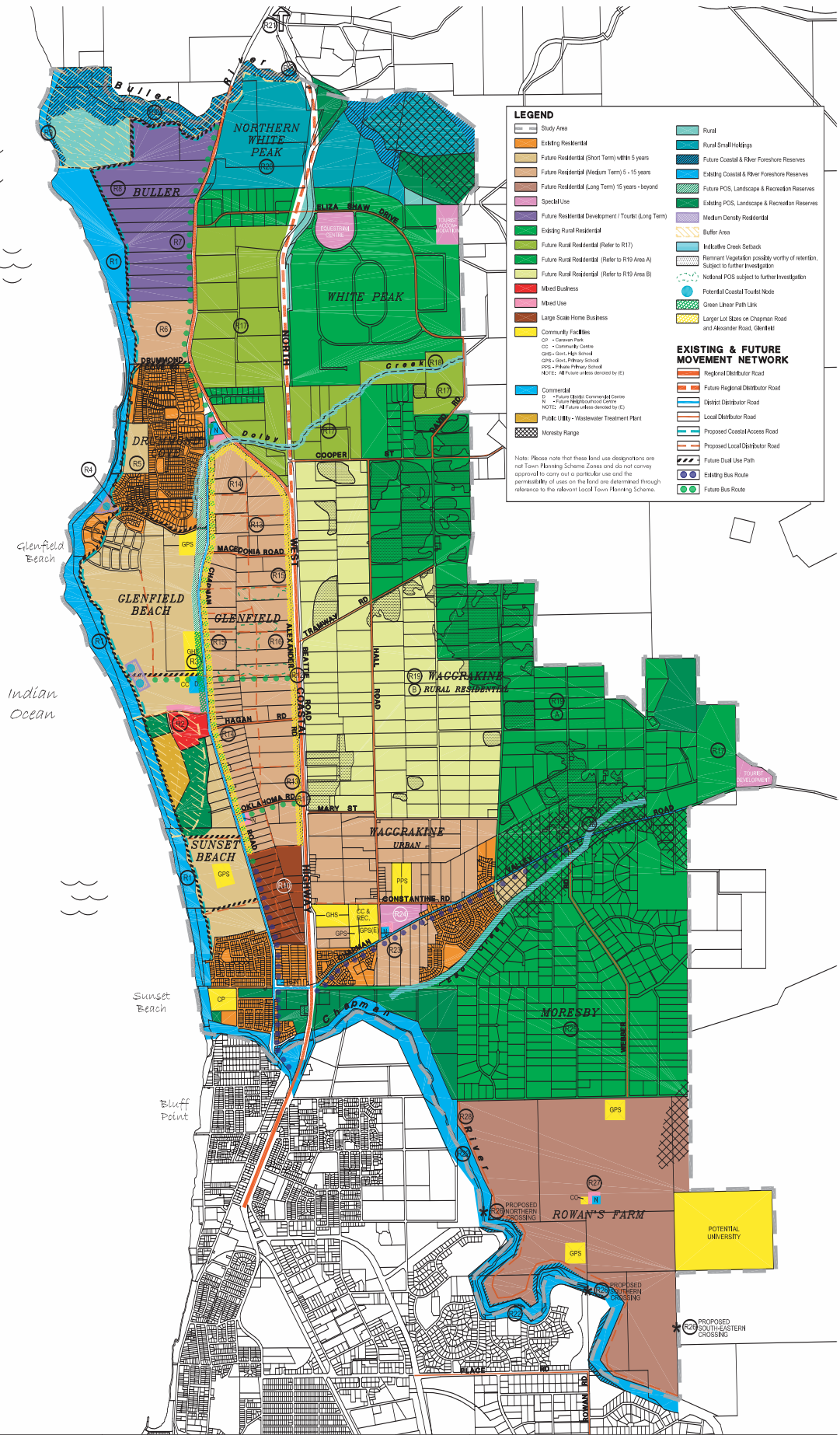
- (R23)** Access to the neighbourhood centre and mixed use sites will be restricted to Hull Road. Any development application lodged for the site would need to address the intersection treatment at Chapman Valley Road/Hull Road.
- (R24)** The development objective for this site is to provide a central focus area for the Waggrakine Urban area that would need to be compatible with adjacent residential and commercial uses. Planning for the site would need to be determined through a Special Use Zone under Draft State of Greenough Town Planning Scheme No. 3 that would specify development objectives, preferred land uses and development standards. Generally, any future development and subdivision are would need to promote an integrated design, suitable development treatments (landscaping, building appearance and location of parking) along the Chapman Valley Road frontage and appropriate access arrangements. The Draft Waggrakine Global Development Scheme will need to be amended to reflect the development guidelines and land use intentions for the site.

MORESBY

- (R25)** Any infill subdivision in Moresby would be assessed according to its integration within the existing subdivision design and there would be a presumption against further subdivision.

ROWAN'S FARM

- (R26)** The southern and northern crossing options have been identified to provide alternative convenient access to the Geraldton City Centre for residents northeast of the Chapman River. The preferred option is to be determined through further analysis (including traffic modelling) by the State of Greenough, City of Geraldton and Moresby Roads prior to subdivision. The south eastern crossing would be outside the Study Area but has been identified as a possible future local access road.
- (R27)** The location of the local distributor road linking Webber Road and the future Chapman River Crossing is to be determined as part of the Local Structure Plan.
- (R28)** Location of the road is dependent on the final width of the river foreshore and is to be determined through a Local Structure Plan.



LEGEND

- Study Area**
- Existing Residential**
- Future Residential (Short Term) within 5 years**
- Future Residential (Medium Term) 5 - 15 years**
- Future Residential (Long Term) 15 years - beyond**
- Special Use**
- Future Residential Development / Tourist (Long Term)**
- Existing Rural Residential**
- Future Rural Residential (Refer to R17)**
- Future Rural Residential (Refer to R19 Area A)**
- Future Rural Residential (Refer to R19 Area B)**
- Mixed Business**
- Mixed Use**
- Large Scale Home Business**
- Community Facilities**
 - CP - General Park
 - CC - Community Centre
 - GHS - High School
 - GHS - High School
 - PHS - Primary School
 - PHS - Primary School
 - PHS - Primary School
 - PHS - Primary School
- Public Utility - Wastewater Treatment Plant**
- Morosity Range**
- Rural**
- Rural Small Holdings**
- Future Coastal & River Foreshore Reserves**
- Existing Coastal & River Foreshore Reserves**
- Future POS, Landscape & Recreation Reserves**
- Existing POS, Landscape & Recreation Reserves**
- Medium Density Residential**
- Buffer Area**
- Indicative Creek Setback**
- Remnant Vegetation possibly worthy of retention. Subject to further investigation**
- National POS subject to further investigation**
- Potential Coastal Tourist Note**
- Green Linear Path Link**
- Larger Lot Sites on Chapman Road and Alexander Road, Glenfield**
- EXISTING & FUTURE MOVEMENT NETWORK**
 - Regional Distributor Road**
 - Future Regional Distributor Road**
 - District Distributor Road**
 - Local Distributor Road**
 - Proposed Coastal Access Road**
 - Proposed Local Distributor Road**
 - Green Dual Use Path**
 - Existing Bus Route**
 - Future Bus Route**

Note: Please note that these land use designations are not Town Planning Scheme Zones and do not carry approval to carry out particular use and the permissibility of uses on the land are determined through reference to the relevant Local Town Planning Scheme.

DATE	NO.	ACTIVITY - REVISION DESCRIPTION	DES	DRN	CHD	APPD	DATE	NO.	ACTIVITY - REVISION DESCRIPTION	DES	DRN	CHD	APPD	DATE	NO.	ACTIVITY - REVISION DESCRIPTION	DES	DRN	CHD	APPD
16.12.25	A	Modification as requested by Steering Committee (Nov 2025)	ADN	SB	LVE	LVE	20.06.05	C	Additional notes added to legend	ADN	SB	ADN	LVE	25.10.05	E	Alteration made as requested by DPF	LVE	SB	ADN	LVE
13.06.05	B	Additional notes added to legend	ADN	SB	ADN	LVE	27.07.05	D	Additional changes as requested by DPF	LVE	SB	ADN	LVE	03.11.05	F	Illustration to POS text block	LVE	SB	ADN	LVE

NORTHERN GERALDTON DISTRICT STRUCTURE PLAN

DISTRICT STRUCTURE PLAN

WESTERN AUSTRALIAN PLANNING COMMISSION

This drawing has been prepared in accordance with the BSD Quality Management System.

SCALE:



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Project Number
P04016

Drawing Number
P759-SK01

Revised
G A1

Designed ADW
Checked LVE
Approved LVE
Local Authority Geraldton, Greenough, Chapman Valley 1

Date 10.02.05
Sheet 01
1

Appendix B – 5 Star Plus Building Standards



5 Star Plus

A New Standard in Sustainable Housing



paying our part in building better communities for Western Australia

MESSAGE

from the Minister



I am delighted to introduce 5 Star Plus – a new standard for sustainable housing in Western Australia.

We all are concerned about global climate change and we all have a role to play in addressing this problem and working towards a sustainable future.

Each time we use water and energy in our homes we contribute significantly to the production of greenhouse gas emissions.

We can act now to minimise our impact on the environment by adopting simple conservation measures such as fitting a water efficient shower head, installing a solar or 5 Star gas hot water system or providing an adequate level of insulation in our homes.

5 Star Plus is a State Government initiative designed to improve the energy and water efficiency of our homes. It is based around two new Codes: the **Energy Use in Houses Code** and the **Water Use in Houses Code** that will be mandatory for new homes approved after 1 September 2007.

The Codes can also be used as a guide by existing homeowners seeking to improve their water and energy efficiency.

As well as helping to save our environment and reduce greenhouse gas emissions, 5 Star Plus will also provide cost savings in household energy and water bills.

I am certain that the immediate and long-term benefits of 5 Star Plus will be appreciated by Western Australians, now and for generations to come.

A handwritten signature in dark ink that reads "Michelle Roberts". The signature is fluid and cursive.

Hon Michelle Roberts MLA
Minister for Housing and Works

5 Star Plus

Playing our part in building better communities for Western Australia

5 STAR PLUS – What Is It?

The Western Australian Government is committed to developing sustainable housing throughout the State.

In May 2006, Western Australia adopted the minimum 5 Star energy efficiency provisions of the **Building Code of Australia** (BCA) for all new homes. Known as 5 Star, the provisions encourage better design resulting in environmental benefits such as reduced energy consumption and real savings in heating and cooling.

5 Star Plus is a simple and effective way to ensure that our homes are minimal in their impact on the environment

5 Star ensures that new houses in Western Australia meet minimum standards for energy efficiency by including requirements such as:

- wall, roof and floor insulation;
- appropriate size, type, orientation and shading of windows;
- controlling draughts to reduce the loss of warm or cool air;
- the use of ceiling fans and innovative ventilation systems to create ample air movement; and
- insulating hot water pipes and air-conditioning ductwork.

Now the Government has gone further and introduced 5 Star Plus – that builds on the energy efficiencies of 5 Star and adds the benefits of water reduction measures for homes right across the State.

USING AN EFFICIENT SOLAR WATER HEATER
INSTEAD OF AN ELECTRIC SYSTEM SAVES
AROUND FOUR TONNES OF CARBON DIOXIDE
EMISSIONS PER ANNUM WHICH IS AS MUCH AS
AN AVERAGE LARGE CAR PRODUCES IN A YEAR.



did you know?



5 STAR PLUS

As from 1 September 2007 the new 5 Star Plus standards will be introduced to build on the energy efficiency benefits of 5 Star. These new standards will for the first time also address the issue of water efficiency in homes.

5 Star Plus is based around two new Codes:

energy

The **Energy Use in Houses Code** confirms the existing 5 Star provisions for house design and construction, and adds requirements for energy efficient water heating that reduces greenhouse gas emissions.

To comply with the Code a building must be designed and constructed to meet minimum 5 Star energy efficiency standards under the Building Code of Australia.

The Code also requires a minimum standard of hot water system such as:

- a solar hot water system;
- a 5 Star rated gas hot water system; or
- a high energy efficient electric heat pump.



building better communities for M

did you know?

5 STAR PLUS SAVES MONEY AND THE ENVIRONMENT

INSTALLING 5 STAR PLUS WATER EFFICIENCY
FEATURES IN YOUR NEW HOME CAN SAVE MORE
THAN 100,000 LITRES PER YEAR. THIS IS
EQUIVALENT TO 2.5 BACKYARD SWIMMING POOLS.



The **Water Use in Houses Code** aims to reduce the consumption of water in houses.

From 1 September 2007 all new houses must ensure:

- 3 or 4 Star rated water efficient fittings and fixtures are fitted; and
- all hot water outlets in new homes be located close to the hot water system or a recirculating hot water supply to minimise wastage of energy and water.

In addition, all homeowners installing a new outdoor swimming pool must ensure that it is fitted with a cover to reduce water evaporation.

During 2008 the Code will also require:

- new homes be plumbed so that they can be connected to an approved alternative water supply at a later date (an alternative water supply may include water tanks, bore water and third pipes).
- new homes on suitable lots be plumbed to enable connection at a later time to a grey water diversion system (grey water is the water that comes from your shower and laundry);
- new homes with a high water demand for landscaping have an approved alternative water supply for appropriate non-potable use; and
- new homes with a high water demand for internal use have an approved alternative water supply for appropriate non-potable use.



water

While 5 Star Plus is mandatory for new homes built after 1 September 2007, existing homeowners can also use these Codes to improve energy and water efficiency in their homes.

5 STAR PLUS

Frequently Asked Questions

Q. What is 5 Star?

A. 5 Star is the standard for energy efficiency in houses required under the Building Code of Australia.

Q. What is 5 Star Plus?

A. 5 Star Plus is a new standard for sustainable housing in Western Australia that will improve water and energy efficiency in homes. It is based around two new codes: the Water Use in Houses Code and the Energy Use in Houses Code.

Q. How does it affect me?

A. If you are planning to build a new home after 1 September, 2007 you will need to comply with the new 5 Star Plus provisions. This means that you will need to ensure that you and your builder adopt the provisions of the new Codes as outlined in this brochure in the design of your home.

If you are an existing homeowner you do not need to comply with 5 Star Plus, however you can use the Codes to improve energy and water efficiency within your home through your choice of appliances such as solar hot water systems, 5 star rated gas hot water systems and water saving shower heads.

Q. Will it cost me more to build a house?

A. Most progressive builders are already incorporating most of the 5 Star Plus measures into the homes they design and build such as water efficient taps, shower heads and toilets and even solar hot water systems. 5 Star Plus now locks in these measures as the minimum standard for housing.

Q. Will 5 Star Plus result in more 'red tape'?

A. Definitely not. One of the key advantages of 5 Star Plus is that it can be quickly and easily implemented into the existing building regulations and approvals processes.

Q. What are the benefits of 5 Star Plus to me?

A. Implementing 5 Star Plus in your home will result in lower water and energy bills to the householder. For example, by switching from an electric hot water system to a solar hot water system, and using an efficiently controlled booster, you can reduce your hot water bills by up to 75% in Perth per annum. This can add up to thousands of dollars saved over the lifetime of the system.

Q. What are the other benefits?

A. Not only will you have lower water and energy bills but you will also be helping the environment by reducing greenhouse gas emissions and conserving our precious water resources.

For example by installing a water efficient dual flush toilet you can save up to 30,000 litres of water per annum. By using a cover on your swimming pool, you can save more than the entire volume of water in your pool that is lost through evaporation in a year.

Appendix C – Waterwise Criteria



Guidelines for waterwise homes and gardens criteria

With the implementation of mandatory minimum water efficiency requirements for all new homes, through the [Building Codes of Australia](#), the benchmark has been set. Therefore the use of fittings and fixtures better than those mandated, the use of water saving technology, alternate water supplies and waterwise garden design have become increasingly important for those wishing to raise the bar in terms of household water efficiency.

Properties that showcase water efficiency both inside and outside the home typically have the following water saving features incorporated (see [Attachment 1](#) for detailed descriptions).

Inside:

- Showerheads installed are better than the minimum mandated WELS 3 Star (9 Litres per minute).
- Taps installed are better than the minimum mandated WELS 4 Star (6 Litres per minute).
- Dual flush toilets installed are better than the minimum mandated WELS 4 Star (Average 3.5 Litre flush).
- Water using appliances installed are rated WELS 4 Star or better.

Outside:

- Garden design incorporates waterwise or endemic plant species and includes a functional mix of paved areas, garden beds and lawn.
- Only use turf species endorsed by the UWA Turf Industries Research Steering Committee ([Attachment 2](#)).
- Improve the soil prior to planting and laying down lawn.
- Garden beds are mulched to a minimum of 5cm with Smart Approved WaterMark mulch certified to Australian Standard AS4454.
- The irrigation system has been installed to Irrigation Australia Ltd Standards ([Attachment 3](#)).



Attachment 1

Detailed Criteria for Waterwise Homes

Water Saving Features

INSIDE

Please refer to the [Building Codes of Australia](#) for mandated standards.

- Showerheads installed should be better than the minimum mandated WELS 3 Star (9 Litres per minute).
- Taps installed should be better than the minimum mandated WELS 4 Star (6 Litres per minute). Consider the following:
 - Aerators - reduce flow, reduce splash, improve wetting.
 - Spring-loaded controls - prevents running taps.
- Dual flush toilets installed should be better than the minimum mandated WELS 4 Star (Average 3.5 Litre flush).
- Baths are low volume and small surface area.
- Spas are not encouraged.
- Hot water system should be located less than the minimum mandated 20m from points of use and / or a recirculation or heat pump system is installed. Consider the following:
 - Group fixture relative to their need for heated water,
 - Multiple water heaters
 - Pipe work configuration (i.e. where to branch off for off-takes) and lagging pipes for insulation.
- Pressure control - consider the installation of a pressure control device to regulate water pressure to a maximum of 35 metres. High pressures contribute to poor water efficiency; pipe leakage, dripping taps, etc.
- If evaporative air conditioners are installed use models with an auto dump triggered by salinity rather than the continuous discharge type. Provide advice to future homebuyers on the appropriate use of an evaporative air conditioner to limit water wastage.
- Water using appliances installed, such as washing machines and dishwashers should be rated WELS 4 Star or better.

To determine the star rating for products visit the [WELS](#) website and search by brand name and product.



OUTSIDE

- Garden design should incorporate waterwise or endemic plant species and includes a functional mix of paved areas, garden beds and lawn. Use the Waterwise Plants for WA directory on the Corporation's website to find waterwise plants suitable for regions throughout WA.
- Plants should be grouped according to their water needs (hydrozones) and garden beds should be densely planted where appropriate to maximise irrigation effectiveness, and appearance.
- Only use turf species endorsed by the UWA Turf Industries Research Steering Committee ([Attachment 2](#)). Lawn areas should be minimised and verges planted with waterwise plants instead of turf.
- Soil in the garden and lawn areas should be improved prior to planting. Improved soils retain more moisture around the root zone longer, soils improved with soil conditioners certified to AS4454 are recommended to a minimum depth of 150mm to lawn areas and 300mm for garden beds.
- Mulches dramatically reduce surface evaporation, and break down to improve the moisture holding capabilities of the soil. Garden beds should be mulched to a minimum of 5cm with Smart Approved WaterMark mulch certified to Australian Standard AS4454.
- Windbreaks; artificial (fences, walls, pergolas) or natural (mounds, shrubs, trees) should be used to reduce irrigation losses and protect plants from heat and stress as wind is a significant element in evaporation and transpiration.
- The irrigation system should be installed to Irrigation Australia Ltd Standards ([Attachment 3](#)).

Garden beds should:

- Use dripper systems or subsurface irrigation, or if overhead watering is required, use large drop sprinklers. The use of microsprays is not encouraged due to their poor efficiency rating.

