

STRUCTURE PLAN
SHIRE OF DARDANUP
AMENDMENT No. 199
LOT 383 PADBURY ROAD DARDANUP WEST

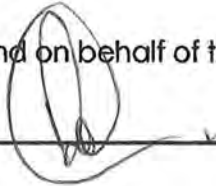
This structure plan is prepared under the provisions of the Shire of Dardanup Local Planning Scheme No.3

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

14 June 2019

Date

Signed for and on behalf of the Western Australian Planning Commission:



An officer of the Commission duly authorised by the Commission pursuant to section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

Tayn Cox

Witness

14 June 2019

Date

14 June 2029

Date of Expiry

TABLE OF AMENDMENTS

EXECUTIVE SUMMARY

The location of Lot 383 is shown on Location Map, Figure 1. It is part of the Dardanup West locality much of which has been designated for small holding lots.

It is proposed to rezone the lot to Small Holding zone to allow for the subdivision and development of ten rural residential lots.

The area of the lot is 16.311 hectares.

The land is a broad low relief plain with a low-rise sandy ridge running east-west roughly through the middle.

It has been cleared of native vegetation and planted with improved pasture for grazing.

The land is within the Dardanup West/Crooked Brook Structure Plan and consolidates existing rural residential developments.

PART ONE

IMPLEMENTATION

IMPLEMENTATION

1. Structure Plan Area

This Structure Plan applies to the land identified on the Structure Plan Map.

2. Operation

The Structure Plan comes into effect on the date it is approved by the WAPC.

3. Staging

Not applicable – as determined by the landowners.

4. Subdivision and Development Requirements

The subdivision and development shall be in accordance with the Structure Plan Map and the associated notes as described below:

Section 1 – Prior to Subdivision

Pursuant to Appendix VII, Area 14, 3(d) of TPS3, at the time of applying for a subdivision the subdivider is to prepare and submit an Urban Water Management Plan (UWMP) giving due regard to the content and format recommended in the Department of Water document “Urban Water Management Plans: Guidelines for Preparing Plans and for Complying with Subdivision Conditions” (2008). The UWMP is to be prepared by a suitably qualified practitioner and shall address local drainage measures to ensure no increase in predevelopment flows, required drainage easements, infrastructure requirements (including size and capacity) details regarding the nature and function of the proposed drainage basin, fill requirements and finished floor levels for construction.

Section 2 – Recommended Subdivision Conditions

At subdivision stage Local Government shall request the Western Australian Planning Commission impose the following (but not limited to) as conditions of subdivision:

1. Section 70A Notification on title advising land owners that:

- a) All dwellings shall be constructed to have a minimum finished floor level of 500mm above the nearest adjoining road level or 600mm above natural ground level whichever is the greater, as determined by a licensed surveyor;
- b) The area is subject to seasonal mosquito infestation;
- c) The area may be subject to seasonal inundation and significant Building Exclusion Areas apply as indicated on the approved Structure Plan;
- d) They may be impacted upon by noise levels above the normal assigned level for nighttime but within the bounds of the noise regulation 17 approved;
- e) On-site effluent disposal is to be through the use of a Secondary Treatment System with Nutrient Removal. There is to be a minimum vertical separation distance of 500mm from the base of the irrigation area of a Secondary Treatment System with Nutrient Removal and the highest known groundwater table. Approval shall be sought from the Shire of Dardanup prior to installation of an effluent disposal system.

2. Preparation and implementation of a landscaping plan. This is to include suitable landscaping of the redesigned Drainage Basin using endemic vegetation to create a natural environment. Implementation of landscaping is to ensure the outcomes of the Bushfire Management Plan are not compromised.

3. Preparation of an Acid Sulfate Soils Self-Assessment. Subject to the results of the self-assessment, an Acid Sulfate Soils Report and Acid Sulfate Soils Management Plan shall be submitted to and approved by the Department of Water and Environmental Regulation before any site works are commenced. Where an Acid Sulfate Soils Management Plan is required to be submitted, site works shall be carried out in accordance with the approved management plan.

4. All buildings, structures and onsite effluent disposal systems on each lot shall conform with the minimum setbacks as follows:
 - a) 20 metres from any road;
 - b) 50 metres from the edge of any wetland (sumpland) or natural vegetation line, man-made water bodies or waterway;
 - c) 10 metres from all side boundaries;
 - d) Be outside of all “Building Exclusion Areas” as identified on the endorsed Structure Plan Map.
5. The Bushfire Management Plan is to be implemented to the satisfaction of the Shire of Dardanup.
6. The measures outlined in the approved Urban Water Management Plan shall be implemented by the subdivider, to the satisfaction of the Western Australian Planning Commission and the Local Government.
7. The retention / water quality basin shown on the Structure Plan Map is to be shown on the diagram or plan of survey as a Reserve for Drainage and vested in the Crown under Section 152 of the Planning and Development Act 2005, such land to be provided free of cost and without payment of compensation by the Crown.
8. Drainage easements are to be established at the time of subdivision for the existing agricultural drain(s) on Lots 7, 8, 9 and 10 which shall flow into the proposed detention basin. Easements to be shown on a plan of subdivision. Width of the easements to be a minimum of 7m.
9. Any existing buildings and/or structures are required to be removed or relocated so as not to be within the boundary setbacks as identified in TPS3 for any Lot.
10. Battle axe legs to Lots 8 & 9 are to be a minimum width of 10m and are to contain a formed driveway of minimum width of 6m, constructed of compacted gravel or limestone marl surface, with 1m wide shoulders to the satisfaction of the local government.
11. Uniform rural style boundary fencing in accordance with Appendix VIII, Area 14, Cl (o) to be provided to all boundaries of all newly created lots.
12. Secondary Treatment System with Nutrient Removal shall be used to ensure Phosphorus Retention Index (PRI) requirements are met, unless otherwise agreed to in writing by Council.
13. A Local Development Plan is to be prepared by the landowner/applicant as a condition of subdivision addressing, but not limited to the following:
 - a) Minimum floor heights;
 - b) Development setbacks.