Lawn areas (if not watered by greywater) should:

- Use sprinklers with coarse drop sprays (e.g. MP rotators) to minimise evaporation.
- Have spray patterns and layouts which minimise overspray.
- Have sprinkler placements which optimise water distribution.
- Not have different types of sprinklers on the one watering station.



Irrigation:

- Irrigation system should be sufficiently sophisticated to allow:
 - Separation of zones.
 - No watering station to service more than one hydrozone.
 - No watering station to service more than one style of sprinkler.
- Controller to be set to apply the "Standard Drink" (10mm) per watering period.
- Controller set to comply with permanent watering rosters as defined on the Water Corporation's website
- Controller is adjusted to water according to the seasons (i.e. turned off during the Winter Sprinkler Ban, reduced during autumn and spring)
- Irrigation system includes a rain sensor or soil moisture sensor that is connected to the irrigation controller and designed to shut off the automatic system when it rains.
- Alternate non-potable water supply sources should be considered:
 - Rainwater tanks should be plumbed in to the house and utilised to flush toilets and/or for washing machine use.
 - Grey water re-use systems should be plumbed in to the house and utilised to flush toilets and/or water the garden.
 - In areas deemed suitable for a bore by the Department of Water, garden bores should be installed and used to water the garden in accordance with the permanent water efficiency measures.

OTHER

- Affordability – demonstrates the ability to save water without compromising the cost of the development, or ongoing maintenance and/or running costs (including energy).
- Waterwise aesthetics.
- Plants and lawn in good health, none dead.
- No large water features installed, especially in full sun.
- Pool blanket on the pool, not on the roller.
- Property showcases a range of water efficiency options available for both inside and outside the home.

Attachment 2

UWA Turf Water Use Research Project

Turf Types Demonstrating Water Efficient Characteristics
(when tested at UWA Turf Research Site Shenton Park, updated May 2014)

Scientific name	Common name	Cultivar or selection
<i>Cynodon dactylon</i>	Couch or Bermuda grass	Wintergreen Windsor Green CT-2 Note: others were not tested.
<i>C. dactylon</i> x <i>C. transvaalensis</i>	Couch hybrid or Bermuda grass hybrid	Santa Ana
<i>Paspalum vaginatum</i>	Saltene or Seashore Paspalum	
<i>Stenotaphrum secundatum</i>	Buffalo or St. Augustine grass	Traditional-style and soft- leaf types
<i>Pennisetum clandestinum</i>	Kikuyu grass	
<i>Zoysia japonica</i>	Zoysia grass (may be referred to by growers as Empire Grass, or Empress Grass)	



Attachment 3

Irrigation Australia Limited (WA Region) Standards for Domestic Irrigation Installation

1. Activities Prior to Commencement

Prior to commencement of a domestic irrigation installation, the Irrigation Contractor shall:

- 1.1 Conduct a flow test, using a 'Flow and Pressure Testing device' and record the flow/s at the appropriate pressure/s recommended by the manufacturers of the components of the irrigation system.
- 1.2 Present to the Client a written quotation detailing all works and activities that will be conducted.
- 1.3 Present the client with a design of the proposed irrigation system.

2. System design and components

Irrigation system design and product selection shall comply with appropriate Australian Codes and standards and conform to the manufacturer's recommendations for the products used. These include:

- 2.1 System design to be according to the flow test results in 1.1 (above) with individual station demand (at the manufacturer's recommended operating pressure) no greater than the tested flow. Where station demand is less than the tested flow a pressure regulating device/s must be installed where such is required to ensure operation to manufacturers' recommended operating pressure.
- 2.2 Pipe will be sized to ensure water velocity does not exceed 1.5 metres per second at design flow.
- 2.3 Sprinklers shall be spaced at no more than the radius of throw specified by the manufacturer's recommendations.
- 2.4 Sprinklers shall operate at the manufacturer's recommended operating pressure.
- 2.5 Mainlines shall be minimum PN9 PVC, PN8 polyethylene or other appropriate material of no lesser pressure rating; pipe under live mains pressure should be minimum PN12 rating or as otherwise specified by Water Corporation regulations.
- 2.6 Valves under live mains pressure shall be Water Corporation approved 'tested' valves.
- 2.7 Sprinklers on any station shall be fitted with matched precipitation nozzles.
- 2.8 Part-Circle Sprinklers shall be used in locations where they will prevent wasteful overspray.
- 2.9 Where an irrigation controller is installed to operate stations of different water requirements it shall be a minimum three-program controller and must be programmable to comply with Water Corporation and Department of Water guidelines or restrictions.



3. Installation of the system

The installation of the irrigation system shall be conducted to meet the requirements of applicable statutory regulations, including backflow prevention:

- 3.1 The Client shall be advised of all installation work that, as a requirement of law, will be completed by a licensed tradesperson.
- 3.2 Master solenoid valves shall be used when connecting to scheme water supply and when installing more than two station valves.
- 3.3 Solenoid wires shall be buried under pipework. Where wires do not run with such pipework they should be placed in electrical conduit.
- 3.4 A colour code for solenoid wires shall be used, black for "Common" wires, red for 'Master Valve' control wires and white for 'spare' wires. Spare wires shall be taped (or otherwise waterproofed) at their field termination point. Station valves shall be installed with cable colours other than those listed. Wire from each valve to the controller shall be one single colour.
- 3.5 Solenoid wire connections shall be made only at valve boxes and a minimum 300mm loop of wire left at each valve for ease of service.
- 3.6 Solenoid wire connections shall be either crimped or soldered and covered with heat shrink material or made with gel-filled or silicone grease type electrical cable connectors made for this purpose.
- 3.7 All pipework shall be buried other than where expressly stated.
- 3.8 Mainline and lateral piping shall be buried to the minimum recommended cover of 150mm.
- 3.9 Low Density poly pipe shall be secured at all connections by ratchet clamps or other device according to manufacturer's specifications.
- 3.10 All valves shall be located in valve boxes designed for this purpose, the lid thereof to be no higher than surrounding material.
- 3.11 All systems shall have a minimum of 150mm of pipe either side of valve to enable service removal of valve and replacement without major disruption.
- 3.12 All irrigation stations should be established to water areas of similar demand (hydrozones).



4. Completion and handover

- 4.1 At the completion of the work the site is to be left in neat and tidy state.
- 4.2 The Irrigation Contractor shall perform a system "hand-over", including a working demonstration of all functions of the irrigation controller. The installer is to install a program (compliant with current Water Corporation and Department of Water regulations and recommendations) and explain same to the client.
- 4.3 The Client shall be given a recommended watering schedule for peak demand, with recommended seasonal reduction (as a percentage of maximum) detailing all stations (with description of each) plus an estimated P.R. (Precipitation Rate) for each station.
- 4.4 If the installed controller requires a battery, a battery of the type recommended by the manufacturer is to be supplied and installed by the Irrigation Contractor prior to hand-over.

5. Warranty

- 5.1 The Irrigation Contractor to specify a minimum one-year warranty on all parts and labour.

6. General

- 6.1 Where any variations from these standards have occurred the Irrigation Contractor will provide detail of these, and the requirements for the changes, to the client as well as a clear indication that such changes do not comply with the "Standards for Domestic Irrigation Installation" of Irrigation Australia Ltd (WA Region).

Disclaimer:

The Standards for Domestic Irrigation Installation have been developed by members of Irrigation Australia Ltd's Western Australian region. These Standards have been designed for use in Western Australia and are based on current knowledge and practice at the time of the preparation of this material (October 2002, Revised 2007).

These Standards are issued as a guide only. Their use is of a voluntary nature and the IAL is not liable for any loss, injury, damages, costs or other consequences of any kind that result from their use. All persons conducting or procuring domestic irrigation installation should comply strictly with the manufacturer's recommendations for the use and installation of equipment. The IA reserves the right to modify, add to or delete Standards prescribed herein at any time.

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Appendix D – Groundwater bore fact sheet



Government of **Western Australia**
Department of **Water**

Reprinted reference

Water facts WF12

Bore water use in Perth gardens

See back cover for information on reprinted reference materials and contact details

Looking after all our water needs

Water facts 12



WATER AND RIVERS COMMISSION AUGUST 1998

Bore water use in Perth gardens

People in most areas of Perth are able to draw on shallow groundwater by sinking private bores.

Each year in Perth, about 70 million kilolitres of high-quality household scheme water is used on Perth's gardens. This is more than the entire contents of Mundaring weir. Instead of using scheme water, many people use shallow groundwater pumped from their own bores to water their gardens.

Perth's groundwater resources

The Swan Coastal Plain, upon which Perth is situated, is covered by a veneer of sediments, particularly sand and limestone. These sediments have been deposited over thousands of years by water and wind. The superficial sediments extend to a depth of about 100 metres (average 50 metres) over the top of older and often less permeable sediments. Rainwater percolates into the superficial sediments and accumulates as groundwater.

Shallow groundwater is an important source of water for Perth's scheme supply and is also extracted through bores for watering private gardens, parks, sporting areas and market gardens.

A distinguishing characteristic of the shallow groundwater that we draw upon for garden watering is that it is generally at the same pressure as the atmosphere. This means that most householders can dig down several metres into the sand to reach the top of the saturated soil, called the watertable, but then must lift the water up to the surface for use. Perth's early settlers lowered a bucket on a rope but most people now have electric pumps to draw the water up. In contrast, deeper sources of groundwater, sometimes called artesian aquifers, hold groundwater under pressure. When a drill is used to bore down through the confining rock, the groundwater may rise to the surface.

Who has bores?

There are estimated to be 130 000 private bores in Perth. The number of private bores increased rapidly when water restrictions were imposed in the late 1970s due to a long dry spell of weather.

The number of bores in an area depends on:

- depth to the watertable — installation costs can be discouraging where the watertable is more than 10 metres deep;
- difficulty — coastal areas have fewer bores possibly because of the high cost of drilling into limestone;
- chance of success — bores are fewer in some eastern suburbs particularly in areas of clay or granite where bore yields are generally low.

Activities removing large volumes of groundwater require an abstraction licence from the Water and Rivers Commission. However, household bores in the Perth metropolitan area do not need a licence mainly due to the relatively minor amounts of water they remove. If you are unsure if a licence is required for your property, please contact the Commission on the phone numbers provided.



Perth's garden bore strategy

In 1997 the Minister for Water Resources launched a campaign to promote the use of garden bores. Currently almost a third of Perth's scheme water supply is used on gardens. Instead of using this high quality water, garden bore owners use shallow groundwater.



Where clean and accessible groundwater exists in areas suitable for garden bores, they are a good way of utilising this resource.

The Commission recently released the 'Perth Groundwater Atlas' to provide information on the areas suitable for garden bores. The Groundwater Atlas is a source of easily accessible groundwater information to assist drillers, irrigators and the public. This publication is available at many libraries, and through the Commission.

Although groundwater may be readily available, it should still be considered a precious resource. Groundwater is very important to the environment and should be used in a responsible manner.

Given that in many areas gardens are not as large as they used to be, consideration should be given to sharing a bore between neighbours. This will provide all the benefits of owning a bore while allowing the cost of installation to be shared.

Groundwater prior to urbanisation

Groundwater is part of a dynamic water cycle. Where the Swan Coastal Plain is still covered in native vegetation, an average of about 10% to 20% of rainwater percolates down into the shallow aquifer to become groundwater. The groundwater then moves very slowly under the force of gravity until it discharges into rivers and the ocean. However, much is returned to the atmosphere along the way via evaporation from wetlands and transpiration by vegetation.

Groundwater is important to the health of the coastal plain environments. The Swan Coastal Plain was once a patchwork of wetlands (lakes and swamps) and many still remain despite draining for agriculture and urban development. These wetlands depend on the groundwater level being at or near the surface. The natural vegetation also relies on groundwater. In many areas, the plants are able to survive and even continue to grow through the summer by reaching down to the watertable.

Groundwater levels have a seasonal cycle. The watertable of the Swan Coastal Plain rises in winter with rainfall recharging the groundwater, and then gradually drops over the summer months. The wetland and woodland vegetation and animals have adapted to this cycle.

Changes with clearing and urbanisation

Since European settlement, the groundwater balance has been altered in three ways:

- Clearing — the natural vegetation, which removed much of the groundwater through transpiration, has been cleared in many areas, causing the watertable to rise.

- Drainage — the watertable has been lowered in low-lying land in and around wetlands, often for agriculture and housing. The excess water is drained to the river, ocean and a few wetlands which have been set aside as permanently inundated collection points, such as Lake Monger.
- Sealing of surfaces — covering the ground with houses, roads and paving increases the amount of water runoff from rainfall. Through much of Perth, these large volumes of runoff are concentrated into compensation basins and into the ground, adding to high watertable problems.

Raised watertables have meant that many suburbs need to be drained to keep houses dry in winter — 520 million cubic metres (twice the scheme water supply) is drained annually from an area of 84 000 hectares in northern, central and southern Perth. Some reduction in watertable levels back toward the natural balance has occurred in the older suburbs where gardens and parklands are well established. However, the current tendency to increase housing density, with increased roof and pavement runoff, is likely to reverse this trend.

The permanently higher watertable and need for drainage has upset the natural balance. In particular, some of the wetlands that have not been drained have grown broader and deeper. Many previously seasonal wetlands are now permanently inundated. The higher watertables have killed trees in and around the water and lakes have lost birds that rely on seasonally receding mudflats.

Private bores can be a good thing

There are many parts of Perth where bores should be encouraged for garden irrigation. In areas where the watertable is close to the surface, a drainage system exists to prevent further groundwater level rises. Using groundwater for irrigating gardens in these areas will reduce the amount that has to be drained to wetlands, rivers or the ocean. The combined effect of many bores can be to draw the watertable down more in summer than at present, but this can help to restore a seasonal cycle.

The benefits are several:

- scheme water savings — use of groundwater for irrigation purposes reduces draw on scheme water supplies, delaying the time when new resources (dams and wellfields) are needed;
- recycling of local water — using the excess groundwater brought about by urbanisation for irrigating gardens is a good idea whereas 'importing' scheme water for garden irrigation adds to the already high groundwater levels.



Waterwise garden bore use

Groundwater bores should be used efficiently. Even though groundwater is readily available in most areas, watering your garden with bore water should still be undertaken responsibly and in a Waterwise manner.

You can be Waterwise by:

- only watering enough to meet the garden's needs
- using plants that require less water (e.g. native species)
- not watering during the daylight hours

While bores offer a range of benefits, their excessive use can contribute to a number of environmental problems:

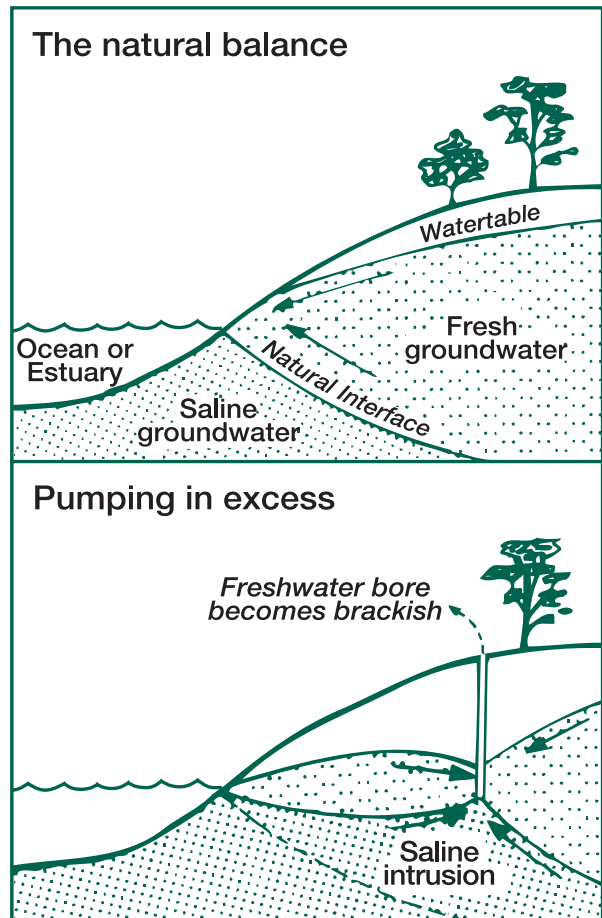
- Groundwater draw-down — overpumping can lower the watertable to undesirable levels in about 10% of suburban areas and be detrimental to the environment.
- Nutrient loss — most of Perth soils are very poor in nutrients and do not readily bind fertiliser. Over-watering will leach out the fertilisers that gardeners need to add to their lawns and flower-beds. This is an unnecessary cost to the gardener and risks polluting the groundwater and local wetlands with nutrients (nitrogen and phosphorus).
- Saltwater intrusion — in areas prone to saltwater intrusion (close to the coast or Swan River estuary) excessive bore use is a major contributing factor to the influx of saline water.

Possible constraints on bores

Bores are an excellent water supply for garden use in much of Perth. However, not all areas of Perth are suitable for bores.

- In some places, the watertable is deep beneath the ground surface or the rock type encountered makes drilling for water difficult and expensive.
- Near the foothills and in places where there are clay soils, groundwater supplies may be limited and bore yields may be low.
- Other areas are environmentally sensitive. Wetlands, and the plants and animals that depend on them, need groundwater to maintain water levels. Pumping out too much water near wetlands could disrupt the natural water cycle and cause environmental damage. Wetlands of conservation value are depicted in the 'Perth Groundwater Atlas'. If you plan on installing a bore near such a wetland (within 500 metres), please contact the Commission.
- In areas near the Swan River estuary or the ocean, saltwater may be drawn into the bores if they are excessively pumped. Because the water within the

ocean and estuaries is saline, a wedge-shaped boundary (or interface) is formed between this saline groundwater and the fresh groundwater below the land. This saltwater wedge may extend more than a kilometre inland. For example, all of the Cottesloe peninsula is underlain by saline groundwater.



Saltwater intrusion into bores

- Where there is or has been industrial activity, and in areas near old waste disposal sites, the groundwater may be contaminated. The Perth Groundwater Atlas shows the location of known and inferred contaminated sites in the metropolitan area.

Areas suitable for bores

Throughout the Perth area the Commission's 'Perth Groundwater Atlas' provides information such as the depth to groundwater, groundwater salinity and identifies areas unsuitable for garden bores. The areas which are generally suitable for drilling garden bores include:

- the northwestern urban corridor;
- the central sandy areas north and south of the Swan River;
- the northeastern urban corridor in areas without clay;
- suburbs west of Jandakot;
- suburbs around Winthrop.



Areas not suitable for bores

Areas generally unsuitable for drilling more garden bores include:

- the Cottesloe peninsula (saltwater intrusion)
- suburbs around Secret Harbour and Port Kennedy (limited groundwater resources)
- within 200 metres of the ocean or the Swan River estuary (saltwater intrusion)
- areas in and around the foothills (groundwater is limited)
- near wetlands (possible excessive lowering of groundwater if bores are overpumped)
- near contaminated areas (groundwater may be polluted)

Groundwater contamination

Groundwater contamination occurs in some Perth suburbs, but is generally of little concern provided that water from household bores is only used for watering gardens and is not used for drinking. Groundwater contamination is most likely to be detected in bores near existing or old commercial or industrial areas.

Pumping from bores can affect groundwater flow and alter the movement of a contaminant plume towards the bore. Garden bores that are located in areas of groundwater contamination may pump contaminated water. While this may or may not harm plants, the contaminated groundwater may be harmful to humans, if consumed. The Water and Rivers Commission strongly recommends that the water from garden bores is not used for drinking unless analysed and certified safe by the Health Department of Western Australia.

The Water and Rivers Commission advises that bores should not be located in areas of groundwater contamination. If in doubt, please contact the Water and Rivers Commission. For more information on groundwater contamination, see Water Facts 10, Groundwater Pollution.

For more information

Copies of the Commission's 'Perth Groundwater Atlas' are available for sale from the Water and Rivers Commission and for viewing in a number of local libraries. The atlas provides easy access to groundwater information for assist drillers, irrigators and the public.

Groundwater and bores: If you wish to find out more about the groundwater resources of Perth and the wise use and management of these resources, contact the Commission on (08) 9278 0300.

Information on Waterwise gardening is also available from the Water Corporation on (08) 9420 2420.

Sinking a bore: Irrigation and reticulation installation companies that are members of the Irrigation Association of Australia can advise on practical aspects of sinking bores. If you are interested in sharing a bore with your neighbours, then some corporate members of the Irrigation Association are able to provide information on agreements that may be used to confirm the arrangement.

To ensure consumer protection, the Australian Drilling Industry Association recommends the use of drillers certified by the ADIA (or suitably equivalent qualifications). The ADIA can provide information on suitably qualified drillers in your area.
Phone: (08) 9354 8436.

Limitations of information

While particular areas are considered suitable for bores, the actual yield and quality of groundwater cannot be guaranteed. Both are highly variable and depend on a number of factors including the precise location and depth of the bore.

For more information contact



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This Water facts sheet is one in a series providing information on water issues of interest to the community.

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About Reprinted Reference materials

In 2006, the Department of Water was established to replace the Water and Rivers Commission.

Proclamation on 31 January 2008 of the Water Resources Legislation Amendment Act 2007 formally abolished the Water and Rivers Commission and transferred all functions to the Minister for Water Resources and the Department of Water.

This has consolidated all water-related functions performed by the commission and some other agencies under one agency to ensure a central focus for planning and managing the states water resources.

As a result some valuable water related reference materials are now not easily identified under the new management structure and contain contact details that are out of date.

The Reprinted Reference 'wrap around' cover provides identity with the new management structure and provides up to date contact information.

This allows us to continue to make many of these reference materials available without the expense to the public sector of costly reproduction.

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You can find details for our other offices around the state, together with an office directory, under Contact Us on our website.

www.water.wa.gov.au

Appendix E - Modelling Summary

Modelling Discussion

GHD built a DRAINS hydrologic and one-dimensional hydraulic model of the existing development, and simulated the model for a range of design storms. DRAINS is a computer program for simulating catchment hydrology and one-dimensional flows in conduits and open channels. Data is input via tables and a graphical user interface, and results are produced graphically and in GIS and tabular format. The Rational Flood Frequency Estimation (ARR 2015) method was adopted to estimate peak flows which were then used in TUFLOW to map the 100 year ARI flood levels. TUFLOW is a computer program for simulating depth-averaged, two and one-dimensional free-surface flows such as occurs from floods and tides.

Time varying surface runoff generated by the runoff routing model discharges into the hydraulic network. The hydraulic network consists of interconnected nodes (manholes, basins and outfalls) and links (pipes, open channels and culverts).

The hydrology was simulated using the RORB model, based on the parameters listed below.

Modelling assumptions

- All roads connected to an at source infiltration system sized for the 1 year 1 hour storm (18 mm)
- All lots to hold 1 year 1 hour storm (18 mm) on site
- Infiltration rates assumed 1 m/day
- Conservative parameterisation

Modelling parameters

DRAINS used the RORB routing model to generate rainfall runoff from identified catchments. The runoff model consists of three components: initial loss, soil model (assumed as type B moderate infiltration rates and moderately well-drained soils) and roughness (runoff routing value). Each sub catchment is divided in three surface runoff types with runoff properties described in the table below.

Runoff Surface	Surface Type	Runoff Routing Value	Initial Loss Value (mm)
1	Pervious	0.030	8
2	Impervious (infiltration at source)	0.015	18
3	Impervious	0.015	1

Note: Impervious (infiltration at source) is included to account for lot infiltration using soakwells as specified.

The percentage of surface types for individual catchment was calculated from existing land use and local structure plan based on the land use surface breakdown as reported in Forrestdale ADS (DoW, 2009).

Land Use Category	Runoff Area 1 (%)	Runoff Area 2 (%)	Runoff Area 3 (%)	Equivalent Runoff Coefficient (approximate)
Open Space	100	0	0	0.1
Road	40	0	60	0.7
Urban	70	30	0	0.2

Conduits roughness values are typical values for the identified conduit type.

Drain Type	Manning's Coefficient of Roughness
Concrete Pipe	0.013
Maintained Open Drain	0.030
Overland Flow Route	0.035

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	D Lamb	N Deeks	On file	C Thompson	On file	02.08.17

www.ghd.com



Appendix B

Bushfire Management Plan



Bushfire Management Plan

Dolbys Drive Local Structure Plan



LOCATION: DOLBYS DRIVE, WAGGRAKINE, WA

CLIENT: GHD PTY LTD



Project Ref 244026/ N25-0427 Issue B

23 April 2026

DOCUMENT ISSUE APPROVAL

Project Title:	Dolbys Drive Local Structure Plan
Project Location:	Dolbys Drive, Waggrakine, WA
Project Address:	Various Lots, Waggrakine, Shire of Chapman Valley
Client:	GHD Pty Ltd
Project No:	244026
Report No:	N25-0427
Issue:	B
Date:	23 April 2026
Distribution:	Client
	Covey Associates

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Practitioner

Abbreviations Used in Report

Abbreviation	Full Meaning
AS 3959	AS 3959:2018 'Construction of buildings in bushfire-prone areas'
BAL	Bushfire Attack Level
BMP	Bushfire Management Plan
BPC	Bushfire Protection Criterion/a
FFDI	Forest Fire Danger Index
NCC	National Construction Code (Building Code of Australia)
PBG	WA 'Planning for Bushfire Guidelines 2024'
POS	Public Open Space
RHF	Radiant Heat Flux
SCV	Shire of Chapman Valley
SPP	State Planning Policy
WAPC	Western Australia Planning Commission

Supporting Documentation

Document	Prepared by
<i>Dolbys Drive Local Structure Plan, Buller, WA (Rev 1 2 August 2017)</i>	<i>GHD Pty Ltd</i>

Contents

1	Introduction	1
1.1	Proposed Development.....	1
1.2	Site description	1
1.3	Purpose.....	2
1.4	Other plans/reports.....	2
2	Environmental Considerations.....	6
2.1	Native vegetation - modification and clearing	6
2.2	Revegetation / Landscape Plans.....	7
3	Bushfire assessment	8
3.1	Broader Landscape Assessment	8
3.1.1	Broader Landscape Assessment area	8
3.1.2	Simplified Broader Landscape Assessment.....	9
3.1.3	Determination of the Broader Landscape Type.....	10
3.2	Bushfire Hazard Level Assessment	13
3.2.1	Vegetation classification	13
3.2.2	Effective Slope.....	13
3.2.3	Pre-Development BHL Assessment Inputs.....	14
3.2.4	Post-Development BHL Assessment Inputs	14
3.2.5	BHL Assessment Methodology	15
3.2.6	Pre-development BHL assessment	15
3.2.7	Post-development BHL assessment.....	16
4	Identification of bushfire hazard issues	19
4.1	Bushfire context	19
4.2	Bushfire hazard issues	19
4.3	Bushfire safety strategy.....	19
5	Assessment against the Bushfire Protection Criteria	21
6	Responsibilities for implementation and management of the bushfire measures	26
7	References	28
	Appendix A APZ Standards from PBG	29
	Appendix B AS 3959 Clause 2.2.3.2 (e) and (f) – Low threat Vegetation and Non-Vegetated Areas ...	35
	Appendix C Vegetation plot photos and description.....	37
	Appendix D Vehicular Access Technical Standards of the PBG.....	53

Appendix E Water Technical Standards of PBG	58
Appendix F Shire of Chapman Valley Firebreak Notice	61

Figures

Figure 1-1. Structure Plan	3
Figure 1-2. Site overview	4
Figure 1-3. Map of designated Bushfire Prone Areas	5
Figure 3-1. BLA context map	12
Figure 3-2. Pre-development vegetation and effective slope	17
Figure 3-3. Pre-development Bushfire Hazard Level assessment.....	18

Tables

Table 1: Summary of environmental values	6
Table 2: Simplified Broader Landscape Assessment Questions.....	9
Table 3: Broader Landscape Type determination table.....	11
Table 4: Pre-development vegetation classifications/exclusions and effective slope	14
Table 5: Bushfire hazard levels and characteristics	15
Table 6: Compliance with the Bushfire Protection Criteria 4 (Strategic Planning) of PBG	21

1 Introduction

1.1 Proposed Development

The Shire of Chapman Valley (SCV) is seeking approval for the extension of the existing Dolbys Drive Local Structure Plan (SP). GHD Pty Ltd previously prepared the SP which was approved in 2017, however this requires review and updating, in order to enable the application of extension of time from the Western Australia Planning Commission (WAPC).

The original SP extended over 8 existing rural-residential lots and one thin vegetated lot in Waggrakine (the project area), which is located in the Shire of Chapman Valley.

- 50 (Lot 171), 52 (Lot 31), 56 (Lot 30), 60 (Lot 173) Dolbys Drive
- 23 (Lot 166), 27 (Lot 27) and 29 (Lot 26) Cooper Street
- 109 (Lot 174) Dulchev Way
- Portion of Lot 10770 (Crown Reserve 27663)

The current SP (see Figure 1-1) proposes the following:

- Primarily rural-residential development (anticipates future lot size of >1 ha);
- Foreshore Reserve along the existing waterway (Dolbys Creek) through the site
- Primary Distributor Road Reserve
- Internal public road network consisting of:
 - A public road in the northern part of the project area, complete with turning head in the north-east,
 - Three other potential internal public roads scenarios, namely Access Scenario 1, 2 and 3, which will connect the proposed northern public road to the existing public road network. It is understood not all three roads will be constructed.
- Potential Emergency Access Way routes
 - Extending north, south and east of the project area from the proposed internal road network to the existing public road network.

1.2 Site description

The project area is approximately 38 ha in area, and is mostly cleared of vegetation, other than the remnant vegetation within Dolbys Creek that crosses the site, and the thin bushland lot in the west. Currently the only existing development on each of the 8 rural residential lots is generally just a dwelling and several outbuildings.

Within the project area, there are no existing public roads, with public road access to the site being via Dolbys Drive from the east, and Cooper Street and Dulchev Way along the southern boundary.

Reticulated water supply appears to be provided to all existing lots within the project area, other than Lot 10770 in the west. There appears to be water pipework and street hydrant along Dolbys Drive, Cooper Street and Dulchev Way.

The project area is surrounded by (see Figure 1-2):

- Cooper Street to the south, with existing rural residential lots further south
- Unconstructed road reserve to the west, with rural residential and residential lots further west
- Rural residential lots to the north, with Cargeeg Bend public road further north

- The continuation of the waterway within the site to the north-east, with Dolbys Drive immediately east with rural residential lots and Stirling Place public road further to the east.

1.3 Purpose

Portions of the project area are designated as bushfire prone on the *Map of Bush Fire Prone Areas* (DFES 2025; see Figure 1-3), and as such, the proposal is required to demonstrate compliance with *State Planning Policy 3.7: Bushfire* (SPP 3.7; WAPC 2024) and the *for Planning for Bushfire Guidelines* (PBG; WAPC 2024). The original SP was submitted soon after the ratification of SPP 3.7 and PBG in late 2015, and has been subject to basic assessment against the original version of the bushfire policy (further detail is provided in Section 1.4).

While the SP presents an indicative internal road and zoning layout, there is flexibility for adjustment according to the development aspirations of subdividers; on this basis the proposal is required to be assessed against Bushfire Protection Criterion (BPC) 4 (Strategic Planning) of PBG. This Bushfire Management Plan (BMP) has been prepared to address requirements under Policy Measure 7(ii) of SPP 3.7 and Sections 2.2 and 4.4 of PBG including:

- An assessment of the broader landscape;
- The identification of any environmental, biodiversity or conservation values on the subject site(s):
 - Where relevant, details on how the clearing of native vegetation specifically for bushfire mitigation to achieve the bushfire protection measures, can be avoided through the use of siting and design measures; and
 - Where the clearing of native vegetation cannot be avoided, details on how the proposal will minimise the clearing are to be provided;
- A pre-development BHL assessment that demonstrates a BHL of predominantly moderate or low:
 - Where the pre-development BHL assessment results in areas with a predominantly extreme BHL, further detail should be provided on the level of native vegetation clearing that will be necessary to reduce the BHL to moderate or low;
- The identification of any bushfire hazard issues arising from the assessment; and
- Assessment against the bushfire protection criteria within BPC 4: Strategic Planning, demonstrating compliance via either the acceptable solutions, or through an outcomes-based approach.

1.4 Other plans/reports

The SP report submitted by GHD in 2017, included bushfire reporting as follows:

- Preparation of a basic Bushfire Hazard Level (BHL) assessment
- Basic assessment against Elements 1 to 4 of the Bushfire Protection Criteria in the WA PBG

The bushfire reporting in the SP report was conducted when SPP 3.7 and the PBG had only just been released, and the level of detail provided is commensurate with the early reporting. While the BHL assessment has been conducted, there is no vegetation mapping to accompany the BHL figure, and the assessment against the Bushfire Protection Criteria is rudimentary.

Given there have been several versions of SPP 3.7 and the PBG since the preparation of the SP report, Covey recommend that this BMP reassess the SP under the current version of SPP 3.7 and the PBG.

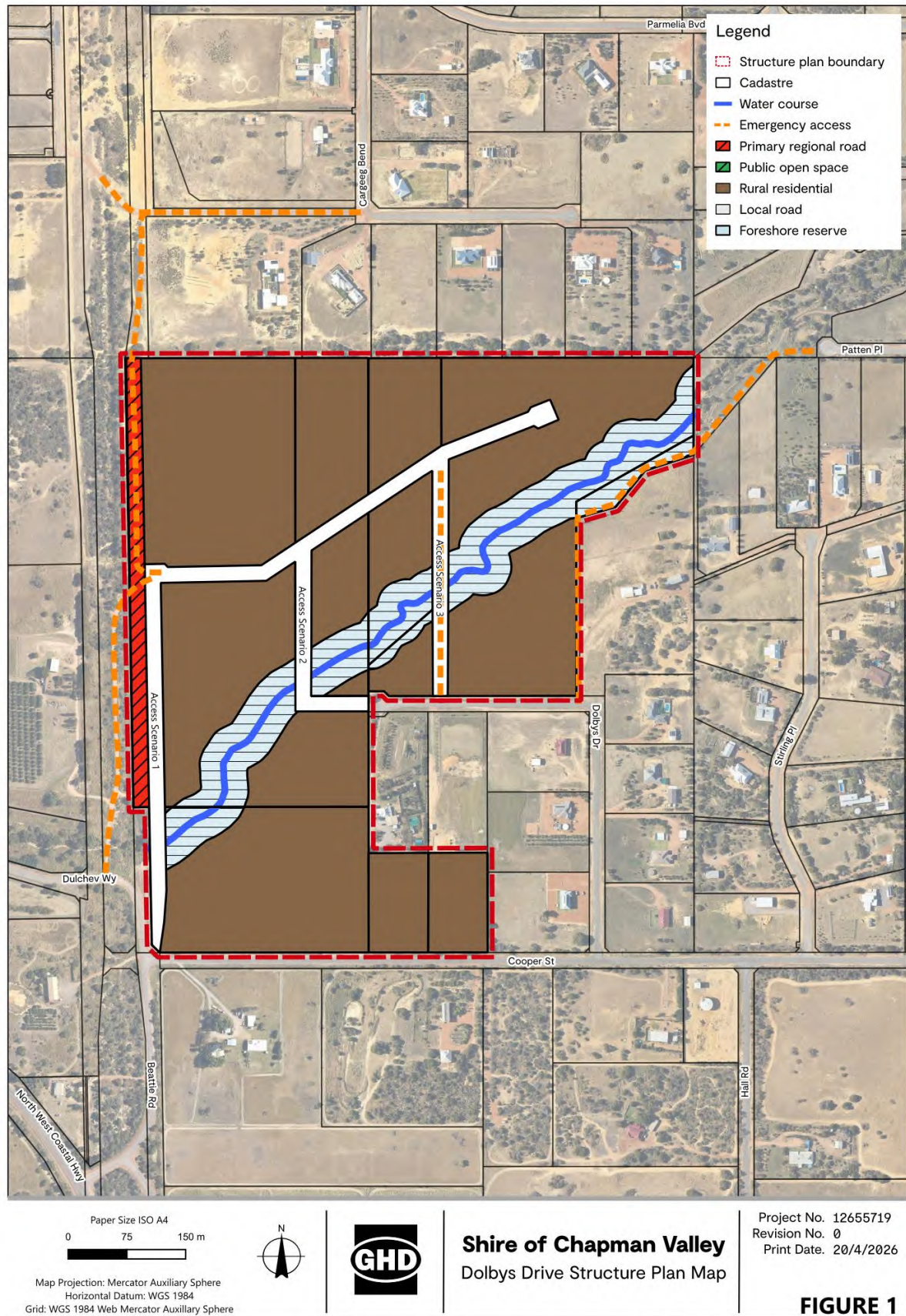
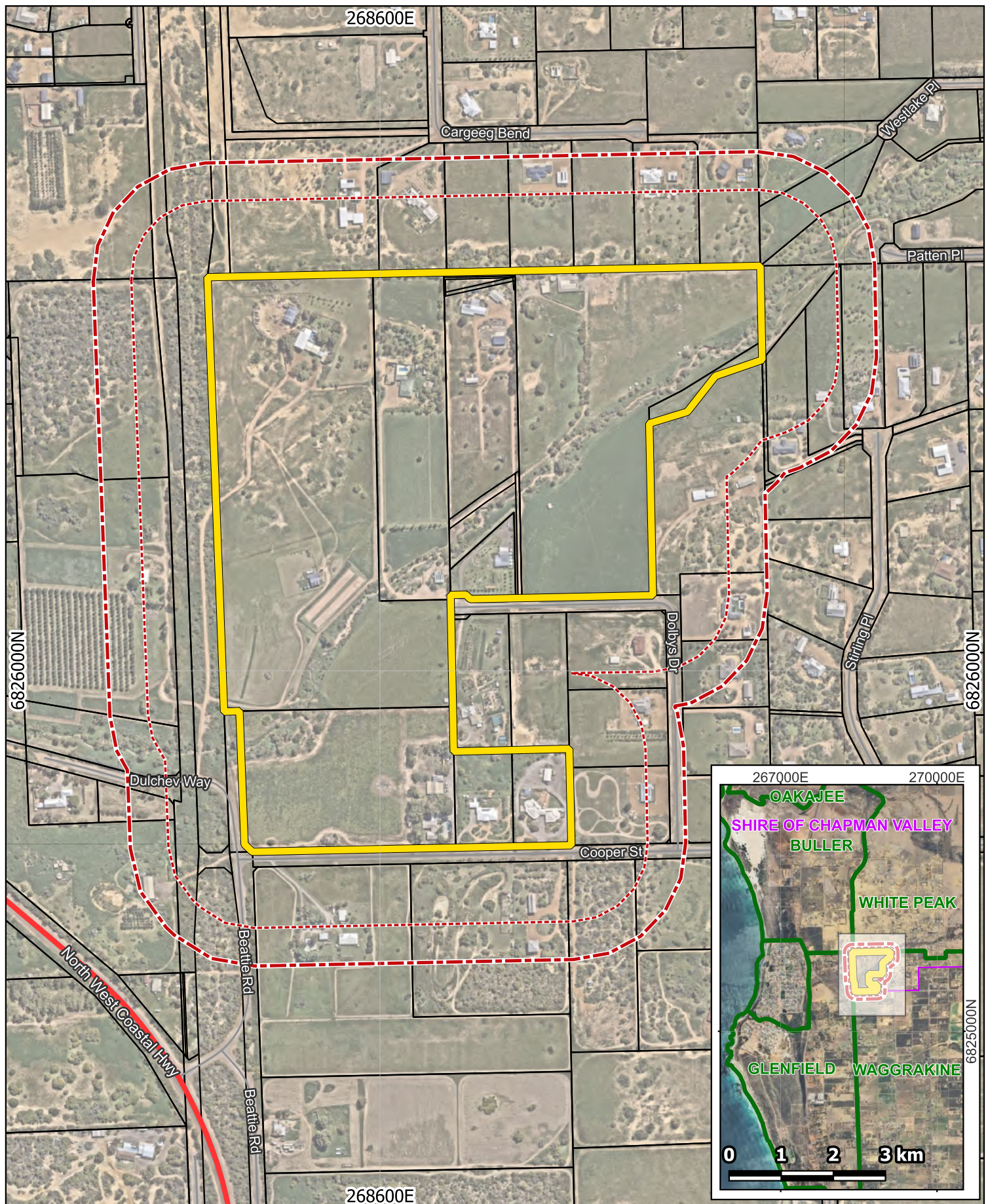