5. Local Development Plans

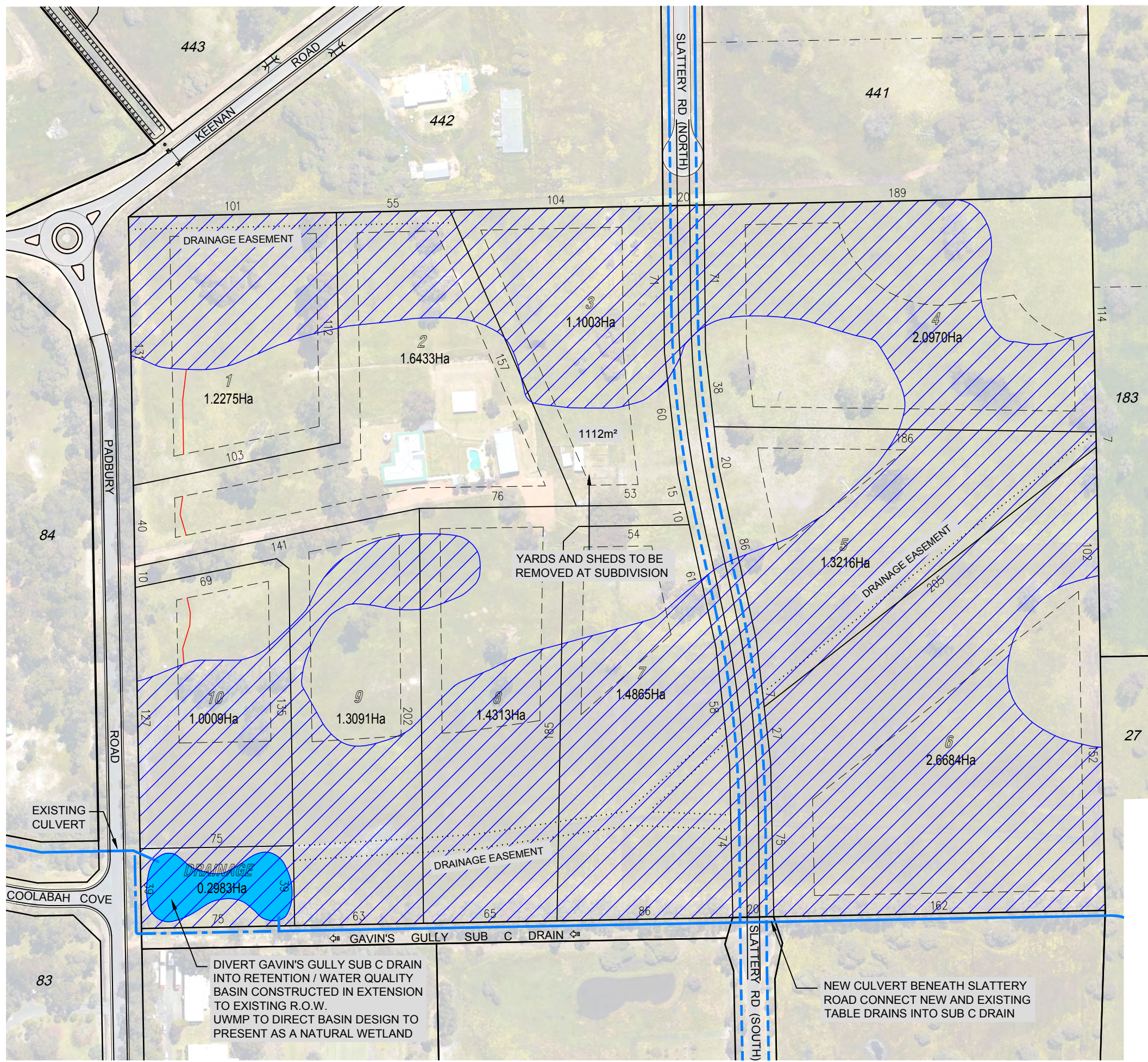
No local development plans are envisaged to be required.

6. Other requirements

Nil

7. Additional Information

Nil



NOTES:

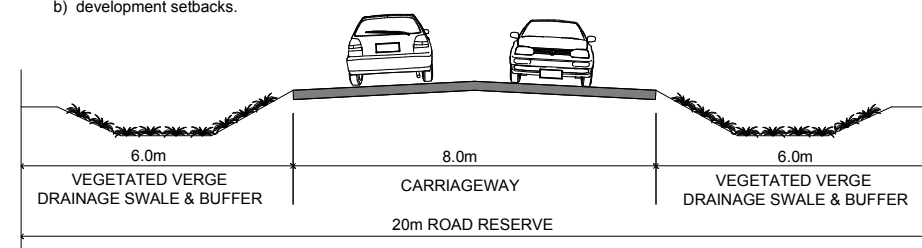
Section 1 – Prior to Subdivision

Pursuant to Appendix VIII, Area 14, 3(d) of TPS3, at the time of applying for a subdivision the subdivider is to prepare and submit an Urban Water Management Plan (UWMP) giving due regard to the content and format recommended in the Department of Water document "Urban Water Management Plans: Guidelines for Preparing Plans and for Complying with Subdivision Conditions" (2008). The UWMP is to be prepared by a suitably qualified practitioner and shall address local drainage measures to ensure no increase in predevelopment flows, required drainage easements, infrastructure requirements (including size and capacity), details regarding the nature and function of the proposed drainage basin, fill requirements and finished floor levels for construction.

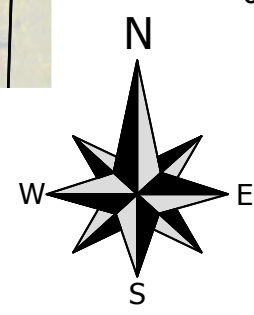
Section 2 – Recommended Subdivision Conditions

At subdivision stage Local Government shall request the Western Australia Planning Commission impose the following (but not limited to) as conditions of subdivision:

- Section 70A notification on title advising land owners that:
 - All dwellings shall be constructed to have a minimum finished floor level of 500mm above the nearest adjoining road level or 600mm above natural ground level, whichever ever is the greater, as determined by a licenced surveyor;
 - The area is subject to seasonal mosquito infestation;
 - The area may be subject to seasonal inundation and significant Building Exclusion Areas apply as indicated on the approved Structure Plan;
 - They may be impacted upon by noise levels above the normal assigned level for nighttime but within the bounds of the noise regulation 17 approved;
 - On-site effluent disposal is to be through the use of a Secondary Treatment System with Nutrient Removal. There is to be a minimum vertical separation distance of 500mm from the base of the irrigation area of a Secondary Treatment System with Nutrient Removal and the highest known groundwater table. Approval shall be sought from the Shire of Dardanup prior to installation of an effluent disposal system.
- Preparation and implementation of a landscaping plan. This is to include suitable landscaping of the redesigned Drainage Basin using endemic vegetation to create a natural environment. Implementation of landscaping is to ensure the outcomes of the Bushfire Management Plan are not compromised.
- Preparation of an Acid Sulfate Soils Self-Assessment. Subject to the results of the self-assessment, an Acid Sulfate Soils Report and Acid Sulfate Soils Management Plan shall be submitted to and approved by the Department of Water and Environmental Regulation before any site works are commenced. Where an Acid Sulfate Soils Management Plan is required to be submitted, site works shall be carried out in accordance with the approved management plan.
- All buildings, structures and on-site effluent disposal systems on each lot shall conform with the minimum setbacks as follows:
 - 20 metres from any road;
 - 50 metres from the edge of any wetland (sumpland) or natural vegetation line, man-made water bodies or waterway;
 - 10 metres from all side boundaries;
 - Be outside of all "Building Exclusion Areas" as identified on the endorsed Structure Plan Map.
- The Bush Fire Management Plan is to be implemented to the satisfaction of the Shire of Dardanup.
- The measures outlined in the approved Urban Water Management Plan shall be implemented by the subdivider, to the satisfaction of the West Australian Planning Commission and the local government.
- The retention / water quality basin shown on the Structure Plan Map is to be shown on the diagram or plan of survey as a Reserve for Drainage and vested in the Crown under Section 152 of the Planning and Development Act 2005, such land to be provided free of cost and without payment of compensation by the Crown.
- Drainage easements are to be established at the time of subdivision for the existing agricultural drain(s) on lots 7, 8, 9 and 10 which shall flow into the proposed detention basin. Easements to be shown on a plan of subdivision. Width of the easements to be a minimum of 7m.
- Any existing buildings and/or structures are required to be removed or relocated so as not to be within the boundary setbacks as identified in TPS3 for any lot.
- Battle axe legs to lots 8 and 9 are to be a minimum width of 10m and are to contain a formed driveway of minimum width of 6m, constructed of compacted gravel or limestone marl surface, with 1m wide shoulders to the satisfaction of the local government.
- Uniform rural style boundary fencing in accordance with Appendix VIII, Area 14, Cl (o) to be provided to all boundaries of all newly created lots.
- Secondary Treatment System with Nutrient Removal shall be used to ensure Phosphorus Retention Index (PRI) requirements are met, unless otherwise agreed to in writing by Council.
- A Local Development Plan is to be prepared by the land owner/applicant as a condition of subdivision addressing, but not limited to, the following:
 - minimum floor heights;
 - development setbacks.