Figure 1-1. Structure Plan

Figure 1-2: Site Overview



100 200 300 400

Legend

- Project Boundary
- Cadastre
- Roads
- State Highway
- Minor
- 100m
- 150m

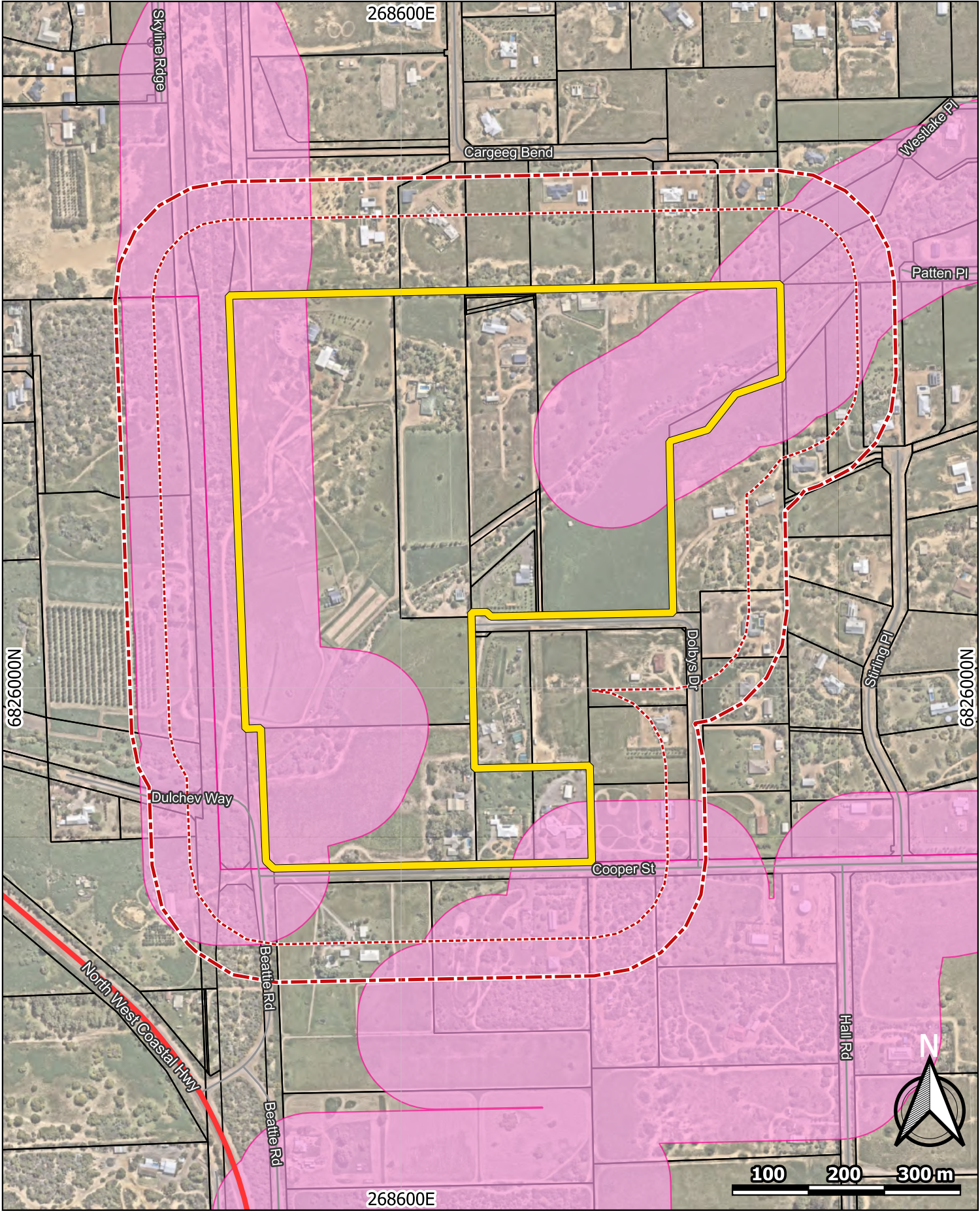
Bushfire Assessment

CRS: GDA2020 / MGA zone 50
Date created: 04/11/2025
Author: Madeline Dooley

244026_1.2_Site Overview.pdf



Figure 1-3: Designated Bushfire Prone Areas



Legend

- Project Boundary

Cadastre
- 100m

150m

Bushfire Prone Area 2
- Roads

State Highway

Minor

CRS: GDA2020 / MGA zone 50
Date created: 04/11/2025
Author: Madeline Dooley



2 Environmental Considerations

2.1 Native vegetation - modification and clearing

The project area has been cleared of most native vegetation for previous land uses, however it is expected that the site will require further clearing to accommodate development as part of future planning applications. Table 1 provides a summary of a search of publicly available environmental data.

Covey assumes that all relevant environmental and aboriginal heritage studies will be undertaken to support the project, and if any State and Federal environmental referrals and approvals are required, they will be sought prior to commencing on-site vegetation modification or clearing required to construct the development.

Table 1: Summary of environmental values

Environmental value	Not mapped within/ adjacent to the project area	Mapped as occurring within or adjacent to the project area		Description
		Within	Adjacent	
Environmentally Sensitive Area	✓			No part of project area/adjacent land identified as being an Environmentally Sensitive Area.
Swan Bioplan Regionally Significant Natural Area	✓			No Regionally Significant Natural Areas were identified.
Ecological linkages	✓(?)			This information is unavailable as the time of this BMP however Covey is not aware of any ecological linkages being identified.
Wetlands	✓			No wetlands are mapped as occurring within or adjacent to the project area
Waterways		✓	✓	There is an existing waterway (Dolbys Creek) that runs from the north-east to the south-west, through the project area, and extends through adjacent land in both directions.
Threatened Ecological Communities listed under the EPBC Act	✓			This layer is currently publicly available at a very coarse level. No Threatened Ecological Communities are mapped in or near the project area.
Threatened and priority flora		X	✓	This layer is currently publicly available at a very coarse level, and while no Threatened and Priority Flora are mapped as occurring within the project area, they are mapped approximately 1 km to the south-east.
Fauna habitat listed under the EPBC Act	✓			No fauna habitat was mapped as occurring within or adjacent to the project area

Environmental value	Not mapped within/ adjacent to the project area	Mapped as occurring within or adjacent to the project area		Description
		Within	Adjacent	
Threatened and priority fauna		X	✓	This layer is currently publicly available at a very coarse level, and there are no Threatened and Priority Fauna are mapped as occurring within the project area, however there is some mapped approximately 1 km to the south-east.
Bush Forever Site	✓			No Bush Forever Area is mapped as occurring within or adjacent to the project area.
DBCA managed lands and waters (includes legislated lands and waters and lands of interest)	✓			No DBCA managed lands and waters is mapped as occurring within or adjacent to the project area.
Conservation covenants	✓			No information has been provided by the client regarding Conservation Covenants.
Crown Reserves		✓	✓	Crown Reserve R27663 (former rail alignment removed in 1957) is mapped in the western portion of the site (extending further north and south) with the interest holder being Main Roads WA. This is zoned in the SP as being for Primary Distributor Road Reserve. Crown Reserves R51459, R50338 and R51029 along a portion of Dolbys Creek immediately adjacent to the north-eastern project area boundary, .and extending further east. Reserves R51459 and R51029 have a management order issued to the Shire of Chapman Valley for the purpose of 'Public Recreation'. Reserve R50338 has a management order issued to the Shire of Chapman Valley for the purpose of 'Drainage'.
Aboriginal Heritage		X	✓	No Aboriginal Heritage Places mapped as occurring within the project area but Heritage Places are identified approximately 500 m to the south-west of the site.

2.2 Revegetation / Landscape Plans

No revegetation is currently being proposed within the project area, however one potential location for future revegetation could be along Dolbys Creek, within the proposed Foreshore Reserve, although it is noted that this is not yet finalised.

While the project area is mostly cleared of native vegetation outside of Dolbys Creek, remnant vegetation (where it exists) could potentially be cleared as part of future development, although this is less likely within the proposed Foreshore Reserve, where it is expected any clearing would likely be highly targeted.

Any required Asset Protection Zones (APZs) are to be either non-vegetated elements or landscaped in accordance with APZ Standards of PBG (refer to Appendix A). All other future onsite landscaping is to comply with the requirements of Australian Standards (AS) 3959:2018 'Construction of buildings in bushfire prone areas' (AS 3959; Standards Australia 2018) Clause 2.2.3.2 (e) and (f) (refer to Appendix B) and align with the principles of APZ Standards.

3 Bushfire assessment

For strategic planning where the lot layout is still to be finalised, the following bushfire assessment tools are required to be utilised:

1. **Broader Landscape Assessment (BLA)** – given the project area within an area designated as Area 2 on the Map of Bushfire Prone Areas (see Section 1.3), it will require an assessment of the broader landscape to demonstrate compliance with Element 1: Location; and
2. **Bushfire Hazard Level (BHL) Map** - is required in accordance with Appendix A.2 of PBG.

3.1 Broader Landscape Assessment

Although Element 1 has been approved at previous planning stages under SPP 3.7 and PBG, given the rudimentary nature of the previous bushfire reporting and that portions of the project area are designated as Area 2, the proposal has conducted an assessment of the broader landscape to address Element 1.

The intent of the Broader Landscape Assessment (BLA) is to examine the landscape external to the planning proposal, to develop an understanding of the wider bushfire hazards and potential for landscape-scale bushfire behaviour, in addition to the broader road network, and proximity to townsites, urban areas and suitable destinations. Examination of the broader landscape provides important contextual information when considering whether a site is suitable for intensification of land use or development.

The outputs of the BLA are used to demonstrate compliance with Element 1: Location of Bushfire Protection Criteria 4 (BPC4).

3.1.1 Broader Landscape Assessment area

The BLA area extends to 2 km from the project area boundary, as required by PBG.

An overview of the BLA assessment area is depicted on Figure 3-1, in addition to the broader vehicular access network and extent of designated bushfire prone land, to serve as a wider context plan.

Figure 3-1 is useful for identifying suitable destinations that could be used in a bushfire emergency, with the closest ones to the project area being:

- Drummond Cove and Glenfield residential areas (approximately 1 km west);

- Geraldton townsite and residential areas (approximately 5 km south);

3.1.2 Simplified Broader Landscape Assessment

In accordance with A1.4 (from Appendix A in the WA PBG), a Simplified BLA can be undertaken in locations that present lower risk of landscape scale bushfire, in order to fast-track the assessment. This approach is considered appropriate where the questions detailed in can be answered “Yes”.

Table 2: Simplified Broader Landscape Assessment Questions

BLA Criteria Question (from A1.4)	Response	Comments
Is the subject site within a kilometre of a townsite, urban area or suitable destination?	Yes	Yes the subject site is within 1 km of Drummond Cove residential area to the west (as depicted in Figure 3-1), which connects with Glenfield immediately south of Drummond Cove.
Is the road pattern from the planning proposal to the closest townsite, urban area or suitable destination, simple and/or direct (limited intersections)?	Yes	As depicted in Figure 3-1, the road pattern is relatively simple and direct with travel from the subject site, to Drummond Cove, to be along Cooper Street to Beattie Road, then north of North West Coastal Highway then turning off west into Drummond Cove at Chapman Road. Given future occupants will largely be landowners, it is expected that they will be familiar with this route, especially as the nearest fuel station is located, namely Caltex on North West Coastal Highway. Additionally, it is noted that much of this travel route is through land not designated as bushfire prone.
Is the majority of vegetation cleared, managed or Class G Grassland, within the broader landscape assessment area (e.g. clearing for residential zoned urban lots)?	Yes	Most land immediately surrounding the subject site is cleared, managed or Class G grassland, with any other vegetation classifications being in isolated plots within rural residential lots, along Dolbys Creek or within future road reserves (and likely to be eventually cleared). Further from the site, there is a more continuous plot of scrub vegetation to the south-east, however this is over 650 m away, and would not be along the path of travel to a suitable destination. Similarly, there is another continuous plot of scrub vegetation to the north and north-east of Drummond Cove, and to the north-west of the subject site, however this is 550 m from the site and again won't be along the path of travel to a suitable destination. Figure 3-1 provides an overview of the points made above, noting the relative lack of

BLA Criteria Question (from A1.4)	Response	Comments
		designated bushfire prone areas outside the two continuous plots detailed above, and the more isolated and fragmented vegetation within some rural residential lots. Based on the above, there is no capacity for the existing vegetation to support landscape-scale bushfire behaviour to the subject site, with any non-grassland vegetation within 500 m of the site being isolated and fragmented, in addition to being very limited designated bushfire prone land along travel routes to a suitable destination.
Is the planning proposal exposed to two or less aspects with external bushfire hazards (excluding Class G Grassland)?	Yes	As detailed above and in Figure 3-1, the only two areas of continuous non-grassland vegetation occur to the south-east and north-west of the subject site, and both are over 500 m away. On this basis, future proposed development will be exposed to no more than two aspects with external bushfire hazards, and given the separation from the site and the anticipated bushfire behaviour from the continuous non-grassland plots, a case could be made that there is no exposure to landscape-scale bushfire behaviour.

3.1.3 Determination of the Broader Landscape Type

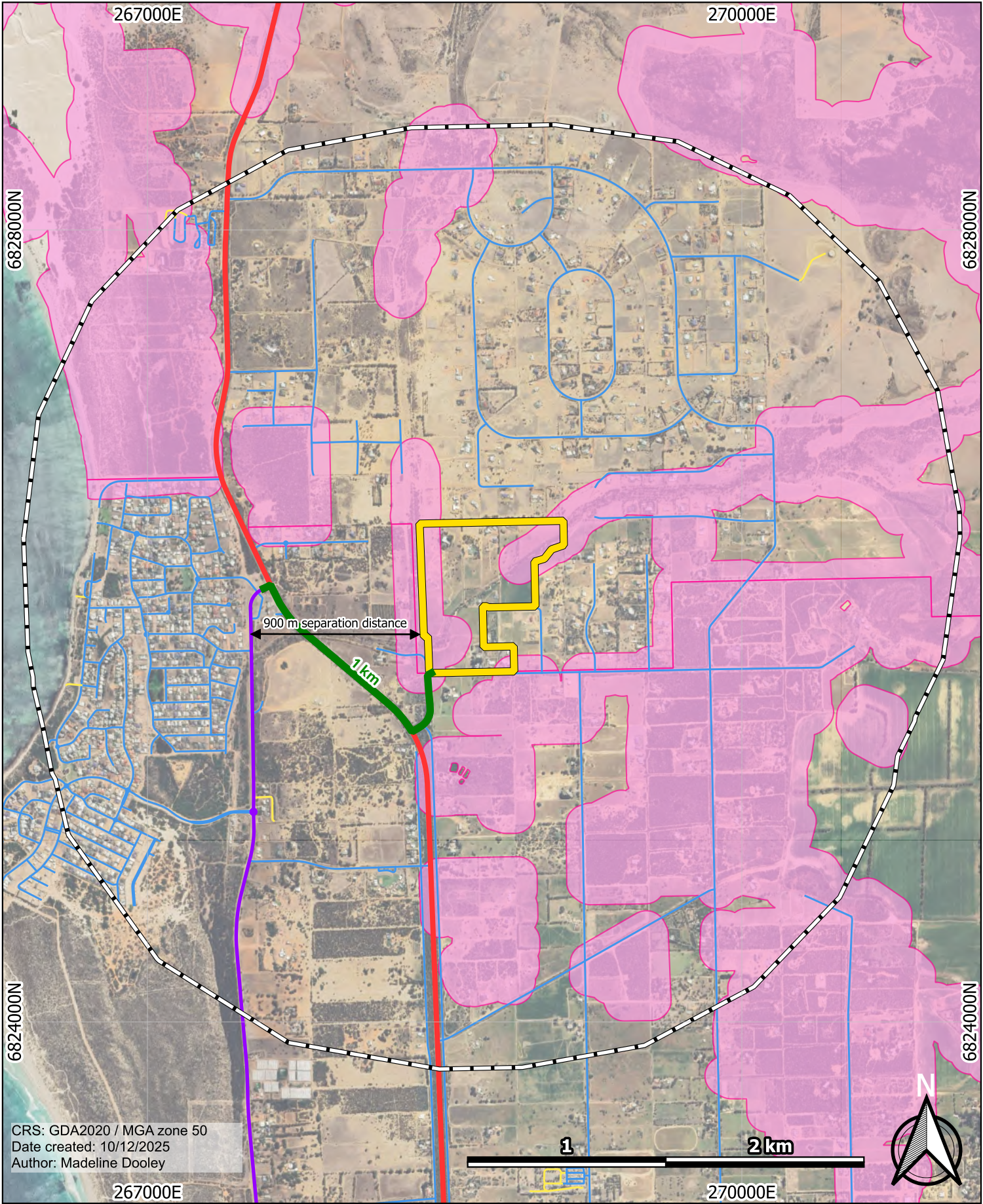
The broader landscape type (BLT) is determined using the points-based system detailed in Table 3.

With an assessed total of **6 points**, the BLT applicable to the proposed development is **BLT A**.

Table 3: Broader Landscape Type determination table

BLA Criteria	5 points	2 points	1 point	Assessed Points	Comments
Proximity of the planning proposal to a suitable destination is:	>10 km	1 – 10 km	<1 km	1 point	As addressed in Table 2
The road pattern from the planning proposal to a suitable destination is:	Complex and indirect (cul-de-sacs, and/or multiple intersections)	Mixed road patterns	Simple and/or direct (limited intersections)	1 point	As addressed in Table 2
The predominant vegetation pattern is:	Large tracts of vegetation (contiguous vegetation)	A mosaic pattern of vegetation (e.g. vegetation within rural living precincts)	Cleared vegetation (e.g. clearing for residential zoned urban lots)	2 points	As addressed in Table 2
Exposure of the planning proposal to an identified external bushfire hazard (excluding Class G Grassland) is from:	Three or four aspects	Two aspects	From nil or one aspect only	2 points	As addressed in Table 2
Total Points				6 points	
Broader Landscape Type (Type A is <12 points; Type B is >12 points)				BLT A	

Figure 3-1: Broader Landscape Assessment Context Plan



Legend

- | | | |
|-----------------------|---------------|----------------|
| Bushfire Prone Area 2 | Roads | Minor Sealed |
| Project Boundary | State Highway | Minor Unsealed |
| 2km Assessment Buffer | Main Sealed | Travel Route |



3.2 Bushfire Hazard Level Assessment

3.2.1 [Vegetation classification](#)

Covey assessed classified vegetation and exclusions within 150 m of the subject site through on-ground verification, conducted on 24 October 2025 in accordance with AS 3959 and the 'Visual Guide for Bushfire Risk Assessment in Western Australia' (WA Department of Planning 2016).