INDICATIVE ROAD CROSS SECTION
SUBJECT TO DETAILED DESIGN AND APPROVAL AT SUBDIVISION STAGE



SCALE 1:2,000 ON A3
DIMENSIONS AND AREAS SHOWN ARE APPROXIMATE ONLY AND SUBJECT TO SURVEY
GRAHAM HOUGHTON - TOWN PLANNER
4 Sutton Court Australind WA 6233
0407 252 056
Cadastral and aerial photographs courtesy Landgate
Digital coordinates GDA94 MGA Zone 50

- 7.0m DRAINAGE EASEMENT
- EXISTING DRAINAGE
- PROPOSED TABLE DRAIN
- REDUNDANT DRAINAGE
- BUILDING EXCLUSION AREAS
Areas susceptible to seasonal waterlogging and inundation and unsuitable for development
- TPS3 DEVELOPMENT SETBACKS
Road setback 20.0m Treeline setback 50.0m
Side setback 10.0m Watercourse setback 50.0m
 Additional bushfire management setback

STRUCTURE PLAN MAP

LOT 383 PADBURY ROAD DARDANUP

05 / 06 / 2019

EXISTING CULVERT

COOLABAH COVE

DIVERT GAVIN'S GULLY SUB C DRAIN INTO RETENTION / WATER QUALITY BASIN CONSTRUCTED IN EXTENSION TO EXISTING R.O.W. UWMP TO DIRECT BASIN DESIGN TO PRESENT AS A NATURAL WETLAND

NEW CULVERT BENEATH SLATTERY ROAD CONNECT NEW AND EXISTING TABLE DRAINS INTO SUB C DRAIN

YARDS AND SHEDS TO BE REMOVED AT SUBDIVISION

DRAINAGE EASEMENT

DRAINAGE EASEMENT

DRAINAGE EASEMENT

PART TWO

EXPLANATORY SECTION and TECHNICAL APPENDICES

EXPLANATORY REPORT with APPENDICES

1. Planning Background

1.1 Introduction and Purpose

Lot 383 is located in Dardanup West. It fronts Padbury Road with Slattery Road abutting on the north and south boundaries of the lot.

The purpose of the Structure Plan is to facilitate the subdivision and development of the land for rural residential lots.

Amendment No. 199 will rezone the land to Small Holding zone.

1.2 Legal description and ownership

Lot 383 on Deposited Plan 247456 with Certificate of Title Vol 1730 Folio 380. The registered proprietor is Anthony Frank Pantlin.

1.3 Planning Framework

1.3.1 Zoning

The land is zoned Rural in the Greater Bunbury Region Scheme and General Farming in the Shire of Dardanup Town Planning Scheme No. 3.

1.3.2 Regional and sub-regional structure plan

Rezoning, subdivision and development requirements for this land are guided by the Dardanup West/Crooked Brook Structure Plan. The subdivision and development provisions of that structure plan are in Appendix VIII, Area No.14, of Town Planning Scheme No. 3.

The provisions that are relevant for the subdivision and development of this land will be implemented through the Notes on the Structure Plan Map.

1.3.3 Lot Sizes

Lot sizes are specified in Appendix VIII as follows. The minimum lot size shall be 1 hectare, with an average of 2 hectares unless varied by an adopted Subdivision Guide Plan. Larger lots may be required to preserve or enhance landscape qualities or other site specific issues. (Substitute Structure Plan for Subdivision Guide Plan.)

2. SITE CONDITIONS and CONSTRAINTS

2.1 Present Land Use

The land has been cleared of native vegetation and planted with improved pasture for grazing.

2.2 On-Site Effluent Disposal Capability

The principal soil-landform unit in this locality is a broad low relief plain of shallow sands and clay that is generally poorly drained. In the rainfall months it can have a high watertable and areas of inundation. This soil-landform unit is generally not suitable for the building of dwellings and the operation of alternative on-site effluent disposal systems.

Overlying this in some areas is a soil-landform unit of low relief sand dunes with sands of varying depth. Depending on the depth of the sand, this landform can be suitable for dwelling and on-site effluent disposal.

To determine the suitability of the soil-landform units for development an Effluent Capability Investigation was carried out by WML Consultants, Consulting Engineers. Their report is appended. Their investigation provided the majority of the information needed to select the most suitable areas for dwelling construction. Additional soil profile information was required for the proposed lot 3. This additional work is appended.

Fifteen holes were dug by auger -11 in the first investigation corresponding to the draft 11 lots and 4 in the follow-up investigation. The location of the holes is in the appended reports. The soil profile of each hole is described and the depth to groundwater noted. The holes with at least 500mm to the groundwater are unsurprisingly located on the sandy dunes.

This data, when combined with site inspections and regional soil maps (Land Resources from Harvey to Capel on the Swan Coastal Plain, Agric. WA, 1998) provided sufficient information to select areas suitable for dwellings and on-site effluent disposal systems. Additional information from aerial photos allowed for the identification of areas where dwellings should not be constructed. These are shown on the Structure Plan Map as Building Exclusion Areas.

The Structure Plan Map has a note that the approval of the Shire shall be sought prior to the installation of an effluent disposal system.

2.3 Acid Sulphate Soils

The regional acid sulphate soil (ASS) risk map (attached), shows that most of the lot has a moderate to low risk of ASS occurring within 3 metres of the natural surface. A small area of the land in the south east corner is shown as having a possible high to moderate risk of acid sulphate soils. In accordance with the Acid Sulphate Soils Planning Guidelines (2008), this land will not be disturbed by development.

The Structure Plan Map has a note requiring the preparation of an Acid Sulphate Soil Assessment and approval of the Department of Environment and Conservation prior to the commencement of works.

2.4 Bushfire Management Plan

The Plan, prepared by LUSHFIRE and Planning includes a BAL Contour Map and a series of fire mitigation measures with recommendations. An implementation table outlines the recommendations, the authority and persons responsible and the stage when the recommendations should be implemented.

The Plan concludes that "any proposed dwelling can be sited so as to ensure that there is a moderate hazard level reflected by having a maximum BAL-29 rating and most likely a BAL-12,5 rating."

The Plan "demonstrates that the proposed development complies with the criteria within the State Planning Policy 3.7 and the Guidelines for Planning in Bushfire Prone Areas."

The Structure Plan Map has a note requiring the preparation of a Fire Management Plan. Although a Plan has been prepared it may be some years before subdivision occurs and circumstances in regard to fire risk may have changed and another Plan will be required.

2.5 Lot Design

The Effluent Capability Investigation and the Bushfire Management Plan provided information for the design of the lots. After a detailed assessment of land in the north east section of the property it was determined that the area of land in the far corner that would be suitable for on-site effluent disposal was unlikely to satisfy the bushfire setback requirements. As a result the proposed lot was amalgamated with the adjoining lot to create a proposed lot 4 of 2.23ha and the lots re-numbered..

NOTE: As a result of this small lot design change, the diagrams in three appended reports show the original two lots and not the amalgamated lot and the original lot numbering. This change in no way affects the veracity of the findings of the reports.

The areas on each lot that are suitable for and have sufficient area for a dwelling can also accommodate the BAL setbacks.

2.6 Subdivision Road and Stormwater Management

The subdivision road is simply a connection of Slattery Way which is constructed up to the northern and southern boundaries.

A Stormwater Management Plan has been prepared by Dirk Van Noort, Consulting Engineer. A sandy ridge creates two sub-catchments with drainage moving northward into recently developed land and southward into Gavin's Gully Sub C Drain. Both drainage catchments eventually end up in Gavin's Gully Drain.

In order to ensure ongoing drainage routes through these catchments, it is proposed to protect two drainage outlets with easements as shown on the Structure Plan Map. These have been created to enable drainage from neighbouring upstream properties to the east and from the proposed development of Lot 383.

Gavin's Gully Drain was developed to service agricultural land that had a relatively slow rate of discharge. Small Holding developments with roadside drains increase the speed of discharge and therefore it is proposed to construct a detention basin in the south west corner of the property where the flow can be controlled by outlet structures.

The Structure Plan Map has a note stating the 'stormwater is to be managed in accordance with the approved Stormwater Management Plan.

2.7 Potable Water

There is not a reticulated water supply in this locality. In common with the already developed area adjacent to this land, potable water will be supplied from rain water storage tanks with at least 92,000 litres capacity (TPS No. 3 cl 3.14.1).

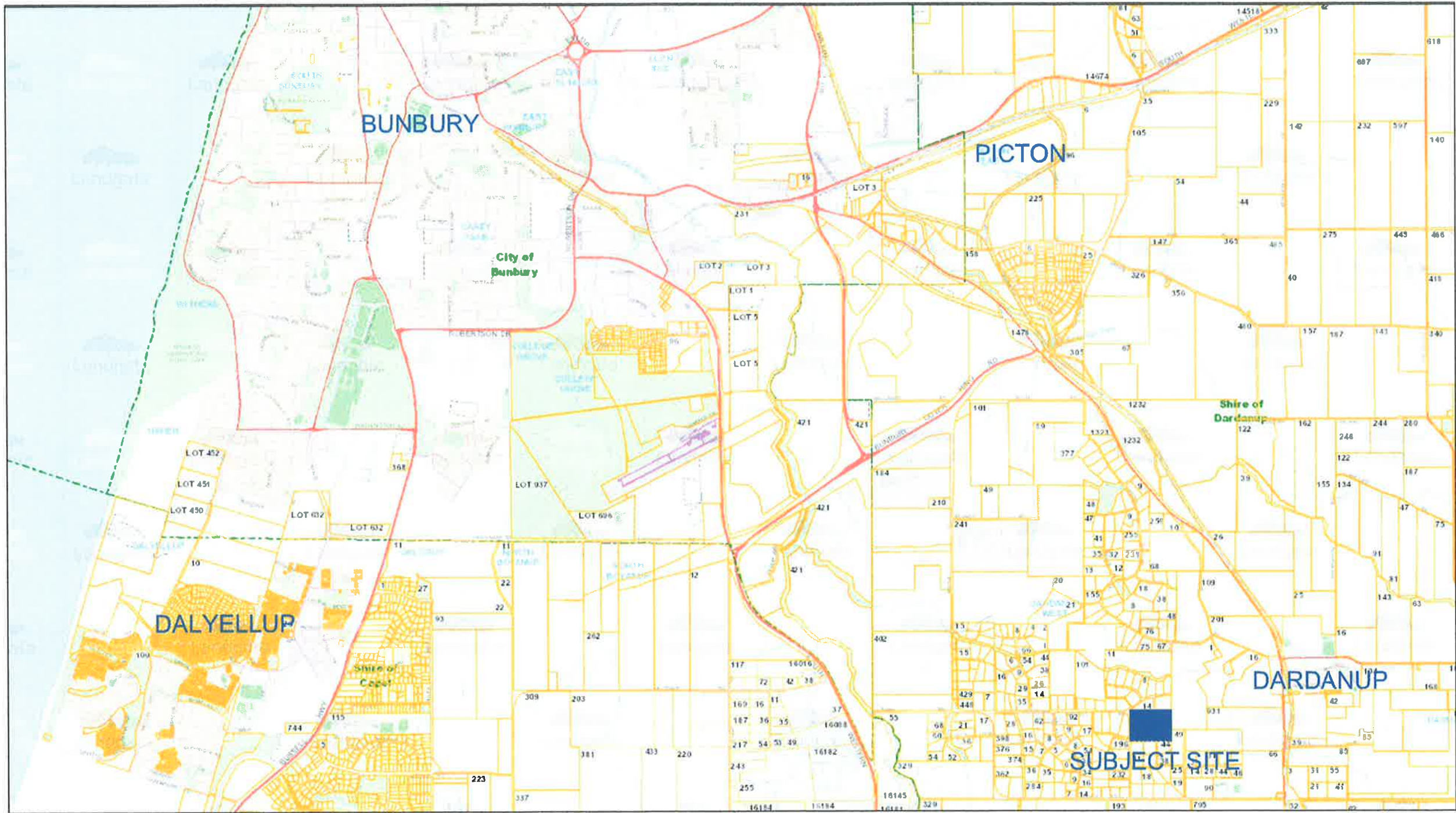
2.8 Possible Sawmill Noise

A softwood sawmill is located some 2.3 kilometres in a north west direction from Lot 383. There may be times when noise from the sawmill operations can be heard on Lot 383. Lot owners need to be informed that the sawmill operator has an approval to emit noise above the normal assigned level for night time under Regulation 17 of the Environmental Protection (Noise) Regulations 1997.

The Structure Plan Map has a note that requires land owners to be informed of this matter.