Georeferenced site photos and a description of the vegetation classifications and exclusions are contained in Appendix C, summarised on Table 4 and depicted on Figure 3-2.

The assessed classified vegetation types that are expected to remain following development works are as follows:

- Glass G Grassland;
- Class C Shrubland;
- Class D Scrub; and
- Class B Woodland.
- Class A Forest
 - While no forest vegetation currently occurs within the project area or assessment area, there is potential for future revegetation within the Foreshore Reserve, which could result in Class A forest fuel structure.

A summary of the assessed exclusions is as follows:

- Clause 2.2.3.2 (a) plots of unmanaged vegetation further than 100 m from the project area;
- Clause 2.2.3.2 (e) areas of non-vegetated land such as land cleared for existing and proposed roads, infrastructure and buildings; and
- Clause 2.2.3.2 (f) land managed in a minimal fuel low threat condition, such as road verges, managed gardens and lawns including the managed POS areas.

Other exclusions that may be relevant for future development are as follows:

- Clause 2.2.3.2 (c) isolated plots of unmanaged vegetation, that will be less than 0.25 ha and will be located so it is further than 20 m from any proposed lots or any other classified vegetation; and
- Clause 2.2.3.2 (d) isolated plots of unmanaged vegetation, that will be less than 20 m wide and will be located so it is further than 20 m from any proposed lots or any other classified vegetation

Exclusions under Clauses 2.2.3.2 (e) and (f) used for all non-vegetated elements and managed vegetation proposed as part of the development, with Clauses 2.2.3.2 (c) and (d) potentially used to exclude vegetation associated with small plots of unmanaged vegetation such as future drainage areas, if possible.

3.2.2 [Effective Slope](#)

Covey assessed effective slope under classified vegetation through on-ground verification on 24 October 2025 in accordance with AS 3959. Results were cross-referenced with Landgate 5 m contour data depicted on Figure 3-2 and are summarised in Table 4.

Site observations indicate that land is elevated to the east and descends through the project area to the west closer to the coast, resulting in classified vegetation having an assessed effective slope of downslope 0° – 5°.

3.2.3 Pre-Development BHL Assessment Inputs

A summary of the assessed pre-development classified vegetation, exclusions and effective slope within the project area and the adjacent 150 m, as it currently presents, are listed in Table 4 and illustrated on Figure 3-2.

Table 4: Pre-development vegetation classifications/exclusions and effective slope

Plot	Vegetation classification	Effective slope	Comments
1	Class G Grassland	Downslope >0–5°	Unmanaged grass >100 mm high, occasionally with scattered shrubs or trees, within the project area.
2	Class C Shrubland	Downslope >0–5°	Shrub vegetation (<2 m high) within the project area.
3	Class D Scrub	Downslope >0–5°	Scrub vegetation that is >2 m but <6 m high within the project area.
4	Class B Woodland	Downslope >0–5°	Mature trees with minimal or grassy understorey, within the project area. Typically restricted to Dolbys Creek line.
5	Class G Grassland	Downslope >0–5°	Unmanaged grass >100 mm high, occasionally with scattered shrubs or trees, outside the project area
6	Class D Scrub	Downslope >0–5°	Scrub vegetation that is >2 m but <6 m high outside the project area.
7	Class B Woodland	Downslope >0–5°	Mature trees with minimal understorey, outside the project area.
8	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Existing non-vegetated elements (roads, paths, buildings) and low threat vegetation (managed gardens, maintained lawn) within the project area.
9	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Existing non-vegetated elements (roads, paths, buildings) and low threat vegetation (managed gardens, maintained lawn) outside the project area
10	Excluded – Clause 2.2.3.2 [a]	N/A	Unmanaged vegetation further than 100 m from the project area.

3.2.4 Post-Development BHL Assessment Inputs

Given the level of planning, indicative rural-residential lot boundaries or building envelopes have not yet been nominated, and as such, determining the post-development BHL is not yet possible.

Within the project area, the BMP assumes that future lots will be at least 1 ha in area (at least 10,000 m²), and at future planning stages (most likely subdivision application), building envelopes (typically 1,000 – 2,000 m² in area) will be defined within each lot. Asset Protection Zones (APZs) would be required around the perimeter of each envelope, and each APZ would be sufficiently sized to ensure a BAL rating of no greater than BAL-29 on any future habitable building within each envelope. Each building envelope and APZ would be wholly located within the lot, and would be able to be fully cleared of vegetation, however targeted clearing of vegetation to achieve the APZ standards (see Appendix A) and comply with the requirements of AS 3959 for low threat vegetation (see Appendix B) would be preferable where possible. Notwithstanding, ideally building envelopes and APZs would be strategically located (as much as practical) to limit clearing of native vegetation, where possible.

In addition to the above, the portions of the Foreshore Reserve within the project area may also be revegetated or landscaped as part of future development. Should any vegetation retention or revegetation be proposed as part of future development or should proposed drainage swales or basins be unable to be excluded from classification, it is expected that sufficient separation will need to be provided as part of future planning so that any BAL impact on habitable buildings is limited to BAL-29 or lower and captured through a future BHL assessment or BAL contour map assessment.

The post-development vegetation classifications for all land external to the project area is expected to remain the same as for the pre-development classifications, with the only anticipated future development most likely to occur along the western boundary should a future road be constructed.

Notwithstanding, if external vegetation is altered prior to future planning stages, the change in vegetation condition is to be captured through a future BAL contour map assessment.

3.2.5 BHL Assessment Methodology

Pre- and post-development vegetation extents have been assigned a bushfire hazard level in accordance with the methodology detailed in Appendix Two of PBG, which is reproduced below in Table 5.

Table 5: Bushfire hazard levels and characteristics

Bushfire hazard level	Characteristics*
Extreme	- Class A Forest - Class B Woodland - Class D Scrub - Any classified vegetation with a greater than 10° slope.
Moderate	- Class C Shrubland - Class E Mallee/Mulga - Class G Grassland, including sown pasture and crops - Vegetation that has a low hazard level but is within 100 metres of vegetation classified as a moderate or extreme hazard, is to adopt a moderate hazard level.
Low	- Low threat vegetation, which may include mangroves and other saline wetlands, areas of maintained lawns, golf courses (such as playing areas and fairways), 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 windbreaks. - Managed grassland in a minimal fuel condition, meaning there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example, short-cropped grass to a nominal height of 100 millimetres. - Non-vegetated areas, waterways, exposed beaches, roads, footpaths, buildings or rock outcrops.
*Vegetation classifications from AS 3959	

3.2.6 Pre-development BHL assessment

Covey has mapped the pre-development bushfire hazard levels within the project area and adjacent 150 m wide assessment area. The bushfire hazard levels have been assessed on the basis of the vegetation discussed in Section 3.2.3 (i.e. the current pre-development extent of vegetation within, and surrounding, the project area).

The pre-development BHL assessment (see Figure 3-3) show that based on the existing vegetation, the project area contains land with **Moderate and Extreme** bushfire hazard levels, noting that the majority of the Extreme

BHL is restricted to Dolbys Creek (future Foreshore Reserve), which will not contain future habitable development.

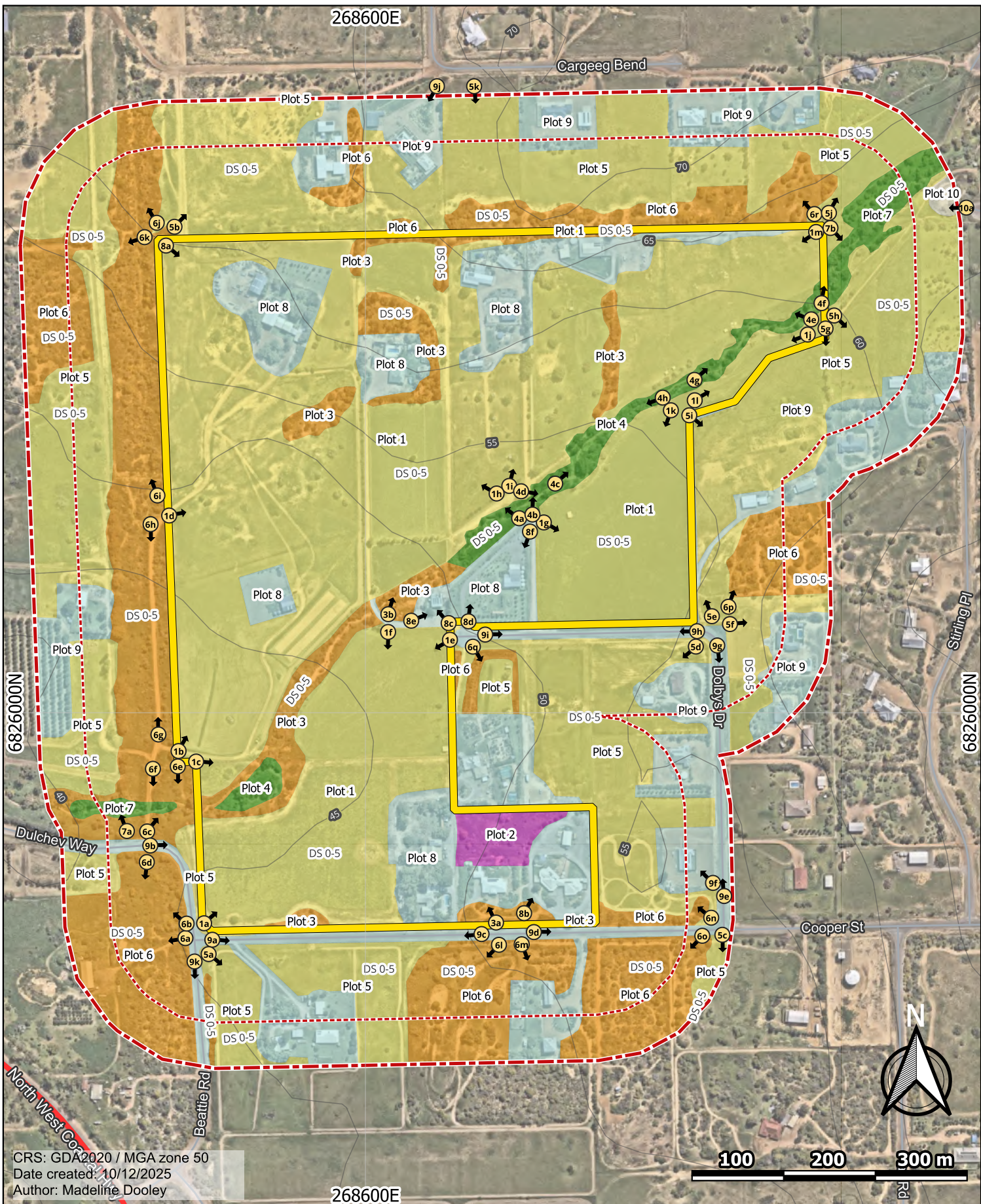
3.2.7 [Post-development BHL assessment](#)

Given the lack of lot design for the project at this strategic planning stage, Covey has not mapped the post-development bushfire hazard levels.

As detailed in Section 3.2.4, given the size of the lots, there is expected to be sufficient area within each rural-residential lot to accommodate a building envelope and an APZ, suitably sized to achieve BAL-29 or lower on any future buildings. The sizing of the APZs will also need to account for any anticipated changes to the pre-development vegetation within, or outside, the project area (e.g. allow for any revegetation, drainage basins, permanent low threat vegetation, or permanent clearing such as that associated with future roads).

Given the above, the post-development BHLs within future building envelopes would be expected to be either **Low and Moderate** bushfire hazard levels, on the basis that suitably sized APZs will be established around future buildings to achieve BAL-29 or lower.

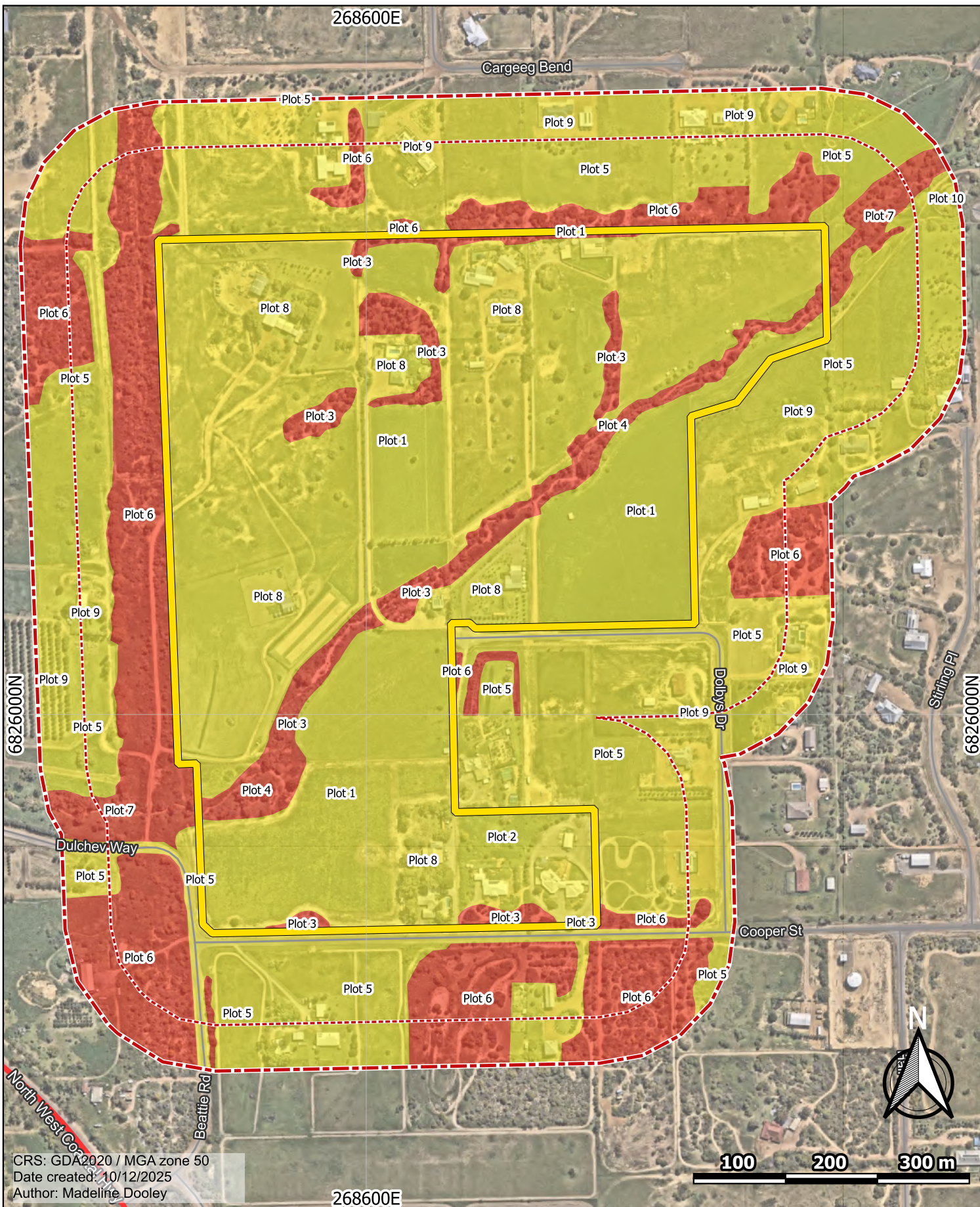
Figure 3-2: Pre-development Vegetation and Effective Slope



Legend

- | | | | |
|---|--|---|---|
|  Project Boundary |  D. Scrub |  5m Contours |  Photo Point |
| Classified Vegetation |  G. Grassland | Bushfire Assessment | Roads |
|  B. Woodland |  Excluded Clause 2.2.3.2(a) |  100m Buffer |  State Highway |
|  C. Shrubland |  Excluded Clause 2.2.3.2(e&f) |  150m Buffer |  Minor |

Figure 3-3: Pre-development Bushfire Hazard Level Assessment



Legend

Bushfire Hazard Level

 Moderate
 Extreme

 Project Boundary

Bushfire Assessment

 100m Buffer
 150m Buffer

 150m Buffer

Roads

 State Highway
 Minor

— Minor

4 Identification of bushfire hazard issues

4.1 Bushfire context

The external bushfire threat to the proposed future development has been assessed through the BLA documented in Section 3.1. It is noted there is very little continuous non-grassland vegetation within or surrounding the project area which could support elevated bushfire behaviour, however the bushfire risk to the site is primarily through fragmented fuels within rural residential development in all other directions.

Notwithstanding, any fire approaching the development, would represent a threat to the proposed buildings and future residents, if not appropriately managed.

4.2 Bushfire hazard issues

Examination of strategic development design in accordance with the concept plan and pre- and post-development bushfire hazards has identified the following bushfire hazard issues to be considered at future planning stages:

1. Based on the existing extent of vegetation within and outside the project area, parts of the proposed development would be subject to an initial BAL of BAL-FZ, if unmanaged. For the development to achieve a compliant rating of BAL-29 or less, sufficient separation need to be provided between habitable development and classifiable, unmanaged vegetation where it exists within or outside the project area;
2. Provision of a coherent internal vehicular access network to ensure occupants are able to egress away from bushfire, and fire brigade has appropriate and flexible access to habitable development and direct interfaces with unmanaged vegetation;
3. Provision of a secure water supply for bushfire fighting activities; and
4. Ensure the bushfire risk to any future vulnerable land uses (if proposed as part of future applications) is appropriately considered and mitigated.

4.3 Bushfire safety strategy

The following bushfire safety strategy is proposed to demonstrate compliance with the Bushfire Protection Criteria of PBG at future planning stages, in order to address the bushfire hazards identified above:

1. Create sufficient separation between future habitable buildings and post-development classified vegetation, both within and outside the project area, to achieve BAL-29 or lower in accordance with AS 3959. This is typically achieved through the nomination of APZs, with the sizing of the APZs to provide the sufficient separation for BAL-29 or lower, and will need to account for any anticipated changes to the existing vegetation within, or outside, the project area, including any revegetation, drainage basins, permanent low threat vegetation, or permanent clearing such as that associated with future roads.
2. Ensure vehicular access to and from the proposed development complies with the technical specifications of PBG;
3. Ensure a secure bushfire fighting water supply, most likely through use reticulated water supply and street hydrants; and
4. If proposed as part of future planning applications, ensure a Bushfire Emergency Evacuation Plan accompanies the BMP for any future vulnerable land uses.

Based on the above, Covey considers the bushfire hazards within and adjacent to project area and the associated bushfire risks are manageable through standard management responses outlined in PBG and AS 3959. These responses will be factored into proposed development as early as possible at all stages of the planning process to ensure a suitable, compliant and effective bushfire management outcome is achieved for protection of future life, property and environmental assets.

5 Assessment against the Bushfire Protection Criteria

An acceptable solutions assessment against Bushfire Protection Criteria 4 (Strategic Planning) of PBG, has been provided in Table 6.