APPENDICES

Location



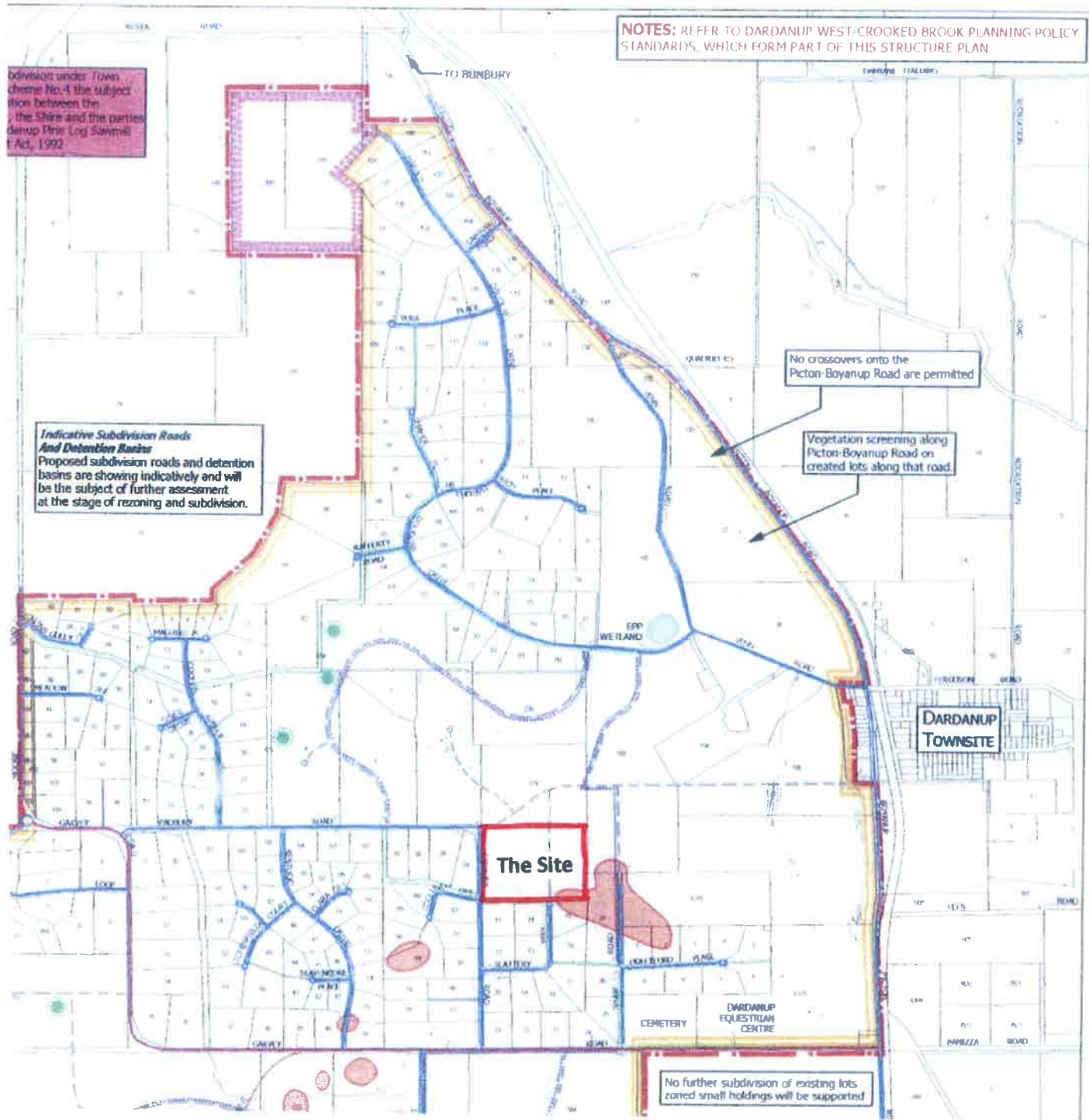
REGIONAL PLAN

LOCALITY PLAN
LOT 383 PADBURY ROAD DARDANUP
24 / 08 / 2017



SCALE 1:50,000 ON A3
 DIMENSIONS AND AREAS SHOWN ARE
 APPROXIMATE ONLY AND SUBJECT TO SURVEY
GRAHAM HOUGHTON - TOWN PLANNER
 4 Sutton Court Australind WA 6233
 0407 252 056
 Cadastral and aerial photographs courtesy Landgate
 Digital coordinates GDA94 MGA Zone 50

Dardanup West/Crooked Brook Structure Plan (extract)



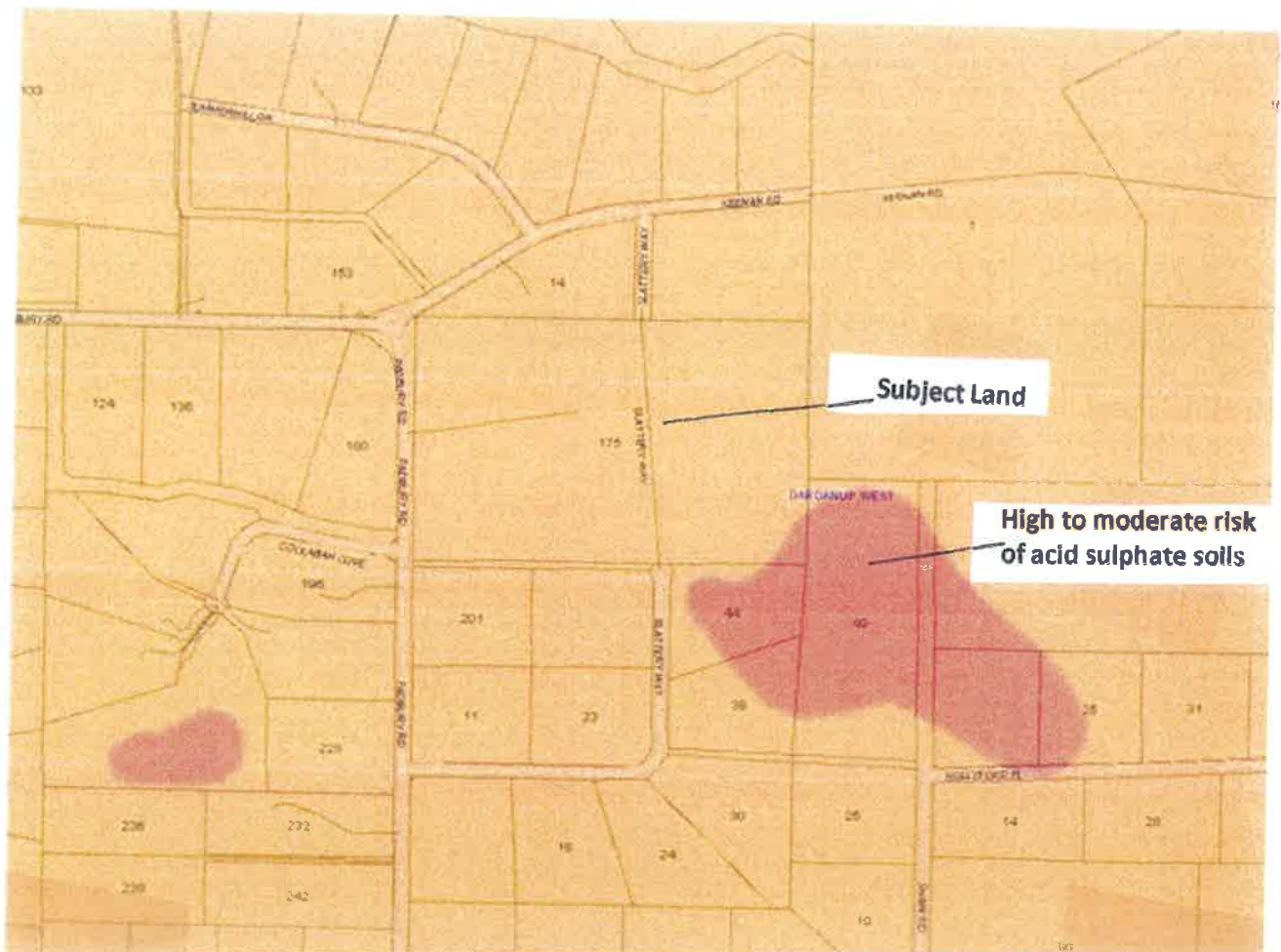
**DARDANUP WEST / CROOKED BROOK STRUCTURE PLAN
(Extract)**

Effluent Capability Investigations

ACID SULPHATE SOILS

The maps show two risk categories:

- **Class 1** - (red/pink) high to moderate risk of ASS occurring within 3m of natural soil surface.
- **Class 2** - (orange) moderate to low risk of ASS occurring within 3m of natural soil surface but high to moderate risk of ASS beyond 3m of natural soil surface.



Our Ref: 7289-G-L-001-A

28 October 2016

Terry Pantlin
54 Forrest Avenue
BUNBURY WA 6230

**LOT 383 PADBURY RD, DARDANUP
EFFLUENT CAPABILITY INVESTIGATION**

Dear Terry,

1 INTRODUCTION

WML Consultants (WML) was engaged to carry out a geotechnical investigation at the above property. It is proposed to re-zone the site to eventually subdivide the existing 16ha lot into 12 individual lots. As part of the re-zoning process, a ground investigation is required to assess the site for on-site effluent disposal capability. It is proposed to use Alternative Treatment Units (ATU's) as the standard leach drain system is unsuitable for this area.

The investigation will be guided by The Department of Health 'Code of Practice for Onsite Sewage Management (Consultation Draft November 2012)'. This requires site investigations to be undertaken in accordance with AS/NZS 1547:2012 'On-site Domestic Wastewater Management'. This letter summarises our findings of the investigation.

2 SITE SETTING

The site is located approximately 2km west of the Dardanup townsite in Western Australia on the eastern side of Padbury Road. The site is currently 16ha and rectangular in shape. The site is generally level with survey indicating approximately variably 2m in elevation changes. A local sand dune near the centre of the site provides the additional elevation.

The 1:50,000 Geological Map 'Bunbury-Burekup' indicates the site typically comprises 'Guildford Formation' with patches of 'Bassendean Sand' and 'Thin Bassendean Sand overlying Guildford Formation'. The south-eastern corner has a pocket of 'Swamp Deposits, mainly peaty sand'.



3 FIELDWORK

3.1 Fieldwork

On 13 September 2016, an engineer from WML undertook an investigation of the site comprising eleven hand-augered boreholes (HA) to between 1.00-1.90m depth across the site. The highest part of the site was typically targeted with the borehole position as this may be the ATU position to achieve greatest separation with the groundwater. Each borehole was logged, photographed and subsequently backfilled. A Perth Sand Penetrometer (PSP) was undertaken adjacent to each borehole to estimate in-situ density. Three in-situ permeability tests using the Talsma-Hallam method in accordance with AS/NZS 1547:2012 was also undertaken. The borehole locations are approximated on a site map attached to this letter.

3.2 Sub-surface Profile

The sub-surface profile generally comprised:

1. Moist, dark grey, fine to medium grained, **silty SAND** (TOPSOIL),
2. Wet, grey tending pale grey, loose to medium dense, fine to medium grained, **SAND** (Bassendean Sand), occasionally some coffee rock gravel fragments (weakly cemented sand) near the base of the borehole,
3. Moist to wet, orange mottled brown, stiff, medium plasticity, **gravelly CLAY to sandy CLAY** (Guildford Formation).

PSP testing indicated the sand is loose to medium dense, this would typically require some compactive effort for any proposed shallow foundation.

3.3 Groundwater

Groundwater was encountered in all boreholes and varied depending on topography. The low-lying areas had groundwater readings on the day typically between 0.15 – 0.54m depth (HA1, 3, 5-7) whilst the higher areas had readings between 0.63 - 1.59m (HA2, 4, 8, 9, 10, 11).

Given that the fieldwork was undertaken at the peak of winter rainfall, and that this year above average rainfall was recorded for the area, the groundwater measured in the boreholes is likely to be at or very near the highest expected level. The results are shown in the soil logs attached.

No streams or creeks were observed on site, however the majority of the low-lying areas can potentially become waterlogged easily. On the neighbouring property over the full length of the southern boundary exists a small flowing man-made trench / drainage easement.

3.4 Laboratory Testing

Samples of representative material were submitted to Civitest Australia, a NATA accredited laboratory for an Emerson Class dispersion test. Other samples were sent to Environmental and Agricultural Testing Services for a Phosphorus Retention Index test. The test results are summarised below with the certificates attached at the end of this report:



Table 1: Laboratory Testing Summary

Location	Depth (m)	Test	PRI	EC
HA1	0.4	PRI / EC	-2	N/A
HA3	0.4	PRI / EC	140	5
HA6	1.1	PRI / EC	163	3
HA8	0.5	PRI / EC	-2	N/A
HA10	0.7	PRI / EC	-2	3

Note: EC – Emmerson Class; PRI – Phosphorus Retention Index;

Based on the test results, the clayey material found in HA3 and HA6 is considered to have a very high phosphorus retention ability and is slightly dispersive. The sandy material has no ability to disperse or adsorb phosphorus.

The Emerson Aggregate Test (Emerson, 1967) was designed to classify the structural stability of a soil under rainfall and indicate the effects on soil at an elevated moisture level. This stability is essential for permeability and capillary action as soil colloids may move with the drainage water and block the macroporosity of the soil. Typically, it is not relevant for clean sands which have no mineral binding ability. Class 1-2 indicate a dispersive soil while Class 7-8 are considered water stable and having no limitations to wastewater application.

Phosphorus Retention Index (PRI) can be defined as the ratio of phosphorus absorbed, to the phosphorus remaining when soil is left in contact with a standard phosphorus solution under standard conditions. It is generally used as a measure of a soils ability to strip an applied effluent of phosphorus and hence prevent leaching or contamination into the groundwater. In sandy soils the Phosphorus Retention Index is usually less than 5. Very strongly adsorbing soils include lateritic loams, iron rich peats, Karri loams with PRI >70. In this instance, a negative value indicates the soil can no longer adsorb anymore phosphorus, and as such would leach through the layer easily.

3.5 Permeability Testing

Three in-situ permeability tests using the Talsma-Hallam method in accordance with AS/NZS 1547:2012 was undertaken at HA2, HA6 and HA11. A borehole 110mm in diameter and 600mm depth was excavated and filled with water to saturate the surrounding soil. A constant head of water was then applied and a known volume of water was timed to dissipate. Three passes per location were undertaken, generally the permeability result of the soil decreased with each successive test. These results are tabulated below:

**Table 2: Permeability results**

Location	Insitu Permeability Test	
	m/s	m/day
HA2	5×10^{-5}	4
HA6	1×10^{-5}	1
HA11	5×10^{-5}	4

4 FINDINGS & RECOMMENDATIONS

4.1 Soil Categorisation

AS/NZS 1547:2012 requires the determination of soil categories from which effluent infiltration capacities can be determined. The factors that affect a soil category are:

- Soil texture and structure
- Dispersion
- Shrink/swelling of soils
- Depth of groundwater
- Presence of hard or impermeable layers
- Soil permeability

The different materials of the site may be categorized in accordance with Table 5.1 of the standard.

Table 3: Soil Categorisation

Soil Type	Permeability		Soil Category
	m/s	m/day	
Sand	5×10^{-5}	4	1
Clayey SAND / sandy CLAY	1×10^{-5}	1	3



4.2 Site Requirements

The Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's) includes requirements for the site being considered for effluent disposal; these are briefly summarised as:

- A minimum of 150m² for the irrigation area
- At least 300mm of permeable soil above a limiting layer (eg rock or hard pan)
- Benching if the site gradient is greater than 1:10
- Individual assessment if the site gradient is greater than 1:5
- The disposal area not to be located on land prone to waterlogging or subject to floodwater inundation
- Soil to have a PRI>20 (if less the soil required modification)
- Minimum depth from the upper surface of the irrigation area to highest known water table shall be 500mm.

4.3 Conclusions

A preliminary assessment has been carried out of the site for suitability for effluent disposal. The assessment was carried out with reference to the methods described in 'AS/NZS 1547:2012 On-site Wastewater Management' and the Department of Health's 'Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's) [2001]'.

For the proposed irrigation areas in each lot, consideration will be required to ensure separation to groundwater is at least 0.5m (in irrigation areas not reduced in size) and that the soils PRI is above 20. This may require some lots to raise the finish level of the irrigation areas as a result of shallow groundwater. In addition, most lots will require modification to the soils to improve PRI resulting from natural sandy material with no ability to strip nutrients from the effluent.