Table 6: Compliance with the Bushfire Protection Criteria 4 (Strategic Planning) of PBG

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
Element 1: Location			
Outcome O1 Avoid broader landscapes that present an unacceptable risk to life, property and infrastructure.	Area 1 (Urban): Does not require assessment of Element 1: Location Area 2: Determine the Broader Landscape Type in accordance with Appendix A.1 and proceed with the following Acceptable Solutions <u>A1.1 Location</u> A1.1a Broader Landscape Type A The subject site is located in an area that is a Broader Landscape Type A. This location satisfies the policy outcome for Element 1: Location and no additional consideration is required. A1.1b Broader Landscape Type B The subject site is located in an area that is a Broader Landscape Type B which presents an unacceptable bushfire risk of a landscape scale bushfire resulting in impacts to people, property and infrastructure. This location does not satisfy the policy outcome for Element 1: Location. Where the practitioner considers that further analysis could demonstrate to the decision-maker that the risks can be appropriately managed, and/or mitigated, an outcomes-based approach should be prepared in accordance with policy measure 7.5 of SPP 3.7. Further explanatory notes are provided in Appendix B.1 of PBG.	Acceptable Solution	Portions of the project area is sited in Area 2 designated bushfire prone area. A Broader Landscape Assessment has been conducted as detailed in Section 3.1. <u>The determined Broader Landscape Type for the project area, is BLT A.</u> On this basis, compliance is achieved with A1.1, with no additional consideration required.
Element 2: Siting and Design			
Outcome O2 Ensure siting and design solutions: - manage or mitigate the bushfire risk to people, property and infrastructure; and - avoid, or where unavoidable, minimises the clearing of native vegetation	Area 1 (Urban): Does not require assessment of Element 2: Siting and Design Area 2: Proceed with the following Acceptable Solutions <u>A2.1 Siting and Design</u> The areas of the subject site(s) identified for intensification and/or the future development site(s) achieve a pre- or post-development bushfire hazard level of moderate or low	Acceptable Solution	The pre-development BHL assessment has been undertaken (see Figure 3-3), which identifies that the existing bushfire hazard levels across the project area are Low, Moderate and Extreme. As detailed in Section 3.2.7, given the lack of lot design for the project at this stage of planning, Covey has not mapped the post-development bushfire hazard levels. Lots and building envelopes are expected to be nominated at future planning stages (likely subdivision application), given each rural-residential lot will be a minimum of 1 ha in area, there should be sufficient area to accommodate a building envelope and a suitably size APZ (to achieve BAL-29 or lower). The sizing of the APZs will also need to account for any anticipated changes to the pre-development vegetation within, or outside, the project area (e.g. allow for any revegetation, drainage basins, permanent low threat vegetation, or permanent clearing such as that associated with future roads). Based on the vegetation classifications identified during the site assessment, or considered potentially likely within the assessment area as part of future development, the following separation distances may apply: 14 m from Class B Woodland (flat/upslope) 17 m from Class B woodland (downslope 0°-5°)

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
			13 m from Class D scrub (flat/upslope) 15 m from Class D scrub (downslope 0°-5°) 9 m from Class C shrubland (flat/upslope) 10 m from Class C shrubland (downslope 0°-5°) 8 m from Class G grassland (flat/upslope) 9 m from Class G grassland (downslope 0°-5°) 21 m from Class A forest (flat/upslope) – from potential future revegetation 27 m from Class A forest (downslope 0°-5°) – from potential future revegetation The post-development BHLs within future building envelopes would be expected to be either with Low and Moderate bushfire hazard levels, on the basis that suitably sized APZs will be established around future buildings to achieve BAL-29 or lower. It is noted there is some land within the project area that is Extreme BHL, however most of that is along Dolbys Creek (and the future Foreshore Reserve), and as such, there would not be expected to be significant levels of native vegetation clearing required for the proposed development. This is addressed further under A2.2 below. Based on the above, compliance is achieved with A2.1.
	<u>A2.2 Clearing of native vegetation</u> The strategic planning proposal avoids, or where unavoidable, minimises the clearing of native vegetation.	<u>Acceptable Solution</u>	The majority of the project area has been cleared as part of the existing rural land use, and there appears to be limited remnant native vegetation remaining other than the isolated scrub vegetation near existing dwellings, and more continuous woodland and scrub vegetation along Dolbys Creek line. While it is expected that most vegetation could be cleared within the parts of the SP zoned for future rural-residential development (for building envelopes and associated APZs) or roads and driveways, there is little if any significant native vegetation within those parts of the project area. Land within the Foreshore Reserve is unlikely to be modified or cleared, with any clearing expected to be minor and targeted, and there is potential for revegetation along Dolbys Creek. Notwithstanding, Covey assumes that all relevant environmental studies will be undertaken to support the project, and if any State and Federal environmental referrals and approvals are required, they will be sought prior to commencing on-site vegetation modification or clearing required to construct the development.
Element 3: Vehicular access			
<u>Outcome O3</u> Ensure the design and capacity of vehicular access and egress provide: - for efficient and effective evacuation to a suitable destination(s) and/or - as a contingency measure for vulnerable land uses, an on-site shelter, where demonstrated appropriate, as a last resort option.	Area 1 (Urban): Does not require assessment of Element 3: Vehicular Access Area 2: Proceed with the following Acceptable Solutions <u>A3.1 Public Roads</u> Public roads, including perimeter roads should meet the technical requirements in Appendix B.3, Table 10	<u>Acceptable Solution</u>	The existing public roads outside the project area, namely Dolbys Drive, Cooper Street, Dulchev Way and Beattie Road, are sealed two-way roads that appear to be compliant with PBG and are sufficient for occupant egress and emergency services access. Covey note that Dulchev Way is a legacy 330 m dead-end road (from the intersection with Cooper Street), which is discussed further in A3.2 and A3.3a. The SP depicts additional future public roads within the project area as part of future development. All future public roads will be required to comply with the relevant technical requirements of PBG for public roads (see Appendix D).
	<u>A3.2 Access Routes</u> Public road access should be provided in two different directions, to two different suitable destinations; and with an all-weather surface.	<u>Acceptable Solution</u>	There are currently no existing public roads within the project area, with the public road network outside the project area as follows: - Dolbys Drive to the east, which is currently a 585 m long no-through road, with an 18 m diameter turning head; - Cooper Street to the south, which connects to Dulchev Way in the west which eventually terminates as a dead-end road approximately 330 m from the intersection to the west,

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
			however there are opportunities for continuous travel as follows: ○ Beattie Road to travel south-west to North-West Coastal Highway ○ Hall Road to travel south to Tramway Road which connects to North-West Coastal Highway in the west, and ○ David Road to travel south to Tramway Road which connects to North-West Coastal Highway in the west, or north to Eliza Shaw Road which also eventually connects to North-West Coastal Highway. The future public roads proposed within the project area as part of the SP include: • A new public road in the northern portion of the project area (from west to east) • 3 potential access scenarios (Access Scenarios 1, 2 and 3), of which not all are proposed to be constructed • Potential emergency access ways (EAWs) as follows: ○ Within the future road reserve to the west, and connecting to Dulchev Way in the south-west. ○ Along the western boundary heading north, to connect to either Cargeeg Bend and/or Skyline Ridge public roads further north of the project area ○ Along the eastern boundary, then along the southern bank of Dolbys Creek and connecting to Patten Place in the east ○ Within the Access Scenario 2 or 3 roads (which have existing crossings across Dolby Creek). In order to comply with A3.2, and noting that EAWs need to be less than 500 m long and no-through public roads less than 200 m long, the following will need to be implemented as a minimum: • The new public road in the northern portion of the site, will need to be connected to the existing public road network by at least one public road along Access Scenario 1 and 3, and either another public road or EAW in Access Scenario 1 or 3. • This is required to address the legacy non-compliance of Dolbys Drive (already a 585 m no-through road) by creating a loop road network that doesn't contain a non-through road exceeding 200 m. ○ The public road on the Access Scenario 1 alignment, could also be via the future road reserve immediately to the west, or by negotiation, could also be an EAW to the north or south, until the future public road is constructed. ○ It is noted that an EAW to the north may exceed the 500 m maximum length permitted for an EAW, however the deviation from the Acceptable Solutions could be proposed as an Outcomes-Based Solution. Given the additional travel distance is relatively minor, and much of the land in the area is not designated bushfire prone, there is a reasonable basis to propose such a solution for decision-maker consideration. • The extension of Dolbys Drive via Access Scenario 2 alone would not produce a compliant access outcome, as it would result in no-through roads on either side that exceed 200 m length, so would require at least a public road or EAW along Access Scenario 1 and 3 to resolve the non-compliance ○ The use of the Access Scenario 2 alignment could be useful in addressing temporary access non-compliances due to staging, where it could be used as a EAW (temporary or permanent). • Similarly, the EAW in the east, from Dolbys Drive to Patten Place would not address the Dolbys Drive legacy non-compliance nor address the overlength no-through road of the proposed northern public road, however does present an opportunity to resolve the

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
			Patten Place legacy non-compliance (currently a 900 m no-through road), should it be practical to do so. This would also be an overlength EAW, and would require an Outcomes-Based Solution to be presented for decision-maker consideration, that justified the deviation from the Acceptable Solutions. The constructed public road network is currently non-compliant with A3.2, as it is only served by the single public road connection to the greater public road network, namely Dolbys Drive, which is a legacy non-compliant no-through road. The proposed internal road network options can be configured to produce a compliant access network provided a compliant public road or EAW is constructed along the Access Scenario 1 alignment (or in the road reserve immediately to the west outside the project area) and Access Scenario 3 alignment (or nearby). In this regard, the proposed development can be provided with at least two access routes which meets the requirements of Acceptable Solution A3.2.
	<u>A3.3a No-through Roads</u> If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints, the public road access is to be a maximum of 200 m from the subject site boundary to an intersection where two-way access is provided. The no-through road may exceed 200 metres if it is demonstrated that an alternative access, including an emergency access way, cannot be provided due to site constraints, and the following requirements are met - the no-through road travels towards a suitable destination; and - the balance of the no-through road that is greater than 200 metres from the subject site, is wholly within BAL-LOW, or is within a residential built-out area, or is within Area 1 (Figure 29). <u>A3.3b No-through Road Requirements</u> A no-through road is to meet all the following requirements: - requirements of a public road (Appendix B.3, Table 10, Column 2); and - turn-around area/head (Figure 30).	<u>Acceptable Solution</u>	Access to most of the project area is currently via a non-compliant no-through road, namely Dolbys Drive, which is 585 m long and exceeds the 200 m permitted. The proposed access network (detailed above in A3.2) is capable of providing a compliant outcome, that resolves the legacy non-compliance and ensures any no-through road is less than 200 m. This is to be achieved through the construction of a compliant public roads and/or EAW along Access Scenarios 1 and 3, as a minimum. All future public roads within the project area will be required to comply with the relevant technical requirements of PBG for public roads (see Appendix D), and any no-through roads, are to comply with the requirements of A3.3a including: - being no greater than 200 m long to a point of choice (unless justification can be provided as per A3.3a) - having a compliant turnaround head or hammerhead arrangement.
Element 4: Water			
<u>Outcome O4</u> Ensure that sufficient water is available to enable people, property and infrastructure to be defended from bushfire.	Area 1 (Urban): Does not require assessment of Element 4: Water Area 2: Proceed with the following Acceptable Solutions <u>A4.1 Water Supply</u> Evidence that a sufficient and accessible reticulated or non-reticulated water supply for bushfire firefighting can be provided at the subdivision and/or development application stage, in accordance with the specifications of the relevant water supply authority or the requirements in Appendix B4: Water Supply dedicated for bushfire firefighting	<u>Acceptable Solution</u>	The existing development within the project area is connected to reticulated water supply with existing street hydrants within the site as depicted on Plate 1. There is also existing reticulated water supply and street hydrants along public roads outside the project area, including Cooper Street and Dulchev Way. Given the proximity to existing reticulated water supply, it is expected that the proposed future development will also be connected to reticulated water supply in accordance with the relevant Water Corporations design standards (refer to Appendix E). Should future public roads be constructed as part of future development, it is expected that additional street hydrants would be installed in accordance with relevant Water Corporation design standards.



Plate 1: Existing Water Corporation pipe and hydrants

6 Responsibilities for implementation and management of the bushfire measures

This BMP has been prepared as a strategic guide to demonstrate how development compliance will be delivered at future planning stages in accordance with PBG. Aside from the preparation of future BMPs to accompany future subdivision and development applications where appropriate, there are no further items to implement, enforce or review at this strategic stage of the planning process.

Future BMPs prepared for subsequent subdivision and development applications are to meet the relevant commitments outlined in this strategic level BMP, address the relevant requirements of SPP 3.7 (i.e. Policy Measure 7.1 (ii)) and demonstrate in detail how the proposed development will incorporate the relevant acceptable solutions or meet the performance requirements of PBG. Future BMPs are to include the following detailed information:

- Proposed development layout, including any lots, roads, POS/drainage areas etc;
- Detailed landscape plans for all Foreshore Reserve, drainage and areas of revegetation or retention, to confirm the final extent of classified vegetation (retained or revegetated) and exclusions (non-vegetated areas and low threat vegetation);
- Final determination of post development classified vegetation extent, exclusions and effective slope;
- Final BAL contour map demonstrating that proposed development areas will achieve BAL-29 or lower (may require designation of building envelopes);
- Width and alignment of compliant APZs/setbacks;
- Confirmation of how bushfire management will be addressed during development staging including consideration of low threat staging buffers and vehicular access (temporary no-through roads/EAWs);
- Proposed approach to fuel management throughout Foreshore Reserve, vacant land, staging buffers, adjacent properties and road verges; or application of AS 3959 in response to classified vegetation;
- Vehicular access provisions, including demonstration that a minimum of two access routes will be achieved for each stage of development (as required);
- Water supply provisions with regards to reticulated water supply provisions (including network of street hydrants), or static firewater tanks if required;
- Demonstration of compliance with the relevant Bushfire Protection Criteria of PBG;
- Requirements for any proposed vulnerable land uses including provision of a BMP and Bushfire Emergency Evacuation Plan to accompany the development application;
- Requirements for BMP compliance reports as a condition of subdivision;
- Provisions for notification on Title for any future lots with a rating of BAL-12.5 or greater as a condition of subdivision;
- Compliance requirements with the current local government annual firebreak notice, as amended or varied (most recent as per Appendix F);
- Construction of Class 1, 2, 3 or associated 10a buildings/decks, in accordance with National Construction Code to the assessed BAL rating;
- Construction 'certain Class 9' buildings, in accordance with the requirements of the National Construction Code; and
- Proposed implementation and audit program outlining all measures requiring implementation and the appropriate timing and responsibilities for implementation.

On the basis of the information contained in this BMP, Covey considers the bushfire hazards within and adjacent to the project area and the associated bushfire risks are manageable through standard management

responses outlined in PBG and AS 3959. Covey considers that on implementation of the proposed management measures, the project area will be able to be developed with a manageable level of bushfire risk whilst maintaining full compliance with PBG and AS 3959.

7 References

Department of Fire and Emergency Services (DFES) 2025, *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from: <https://maps.slip.wa.gov.au/landgate/bushfireprone/>,

Standards Australia (SA) 2018, *Australian Standard AS 3959:2018 Construction of buildings in bushfire-prone areas*. SAI Global, Sydney.

Western Australian Department of Planning (DoP) 2016, *Visual guide for bushfire risk assessment in Western Australia*. Department of Planning, Perth.

Western Australian Planning Commission (WAPC) 2024, *State Planning Policy 3.7: Bushfire*, November 2024. Western Australian Planning Commission, Perth.

Western Australian Planning Commission (WAPC) 2024, *Planning for Bushfire Guidelines*, November 2024. Western Australian Planning Commission, Perth.

Appendix A

APZ Standards from PBG

An APZ is a low fuel area maintained around a habitable building to increase the likelihood that it will survive a bushfire, by providing a defendable space and reducing the potential for direct flame contact, radiant heat exposure and ember attack. The APZ allows emergency services access and provides an area for firefighters and home-owners to defend their property.

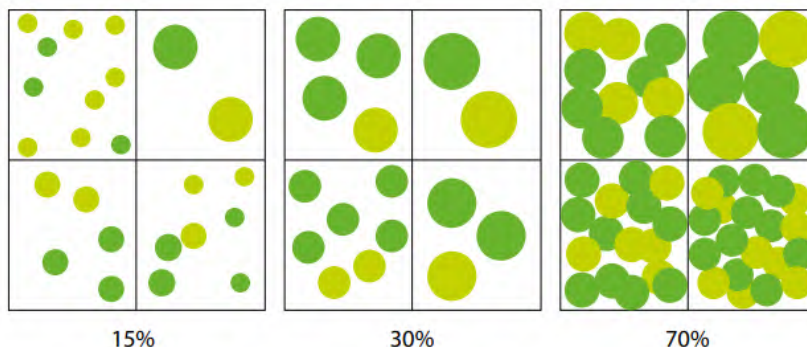
An APZ should not be seen as an area entirely cleared of vegetation, but as a strategically designed space that considers how existing and future mature vegetation, and combustible and non-combustible features interact with and affect the building's resilience to bushfire.

Vegetation management within an APZ should provide defendable space and be maintained to a low threat state, in perpetuity, in accordance with the requirements outlined below.

Table 9: Asset Protection Zone Technical Requirements

• **Trees* (> 6 metres in height)**

- Trunks at maturity should be a minimum distance of six metres from all elevations of the building.
- Branches at maturity should not touch or overhang a building or powerline.
- Lower branches and loose bark should be removed to a height of two metres above the ground and/or surface vegetation.
- Canopy cover within the APZ should be <15 per cent of the total APZ area.
- Tree canopies at maturity should be at least 5 metres apart to avoid forming a continuous canopy. Stands of existing mature trees with interlocking canopies may be treated as an individual canopy provided that the total canopy cover within the APZ will not exceed 15 per cent and are not connected to the tree canopy outside the APZ.



• **Shrub* and Scrub* (0.5 metres to 6 metres in height)**

- Should not be located under trees or within three metres of buildings.
- Should not be planted in clumps >5 square metres in area.
- Clumps should be separated from each other and any exposed window or door by at least 10 metres.
- Shrub and scrub >6 metres in height are to be treated as trees.

• **Ground covers (<0.5 metres in height)**

- Can be planted under trees but must be maintained to remove dead plant material, as prescribed in 'Fine fuel load'.
- Can be located within two metres of a structure, but three metres from windows or doors if >100 millimetres in height.
- Ground covers >0.5 metres in height are to be treated as shrubs

• **Grass**

- Grass should be maintained at a height of 100 millimetres or less, at all times.

Table 9: Asset Protection Zone Technical Requirements

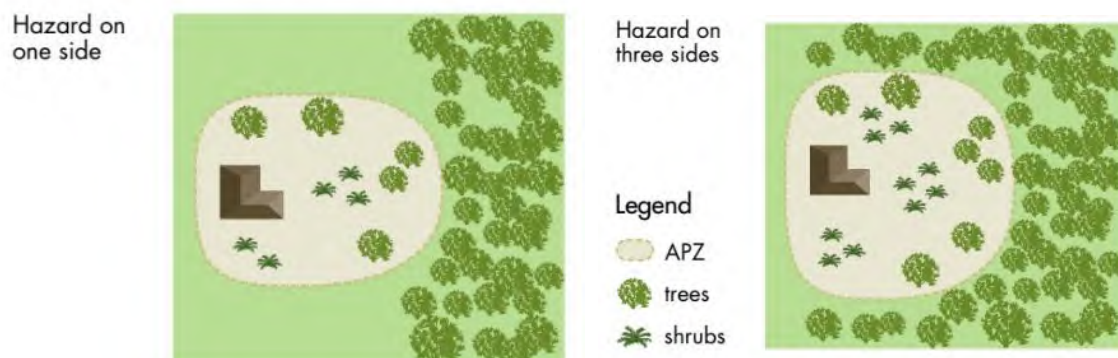
- Wherever possible, perennial grasses should be used and well-hydrated with regular application of wetting agents and efficient irrigation.
- **Fine Fuel load (combustible dead vegetation mater <6 mm in thickness)****
 - Should be managed and removed on a regular basis to be maintained as low threat vegetation.
 - Should be maintained at <2 tonnes per hectare (on average).
 - Mulches should be non-combustible such as stone, gravel, shells, rock or crushed mineral earth or wood mulch >5 millimetres in thickness.
- **Defendable Space**
 - Within three metres of each wall or supporting post of a habitable building, the area is kept free from vegetation, but can include ground covers, grass and non-combustible mulches as prescribed above.
- **Fences within the APZ**
 - Should be constructed from non-combustible materials (for example, iron, brick, limestone, metal post and wire, or bushfire-resisting timber referenced in Appendix F of AS 3959)
- **LPG Cylinders**
 - Should be located on the side of a building furthest from the likely direction of a bushfire or on the side of a building where surrounding classified vegetation is upslope, at least one metre from vulnerable parts of a building.
 - The pressure relief valve should point away from the house.
 - No flammable material within six metres from the front of the valve.
 - Must sit on a firm, level and non-combustible base and be secured to a solid structure.