4.4 Safety in Design

This project has design elements, however these elements are considered rudimentary with the associated risks and hazards being widely known and understood. Any competent person carrying out this type of work should be aware of these hazards and apply standard industry practices to mitigate the risks



Yours faithfully,

Alex Pope
Civil Engineer
For and on behalf of WML Consultants Pty Ltd

Reviewed by:

Paul Foley
Group Manager Geotechnical & Pavements
For and on behalf of WML Consultants Pty Ltd

Attached

- Site Photographs
- Site Investigation Plan Drawing
- Borehole logs
- Laboratory Test Results

References

- 1:50,000 Geological Map 'Bunbury-Burekup'
- AS 1726:1993 – Geotechnical Site Investigations
- AS/NZS 1547:2012 - On-site Domestic Wastewater Management
- Department of Health - Code of Practice for Onsite Sewage Management, (Consultation Draft, November 2012)
- Department of Health - Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs), (November 2001)



Figure 1: Facing north from HA7 (almost bogged in 4WD...)



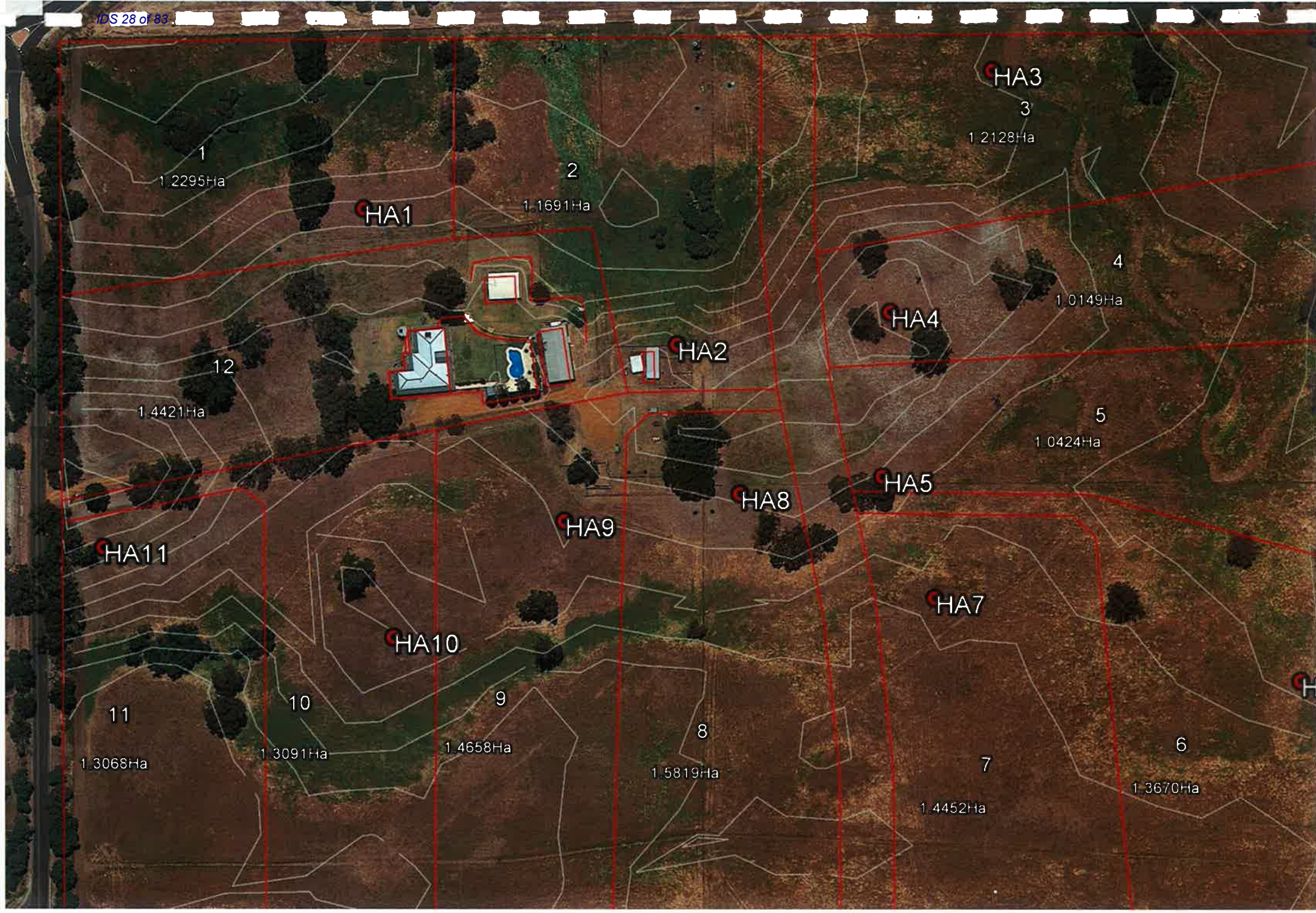
Figure 2: Borehole arisings from HA4, representative of Bassendean Sand profile



Figure 3: Neighbouring drainage easement on southern boundary



Figure 4: Panorama facing south to west from HA3





HAND AUGER: HA1

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.40 m AHD
JOB NO.: 7289	POSITION: 382457.0 m E 6303212.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .
	0.40m 0.40m PRI / EC			SP	Wet, grey tending pale grey, loose, fine to medium grained, SAND .
	0.5				
		<u>Perth Sand Penetrometer</u> Depth (m) Blows 0.20 - 0.50 6 0.50 - 0.80 6 0.80 - 1.10 5			
	1.0			SW	Wet, dark brown, dense, fine to coarse grained, gravelly SAND with a trace of silt. <i>Coffee Rock, weakly cemented, gravel pieces angular fine to medium.</i>
	1.5				Hole Terminated at 1.30 m Wet Collapse
	2.0				

COPY OF WML LIB 1.06.GLB Log WML SOIL 7289 LOGS.GPJ <<DrawingFile>> 15/10/2016 08:35 8.30.004 Developed by Datgal



HAND AUGER: HA2

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand Tools	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 22.20 m AHD
JOB NO.: 7289	POSITION: 382574.0 m E 6303163.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine to medium roots. <i>TOPSOIL</i> .								
		<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Blows</th> </tr> </thead> <tbody> <tr> <td>0.20 - 0.50</td> <td>7</td> </tr> <tr> <td>0.50 - 0.80</td> <td>5</td> </tr> <tr> <td>0.80 - 1.10</td> <td>5</td> </tr> </tbody> </table>	Depth (m)	Blows	0.20 - 0.50	7	0.50 - 0.80	5	0.80 - 1.10	5		SP	Wet, grey tending pale grey, loose, fine to medium grained, SAND .
Depth (m)	Blows												
0.20 - 0.50	7												
0.50 - 0.80	5												
0.80 - 1.10	5												
	1.5				Hole Terminated at 1.40 m Wet Collapse								

COPY OF WML LIB 1.08.GLB Log WML SOIL LOGS.GPJ <<DrawingFiles>> 15/10/2016 08:35 8:30:004 Developed by Dajpal



HAND AUGER: HA3

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.60 m AHD
JOB NO.: 7289	POSITION: 382690.0 m E 6303266.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .
	0.40m 0.40m PRI / EC			SC	Moist, orange brown, loose, fine to medium grained, SAND with some clay.
	0.5	<u>Perth Sand Penetrometer</u> Depth (m) Blows 0.20 - 0.50 3 0.50 - 0.80 5 0.80 - 1.10 7		SP	Wet, pale grey, loose, fine to medium grained, SAND .
	1.0				
	1.5				Hole Terminated at 1.20 m Wet Collapse
	2.0				