* Plant flammability, landscaping design and maintenance should be considered – refer to explanatory notes

** Fine fuel load:

- *is the combustible, dead or dry vegetation matter on the ground, near ground, or elevated. Fine fuel includes grass, leaves, bark and twigs less than six millimetres in diameter that ignite readily and are burnt rapidly when dry.*
- *Fine fuel should be maintained at less than 2t/ha (100gm/m² equates to 1t/ha).*
 - *To estimate a fuel load (in t/ha), collect the dry fine fuel from a representative one square meter and weigh (in grams using kitchen scales) and multiply the weight by 0.01.*

Figure 25: Design of an Asset Protection Zone



B.2.2 Designing an Asset Protection Zone

An APZ should not be seen as an area entirely cleared of vegetation, but as a strategically designed space that considers how existing and future mature vegetation, and combustible and non-combustible features interact with and affect the building's resilience to bushfire.

An APZ should provide the greatest level of vegetation management within at least three metres of a habitable building, to ensure adequate unobstructed defensible space for emergency services to operate. This area should contain minimal vegetation and be free of combustible materials and obstructions. Within the remainder of the APZ, planting of vegetation can increase as you move farther away from the building.

The placement of plants within an APZ is a key design technique. Separation of garden beds with areas of low fuel or non-combustible material will break up fuel continuity and reduce the likelihood of vegetation within an APZ supporting a bushfire. It is important to consider the plant density and final structure and form of plants in their mature state.

Strategic landscaping measures can be applied, such as replacing weeds with low flammability vegetation to create horizontal and vertical separations between the retained vegetation.

Mulches used within the APZ should be non-combustible. The use of stone, gravel, shells, rock and crushed mineral earth is encouraged. Very fine or light mulch (such as shredded pine bark, pine needles, or poplar woodchips) less than five millimeters in diameter should be avoided. It is recommended that wood mulch is used in garden beds or areas where the moisture level is higher by regular irrigation, and these areas are separated with non-combustible elements, such as pathways and open spaces.

Incorporation of landscaping features, such as masonry feature walls, can provide habitable buildings with barriers to wind, radiant heat and embers. These features can include noise walls or wind breaks. Use of Appendix F of AS 3959 for bushfire resistant timber selection or the use of non-combustible fencing materials such as iron, brick, limestone, metal post and wire is encouraged within an APZ

B2.3 Management of an Asset Protection Zone

Ongoing maintenance of an APZ is usually enforced through a condition of a development approval, which should refer to Table 9 APZ technical requirements within this Appendix.

In addition to regular maintenance of an APZ, further bushfire protection can be provided by:

- ensuring gutters are free from vegetation
- installing gutter guards or plugs
- regular cleaning of underfloor spaces, or enclosing them to prevent gaps
- trimming and removing dead plants or leaf litter
- pruning climbing vegetation (such as vines) on a trellis, to ensure it does not connect to a building, particularly near windows and doors
- removing vegetation in close proximity to a water tank to ensure it is not touching the sides of a tank
- following the requirements of the relevant local government firebreak notice, which may include additional provisions such as locating wood piles more than 10 metres from a building.

Preparation of a property prior to the bushfire season and/or in anticipation of a bushfire is beneficial even if your plan is to evacuate. Embers can travel up to several kilometres from a bushfire and fall into small spaces and crevices or land against the external walls of a building.

Best practice recommends objects within the APZ are moved away from the building prior to any bushfire event.

Objects may include, but are not limited to:

- door mats
- outdoor furniture
- potted plants
- shade sails or umbrellas
- plastic garbage bins
- firewood stacks
- flammable sculptures
- playground equipment and children's toys.

B2.4 Plant Flammability

There are certain plant characteristics that are known to influence flammability, such as moisture or oil content and the presence and type of bark. Plants with lower flammability properties may still burn during a bushfire event, but may be more resistant to burning and some may regenerate faster post-bushfire.

There are many terms for plant flammability that should not be confused, including:

- **Fire resistant** – plant species that survive being burnt and will regrow after a bushfire and therefore may be highly flammable and inappropriate for a garden in areas of high bushfire risk.
- **Fire-retardant** – plants that can absorb more of the heat of the approaching bushfire without burning, compared to more flammable plants.
- **Fire wise** – plants that have been identified and selected based on their low flammability properties and linked to maintenance advice and planting location within a garden.

Although not a requirement of these Guidelines, local governments may develop their own list of fire wise or fire-retardant plant species that suit the environmental characteristics of an area.

When developing a recommended plant species list, local governments should consult with ecologists, land care officers or environmental authorities to ensure the plants do not present a risk to endangered ecological communities, threatened, or endangered species or their habitat.

When selecting plants, private landholders and developers should aim for plants within the APZ that have the following characteristics:

- grow in a predicted structure, shape and height;
- are open and loose branching with leaves that are thinly spread;
- have a coarse texture and low surface-area-to-volume ratio;
- will not drop large amounts of leaves or limbs, that require regular maintenance;
- have wide, flat, and thick or succulent leaves;
- trees that have bark attached tightly to their trunk or have smooth bark;

- have low amounts of oils, waxes, and resins (which will often have a strong scent when crushed);
- do not produce or hold large amounts of fine dead material in their crowns; and/or
- will not become a weed in the area.

Appendix B

AS 3959 Clause 2.2.3.2 (e) and (f) – Low threat Vegetation and Non-Vegetated Areas

2.2.3.2 Exclusions—Low threat vegetation and non-vegetated areas

The following vegetation shall be excluded from a BAL assessment:

- (a) Vegetation of any type that is 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 vegetation.
- (c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other or of other areas of vegetation being classified vegetation.
- (d) Strips of vegetation less than 20 m in width (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 vegetation.
- (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 fairways), 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 windbreaks.

NOTES:

- 1 Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognizable as short-cropped grass for example, to a nominal height of 100 mm).
- 2 A windbreak is considered a single row of trees used as a screen or to reduce the effect of wind on the leeward side of the trees.

Appendix C

Vegetation plot photos and description



Photo ID: 1a



Photo ID: 1b



Photo ID: 1c



Photo ID: 1d



Photo ID: 1e



Photo ID: 1f

Plot number	Plot 1
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height



Photo ID: 1g



Photo ID: 1h



Photo ID: 1i



Photo ID: 1j



Photo ID: 1k

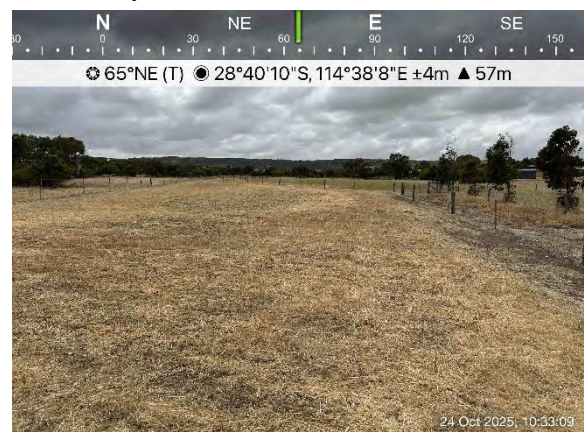


Photo ID: 1l

Plot number	Plot 1
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height



Photo ID: 1m

Plot number	Plot 1
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height



Photo ID: 3a



Photo ID: 3b

Plot number	Plot 3
Vegetation classification	Class D Scrub
Description / justification	Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity



Photo ID: 4a



Photo ID: 4b



Photo ID: 4c



Photo ID: 4d



Photo ID: 4e

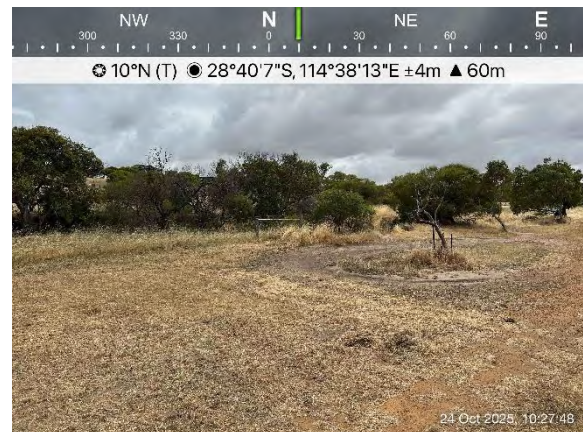


Photo ID: 4f

Plot number	Plot 4
Vegetation classification	Class B Woodland
Description / justification	Trees 2-30 m at maturity, dominated by trees with a grassy understorey (lacks shrubby middle layer and deep surface litter)



Photo ID: 4g



Photo ID: 4h

Plot number	Plot 4
Vegetation classification	Class B Woodland
Description / justification	Trees 2-30 m at maturity, dominated by trees with a grassy understorey (lacks shrubby middle layer and deep surface litter)



Photo ID: 5a

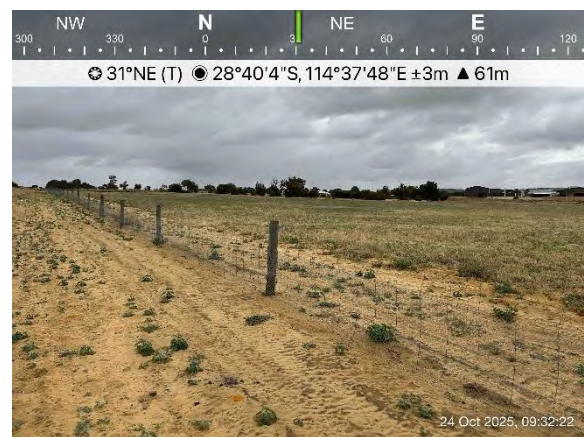


Photo ID: 5b



Photo ID: 5c



Photo ID: 5d



Photo ID: 5e



Photo ID: 5f

Plot number	Plot 5
Vegetation classification	Class G Grassland
Description / justification	Grassland at maturity, greater than 100 mm in height



Photo ID: 5g



Photo ID: 5i



Photo ID: 5k



Photo ID: 5h



Photo ID: 5j

Plot number	Plot 5
Vegetation classification	Class G Grassland
Description / justification	Grassland at maturity, greater than 100 mm in height



Photo ID: 6a



Photo ID: 6b

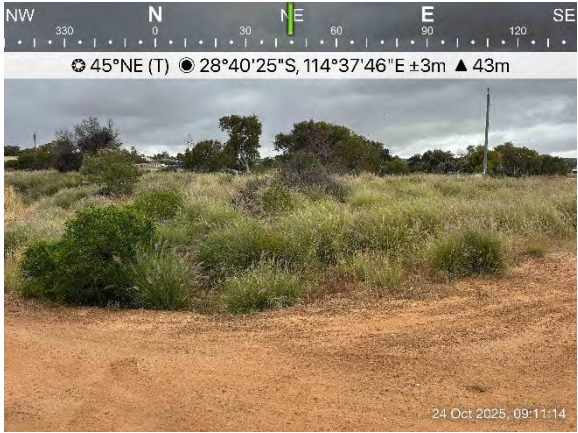


Photo ID: 6c



Photo ID: 6d



Photo ID: 6e



Photo ID: 6f

Plot number	Plot 6
Vegetation classification	Class D Scrub
Description / justification	Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity



Photo ID: 6g



Photo ID: 6h

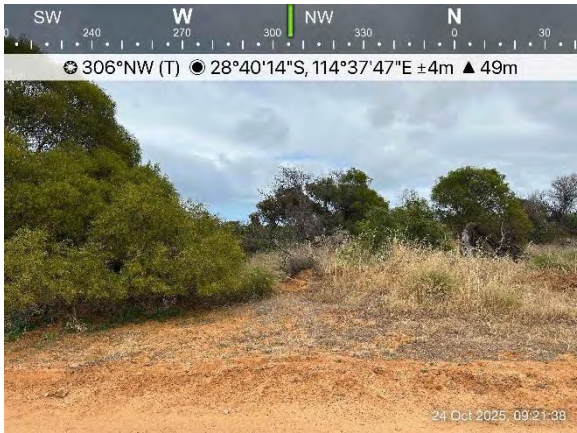


Photo ID: 6i



Photo ID: 6j



Photo ID: 6k

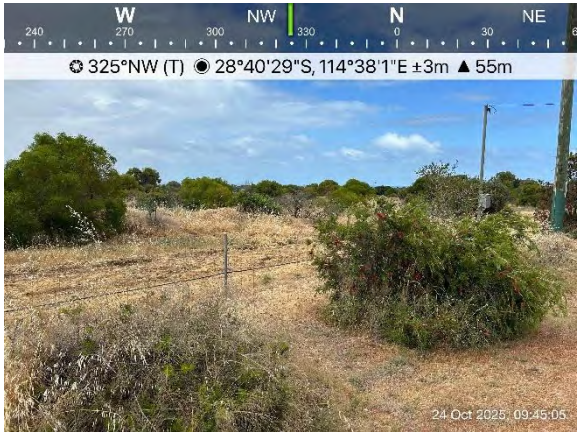


Photo ID: 6l

Plot number	Plot 6
Vegetation classification	Class D Scrub
Description / justification	Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity

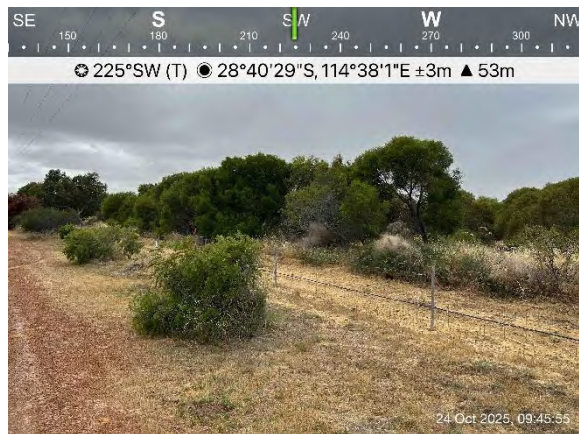


Photo ID: 6m



Photo ID: 6o



Photo ID: 6q



Photo ID: 6n



Photo ID: 6p



Photo ID: 6r

Plot number	Plot 6
Vegetation classification	Class D Scrub
Description / justification	Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity



Photo ID: 7a



Photo ID: 7b

Plot number	Plot 7
Vegetation classification	Class B Woodland
Description / justification	Trees 2-30 m at maturity, dominated by trees with a grassy understorey (lacks shrubby middle layer and deep surface litter)



Photo ID: 8a



Photo ID: 8b



Photo ID: 8c



Photo ID: 8d



Photo ID: 8e



Photo ID: 8f

Plot number	Plot 8
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints



Photo ID: 9a



Photo ID: 9b



Photo ID: 9c



Photo ID: 9d



Photo ID: 9e



Photo ID: 9f

Plot number	Plot 9
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints



Photo ID: 9g



Photo ID: 9i



Photo ID: 9k



Photo ID: 9h



Photo ID: 9j

Plot number	Plot 9
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints

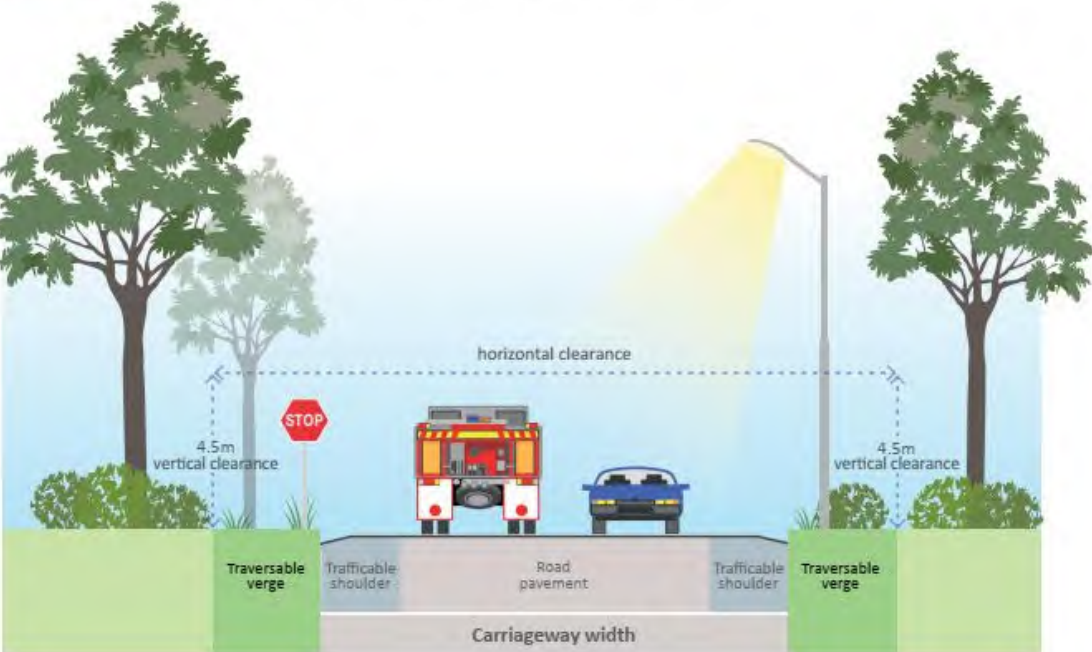


Photo ID: 10a

Plot number	Plot 10
Vegetation classification	Excluded – Clause 2.2.3.2 [a]
Description / justification	Classified vegetation >100m from site

Appendix D

Vehicular Access Technical Standards of the PBG

Public Roads
Acceptable Solution A3.1
Public roads, including perimeter roads should meet the technical requirements in Appendix B.3, Table 10
Appendix B.3.1
The Guidelines do not prescribe values for the carriageway width or the horizontal clearance for public roads (except for perimeter roads). Public roads should be in accordance with the class of road as specified in the Public Works Engineering Australasia (IPWEA) subdivision guidelines, Liveable Neighbourhoods, Austroads Standards, any applicable or relevant Main Roads standards, supplements, policies and any applicable or relevant local government standards or policies. However, it is important that public roads (and other forms of access) in bushfire prone areas, allow for emergency services vehicles to stop and operate on the side of the public road, specifically where the public road traverses large areas of classified vegetation. It is, therefore, recommended that public roads achieve a minimum six metres horizontal clearance. Perimeter roads require additional width. Where local or state government roads are proposed to be widened or modified by the proponent, as part of the structure planning process or at the subdivision stage, approval is required from the relevant government authority.
Figure 26: Area encompassing horizontal clearance and vertical clearance  Horizontal clearance: The carriageway width (including the road pavement and trafficable shoulder) and traversable verge that provides for the movement and parking of vehicles and area required by emergency services to operate. Infrastructure and vegetation within the traversable verge should be frangible, however, non-frangible items can occur providing they do not restrict vehicular movement in the event of an emergency.

No-Through Roads

Acceptable Solution A3.3

A3.3a No-through Roads

If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints, the public road access is to be a maximum of 200 m from the subject site boundary to an intersection where two-way access is provided.

The no-through road may exceed 200 metres if it is demonstrated that an alternative access, including an emergency access way, cannot be provided due to site constraints, and the following requirements are met

- the no-through road travels towards a suitable destination; and
- the balance of the no-through road that is greater than 200 metres from the subject site, is wholly within BAL-LOW, or is within a residential built-out area, or is within Area 1 (Figure 29).

A3.3b No-through Road Requirements

A no-through road is to meet all the following requirements:

- requirements of a public road (Appendix B.3, Table 10, Column 2); and
- turn-around area/head (Figure 30).

Appendix B.3.3

No-through roads reduce the legibility of a road network and options available for access and egress in the event of a bushfire emergency. The inclusion of new no-through roads within subdivision or structure plan designs, in the first instance, should be avoided in bushfire prone areas.

However, where it is demonstrated, to the satisfaction of the decision-maker that a no-through road cannot be avoided due to site or design characteristics, the inclusion of a new no-through road is to be treated as an acceptable solution, if it satisfies the prescribed maximum road length. Where this is not demonstrated, a decision-maker is able to request a redesign to remove the no-through road.

The acceptable solution for no-through roads in areas shown as Area 2 on the Map of Bush Fire Prone Areas includes a maximum of 200 metres from the lot(s) boundary to an intersection where two-way access is provided (Figure 28). There is no prescribed maximum length for no-through roads in areas shown as Area 1 (Urban) on the Map of Bush Fire Prone Areas.

Figure 28: Demonstration of a lot achieving two-way access within 200 metres



No-Through Roads

Figure 29: Example of a site on a no-through road greater than 200 metres but within 200 metres of BAL-LOW

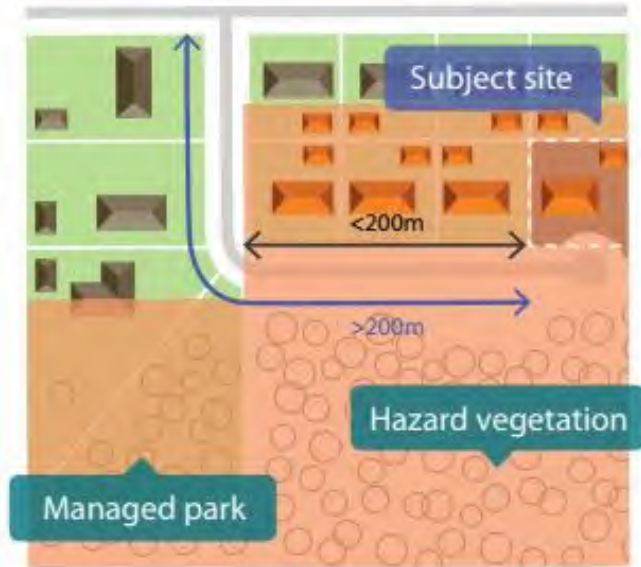


Figure 30: Design requirements for a turn-around area

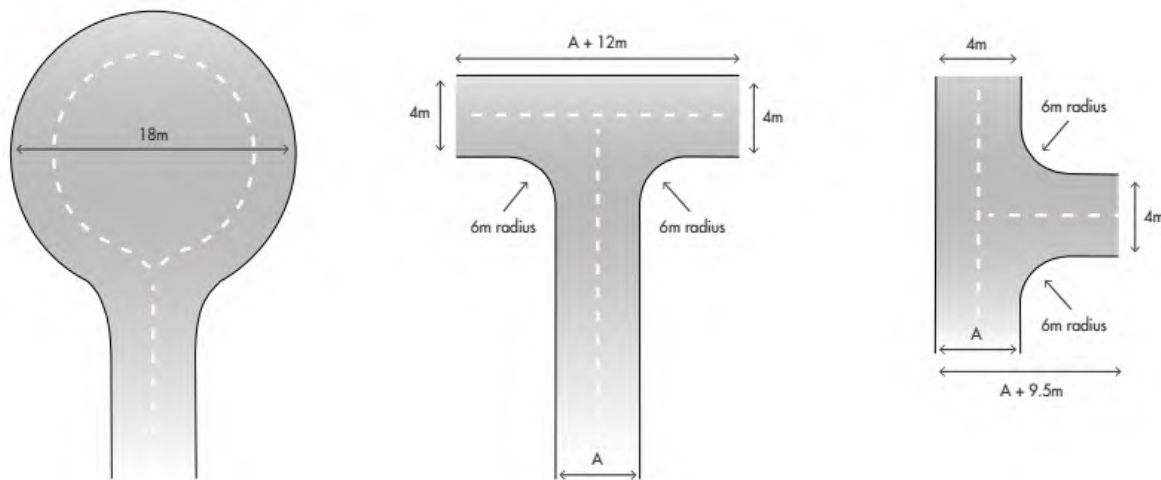


Table 10: Vehicular access technical requirements

	1		2		3		4		5	
TECHNICAL REQUIREMENTS	PERIMETER ROADS		PUBLIC ROADS		EMERGENCY ACCESS WAY ³		FIRE SERVICE ACCESS ROUTE ³		BATTLE-AXE & PRIVATE DRIVEWAYS ¹	
MAP OF BUSH FIRE PRONE AREAS DESIGNATION	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1
Minimum horizontal clearance (metres)	12	8	See note 5		10	6	10	6	6	
Minimum vertical clearance (metres)	4.5									
Minimum weight capacity (tonnes)	15									
Maximum grade unsealed road ²	See note 5		See note 5		1:10 (10% or 6°)					
1:7 (14.3% or 8°)										
1:10 (10% or 6°)										
8.5										
Maximum grade sealed road ^{2,4}										
Maximum average grade sealed road										
Minimum inner radius of road curves (metres)										

Notes:

¹ Driveways and battle-axe legs to comply with the Residential Design Codes and Development Control Policy 2.2 Residential Subdivision where not required to comply with the widths in this Appendix or the Guidelines.

² Dips must have no more than a 1 in 8 (12.5% - 7.1 degrees) entry and exit angle.

³ To have crossfalls between 3 per cent and 6 per cent.

⁴ For sealed roads only the maximum grade of no more than 1 in 5 (20 per cent) (11.3 degrees) for no more than 50 metres is permissible, except for short constrictions to 3.5 metres for no more than 30 metres in length where an obstruction cannot be reasonably avoided or removed.

⁵ As outlined in the Institute of [Public Works Engineering Australasia \(IPWEA\) subdivision guidelines](#), [Liveable Neighbourhoods](#), [Austroads Standards](#) Main Roads standard, supplement, policy or guideline and/or any applicable or relevant local government standard or policy.

Appendix E

Water Technical Standards of PBG

Appendix B.4 – Water Supply	
B4.1 Construction and Design Technical requirements	
- An above-ground tank and associated stand should be constructed of non-combustible material. - Below-ground tanks should have a 200 millimetres diameter access hole to allow tankers or emergency services vehicles to refill direct from the tank, with the outlet location clearly marked on the surface. - Above and below ground tanks may need to comply with AS/NZS 3500.1:2018. - An inspection opening may double as the access hole provided that the inspection opening meets the requirements of AS/NZS 3500.1:2018. - Where an outlet for an emergency services vehicle is provided, then an unobstructed, hardened ground surface is to be supplied within four metres of any water supply.	
<u>B4.1.1 Pipes and Fittings</u>	
- All above-ground, exposed water supply pipes and fittings should be metal. - Fittings should be located away from the source of bushfire hazard and be in accordance with the applicable section below, unless otherwise specified by the local government.	
<u>B4.1.2 Fittings for above-ground water tanks</u>	
- Commercial land uses: 125mm Storz fitting; or - Strategic water tanks: 50mm or 100mm (where applicable and adapters are available) male camlock coupling with full flow valve; or - Standalone water tanks: 50mm male camlock coupling with full flow valve; or - Combined water tanks: 50mm male camlock coupling with full flow valve or a domestic fitting, being a standard household tap that enables an occupant to access the water supply with domestic hoses or buckets for extinguishing minor fires.	
<u>B4.1.3 Remote outlets</u>	
In certain circumstances, it may be beneficial to have the outlet located away from the water supply. In instances in which a remote outlet is to be used, the applicant should consult the local government and DFES on their proposal.	
B4.2 Use of Water Supply	
- The combination of drinking water and water for firefighting purposes is not recommended, as stagnant water may alter the quality of the drinking water and the emergency services, by law, may not be able to take water from the water supply to suppress a bushfire. - Combining drinking water and water for firefighting purposes is contrary to provisions within clause 4.2.3 of AS/ NZS 3500.1:2021	
B4.3 Independent Water and Power Supply	
Water tank/s are to be provided in accordance with Table 11, Water supply dedicated for bushfire firefighting purposes.	
B4.5 Location of Water Tanks and Hydrants	

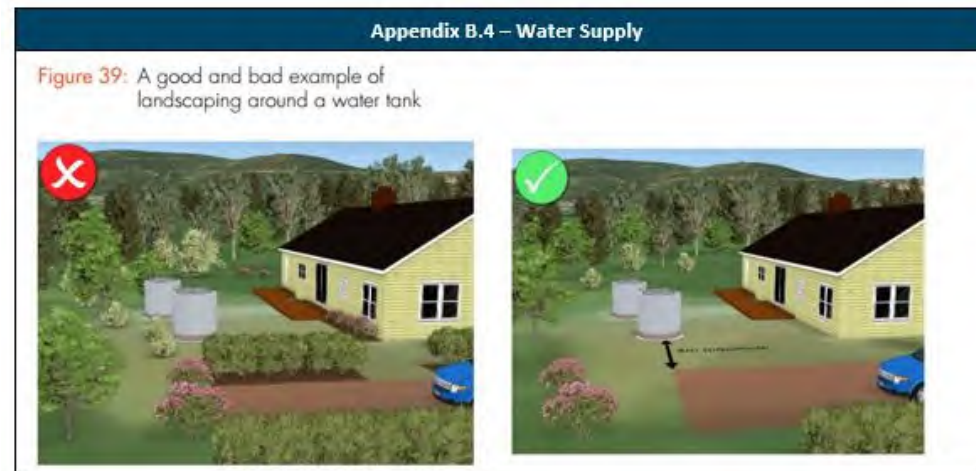


Table 11: Water supply dedicated for bushfire firefighting purposes

SECTIONS FROM THE PLANNING FOR BUSHFIRE GUIDELINES					
SECTION 5 ² STRUCTURE PLANS AND SUBDIVISION APPLICATIONS		SECTION 6 ² DEVELOPMENT – RESIDENTIAL	SECTION 7 ² DEVELOPMENT – COMMERCIAL & INDUSTRIAL	SECTION 8 ² – DEVELOPMENT – VULNERABLE LAND USES	
One additional lot	10,000 litre water tank per lot	10,000 litre water tank per habitable building	For each habitable building - 10,000 litre per 1,500 m ² of floor space up to 50,000 litre. Provided in a water tank	Camping ground	At the discretion of the local government
Three to 24 lots	10,000 litre water tank per lot ¹ or 50,000 litre strategic water tank				
25 lots or more	50,000 litre per 25 lots or part thereof, provided as a strategic water tank(s) and/or 10,000 litre water tank per lot			Other vulnerable land uses	For each habitable building - 10,000 litre per 500 m ² of floor space up to 50,000 litre. Provided in a water tank

Notes:

¹ Evidence that the identified water supply amounts in either column denoted is to be provided at the relevant planning stage.

² where more than one habitable building is proposed, strategic water tanks are to be provided in accordance with Section 5 requirements and at the discretion of the Local Government.

Appendix F

Shire of Chapman Valley Firebreak Notice

BUSH FIRES ACT 1954 AS AMENDED

HARVESTING OPERATIONS

1. No harvesting operations are permitted on **Christmas Day, Boxing Day and New Years Day**. A separate fire fighting fire appliance is required to be present in any paddock being harvested, churning, raking stubble, straw baling and associated allied activities during restricted and prohibited periods. The fire fighting unit must be in a state of readiness and have a minimum capacity of 400L of water, a powered pump and hose. The farm fire fighting unit should be parked on bare ground in or near the harvesting or working area.
2. A Harvesting and Movement Ban and Use of Internal Combustion Engines (except for the watering and movement of stock) will be imposed when the actual weather conditions reach a Fire Danger rating of thirty five (35) on the maximum wind speed at the weather stations of two (2) bush fire brigades. All such bans are at the discretion of the Chief Bush Fire Control Officer or a duly appointed person.

If a ban has been imposed, all persons registered will be sent a text message advising of details. All bans will still be broadcast on radio:

**ABC State wide AM
98.1 FM & 96.5 FM**

NOTE: Attention of landowners is drawn to the fact that this order allows for provision of firebreaks in situations other than immediately with property boundaries subject to approval. The Chief Bush Fire Control Officer and appointed Fire Control Officers have been authorised to act for Council in this matter.

Notice is hereby given to all land owners in areas requiring compulsory firebreaks that these must be installed by 15 October and maintained free of flammable material as required under the Bush Fire Act 1954 and in accordance with this Notice, approved fire management plans or approved variations to this Notice.

PROPERTIES WILL BE INSPECTED TO ENSURE COMPLIANCE WITH COUNCILS REQUIREMENTS

SMALL LOTS RESIDENTIAL & SPECIAL RURAL / RURAL RESIDENTIAL / RURAL SMALL HOLDINGS UP TO 3.0HA

Mowed, slashed to a maximum height of 7.5cm. Mineral earth (bare earth) firebreaks not permitted.

All structures and buildings must have a minimum 2m clearance of all flammable material. All dead trees, shrubs must be removed from block unless application is made to retain dead trees, shrubs prior to 15 October and approved. Exemptions will only be considered if presented in writing by 15 October.

RESIDENTIAL & SPECIAL RURAL / RURAL RESIDENTIAL / RURAL SMALL HOLDINGS 3.0HA PLUS

Fire breaks must be mineral earth (bare earth) a minimum 3m wide and have minimum overhead clearance 4m or have flammable material graded, mowed or slashed to a maximum height of 7.5cm over the entire property (excluding managed vegetation such as ornamental trees, distinct islands of vegetation remote from boundaries and assets).

All structures and buildings must have a minimum 3m clearance of all flammable material. All dead trees, shrubs must be removed from block unless application is made to retain dead trees, shrubs prior to 15 October and approved. Exemptions will only be considered if presented in writing by 15 October.

If it is considered for any reason to be impracticable to clear firebreaks as required by this notice, or if you consider natural features render firebreaks unnecessary, you may make your case in writing to the Shire.

FUEL PUMPS (FUEL DEPOTS)

On or before the 15 October all grass and similar material is to be cleared from such places where drum ramps are located and where drums, empty or full, are stored and such areas to be maintained cleared of grass and similar flammable material until 15 March.

FIRE MANAGEMENT PLANS

If your property has an approved fire management plan in place then you are to comply with the requirements of that plan in full.

FARM BUILDINGS AND UNATTENDED ELECTRIC MOTORS AND HAY STACKS

Fire breaks at least 2m in width completely surrounding and not more than 20m from the perimeter of any building, group of buildings or haystacks. All flammable material must be removed from an area 3m in width immediately surrounding the building. All flammable material must be removed from an area 3m in width immediately surrounding an unattended electric motor site.

UNATTENDED FUEL OPERATED MOTORS

All flammable material must be removed from an area 2m in width immediately surrounding an unattended fuel operated motor whether the motor is intended to be used or not.

RURAL LAND

Firebreaks must be provided not less than 2m in width inside and along the whole of the external boundaries of the properties owned or occupied; where this is not practicable the firebreaks must be provided as near as possible to, and within, such boundaries.

BARBEQUES AND INCINERATORS

Gas and electric barbeques are permitted any time. Solid fuel barbeques and incinerators are **PROHIBITED** on days of VERY HIGH FIRE DANGER or above.

PENALTY

The penalty for failing to comply with this notice is a fine of up to \$250 and a person in default is also liable, whether prosecuted or not, to pay the cost of performing the work in this notice. If it is not carried out by the owner or occupier by the date required by this notice.

**FAILURE TO INSTALL AND MAINTAIN
FIREBREAKS IN ACCORDANCE WITH
THIS NOTICE MAY RESULT IN A
\$5,000 PENALTY**



BUSH FIRE CONTROL OFFICERS

Chief Bush Fire Control Officer & Fire Weather Officer

Andrew Vlahov Mob: 0427 205 144
UHF: 5

Yetna Brigade, Deputy Chief Bush Fire Control Officer & Deputy Fire Weather Officer

Local Bush Fire Control Office Ph: 9920 5555
Jason Stokes Mob: 0407 388 511

(in the absence of the Chief Bush Fire Control Officer/Fire Weather Officer, the Deputy becomes the Acting Chief Bush Fire Control Officer/Fire Weather Officer)

Naraling Brigade

Local Bush Fire Control Officer:
Craig Mincherton Ph: 9920 3033
UHF: 33 Mob: 0417 957 075

Howatharra Brigade

Local Bush Fire Control Officer:
Calvin Royce Ph: 9925 1010
UHF: 29 Mob: 0427 251 016

Nabawa Brigade

Local Bush Fire Control Officer:
Neil Kupsch Ph: 9920 5050
UHF: 4 Mob: 0429 108 289

Yuna Brigade

Local Bush Fire Control Officer:
Shaun Earl Mob: 0429 108 425
UHF: 20

Durawah/Valentine Brigade

Local Bush Fire Control Office
Bruce Ley Mob: 0428 930 423
UHF: 51

Shire and Emergency Two-way Radio Channel

UHF: 11 Senior Ranger: 0428 948 073

Bush Fire Services
FESA

Ph: 9956 0000



CONTRACTORS

Morgan Mowing	0439 242 993
Central Earthmoving	0459 301 851
Centre Point Earthmoving - Chris Newman	0427 976 833
Graham Hancock	0408 230 421
Midwest Mulching & Mowing	0429 341 306
SMS Group WA	9935 9230
Ivey Contracting (Grading Only)	0428 840 935

Tree Plantations

Construct a 30m wide mineral earth firebreak around the perimeter of the plantation, with a 4m high vertical clearance of all inflammable material. This being in addition to compliance with the DFES 'Guidelines for Plantation Fire Protection' requirements, the Shire of Chapman Valley 'Tree Farms' Local Planning Policy and specific individual plantation development approval conditions.

PENALTIES

Failure to maintain a firebreak as per firebreak order	\$250
Offence relating to lighting a fire in the open air	\$250
Setting fire to bush during prohibited burning period	\$250
Failure of Occupier to extinguish a bushfire	\$250
Refusal to state name and abode or stating a false name and abode	\$100
Failure to produce permit to burn	\$100

Fire Control Officers are not obliged to issue permits.

Permits cannot be issued over the phone and should a Fire Control Officer refuse to issue a permit, it's a breach of the Bush Fire Act 1954 to request a permit from another Fire Control Officer.

You MUST have a copy of the permit on you during the burn.



SHIRE OF

Chapman Valley

love the rural life!

FIRST AND FINAL Fire Break Notice 2025/26 Period

SECTION 33 BUSH FIRE ACT

PROHIBITED BURNING PERIOD YUNA (Zone 2)

15 October to 14 February
All OTHER AREAS (Zone 4)
15 October to 14 February
STRICTLY NO BURNING

RESTRICTED BURNING PERIOD YUNA (Zone 2)

1 September to 14 October
15 February to 7 April
All OTHER AREAS (Zone 4)
1 September to 14 October
15 February to 7 April
PERMITS ARE REQUIRED

COMPULSORY FIREBREAKS (Zone 4)

Nabawa / Yetna / Howatharra Brigades
15 October to 7 April

FIRST AND FINAL NOTICE IS HEREBY SERVED TO ALL RESIDENTS AND RATEPAYERS

Failure to install and maintain firebreaks in accordance with this notice may result in a \$5,000 fine.



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