COPY OF WML LIB 1.06\GLB Log WML SOIL 7289 LOGS.GPJ <<DrawingFile>> 15/10/2016 08:35 8.30.004 Developed by Datigel



HAND AUGER: HA4

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 22.60 m AHD
JOB NO.: 7289	POSITION: 382653.0 m E 6303176.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Dry, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .								
		<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Blows</th> </tr> </thead> <tbody> <tr> <td>0.20 - 0.50</td> <td>5</td> </tr> <tr> <td>0.50 - 0.80</td> <td>5</td> </tr> <tr> <td>0.80 - 1.10</td> <td>6</td> </tr> </tbody> </table>	Depth (m)	Blows	0.20 - 0.50	5	0.50 - 0.80	5	0.80 - 1.10	6		SP	Dry, pale grey, loose, fine to medium grained, SAND .
Depth (m)	Blows												
0.20 - 0.50	5												
0.50 - 0.80	5												
0.80 - 1.10	6												
	0.5												
	1.0												
	1.5			SP	Wet, pale grey, loose, fine to medium grained, SAND .								
	2.0			SP	Wet, cream mottled dark brown, medium dense, fine to medium grained, SAND with a trace of fine gravel. <i>Coffee Rock, weakly cemented, gravel pieces angular fine to medium.</i>								
	2.0				Hole Terminated at 1.90 m Wet Collapse								

COPY OF WML UB 1.06.GLB Log WML SOIL 7289 LOSS.GPJ --DrawingFile-- 15/10/2016 08:35 8:30:064 Developed by Dalziel

1.24m



HAND AUGER: HA5

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.80 m AHD
JOB NO.: 7289	POSITION: 382651.0 m E 6303115.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .								
		<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Blows</th> </tr> </thead> <tbody> <tr> <td>0.20 - 0.50</td> <td>3</td> </tr> <tr> <td>0.50 - 0.80</td> <td>5</td> </tr> <tr> <td>0.80 - 1.10</td> <td>5</td> </tr> </tbody> </table>	Depth (m)	Blows	0.20 - 0.50	3	0.50 - 0.80	5	0.80 - 1.10	5		SP	Wet, grey tending pale grey, loose, fine to medium grained, SAND . <i>20mm diameter root at 0.2m.</i>
Depth (m)	Blows												
0.20 - 0.50	3												
0.50 - 0.80	5												
0.80 - 1.10	5												
	0.45m												
	1.0				Hole Terminated at 1.00 m Wet Collapse								
	1.5												
	2.0												

COPY OF WML LIB 1.06.GLB Log WML SOIL 7289 LOGS.GPJ <<DrawingFile>> 15/10/2016 08:35 8:30:04 Developed by Dalziel



HAND AUGER: HA6

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 22.00 m AHD
JOB NO.: 7289	POSITION: 382807.0 m E 6303041.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .								
	0.54m	<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Blows</th> </tr> </thead> <tbody> <tr> <td>0.20 - 0.50</td> <td>3</td> </tr> <tr> <td>0.50 - 0.80</td> <td>2</td> </tr> <tr> <td>0.80 - 1.10</td> <td>6</td> </tr> </tbody> </table>	Depth (m)	Blows	0.20 - 0.50	3	0.50 - 0.80	2	0.80 - 1.10	6		SP	Wet, brown, very loose, fine to medium grained, SAND with some silt.
Depth (m)	Blows												
0.20 - 0.50	3												
0.50 - 0.80	2												
0.80 - 1.10	6												
	1.10m	1.10m PRI / EC		GC	Wet, orange mottled brown, dense, fine to coarse, sandy clayey GRAVEL . <i>Gravel sub-rounded to sub-angular, laterite.</i>								
	1.5				Hole Terminated at 1.50 m Hard Digging								
	2.0												

COPY OF WML LIB 1.06.GLB Log WML SOIL LOGS GPJ <<DrawingFile>> 15/10/2016 08:35 8.30.004 Developed by Dalgal



HAND AUGER: HA7

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.60 m AHD
JOB NO.: 7289	POSITION: 382671.0 m E 6303070.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION
0.15m		9 kg Dynamic Cone Penetrometer		SM	Wet, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .
		Depth (m) Blows		CI	Wet, dark brown, firm, sandy CLAY .
		0.05 - 0.20 1			
		0.20 - 0.35 2			
		0.35 - 0.50 2			
	0.50 - 0.65 5				
	0.65 - 0.80 5				
	0.80 - 0.95 6				
	0.95 - 1.10 7				
0.5				SP	Wet, pale grey, loose, fine to medium grained, SAND .
1.0				CI	Moist, pale grey mottled orange, stiff, sandy CLAY .
1.5					Hole Terminated at 1.40 m Wet Collapse
2.0					

COPY OF WML LIB 1.06.GLB Log WML SOIL 7289 LOGS.GPJ <<DrawingFile>> 15/10/2016 09:35 8.30.004. Developed by Daigal



HAND AUGER: HA8

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 22.00 m AHD
JOB NO.: 7289	POSITION: 382598.0 m E 6303108.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .								
		<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Blows</th> </tr> </thead> <tbody> <tr> <td>0.20 - 0.50</td> <td>4</td> </tr> <tr> <td>0.50 - 0.80</td> <td>5</td> </tr> <tr> <td>0.80 - 1.10</td> <td>6</td> </tr> </tbody> </table>	Depth (m)	Blows	0.20 - 0.50	4	0.50 - 0.80	5	0.80 - 1.10	6		SP	Moist, pale grey speckled black, loose, fine to medium grained, SAND with a trace of silt. <i>Heavily decayed root 50mm at 0.6m.</i>
Depth (m)	Blows												
0.20 - 0.50	4												
0.50 - 0.80	5												
0.80 - 1.10	6												
	0.5	0.50m 0.50m PRI / EC											
	0.7				Wet, pale grey, loose, fine to medium grained, SAND .								
	1.0			SP									
	1.5				Hole Terminated at 1.50 m Wet Collapse								
	2.0												

COPY OF WML LIB 1.06.GLB Log WML SOIL 7289 LOGS.GPJ <<DrawingFile>> 15/10/2016 08:35 8:30:004 Developed by Dalpat



HAND AUGER: HA9

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.80 m AHD
JOB NO.: 7289	POSITION: 382533.0 m E 6303097.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .								
		<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Blows</th> </tr> </thead> <tbody> <tr> <td>0.20 - 0.50</td> <td>4</td> </tr> <tr> <td>0.50 - 0.80</td> <td>4</td> </tr> <tr> <td>0.80 - 1.10</td> <td>3</td> </tr> </tbody> </table>	Depth (m)	Blows	0.20 - 0.50	4	0.50 - 0.80	4	0.80 - 1.10	3		SP	Wet, grey tending pale grey, loose, fine to medium grained, SAND .
Depth (m)	Blows												
0.20 - 0.50	4												
0.50 - 0.80	4												
0.80 - 1.10	3												
	0.5			SW	Wet, dark brown, loose, fine to medium grained, SAND with some fine to coarse gravel.								
	1.0			SP	Wet, cream mottled dark brown, very loose, fine to medium grained, SAND with a trace of fine gravel.								
	1.5			SP									
	2.0				Hole Terminated at 1.60 m Wet Collapse								

COPY OF WML LIB 1.06\GLB_Log_WML_SOIL_7289.LOGS.GPJ <<DrawingFile>> 15/10/2016 08:35 8.30.004 Developed by Datapl

0.63m



HAND AUGER: HA10

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.80 m AHD
JOB NO.: 7289	POSITION: 382470.0 m E 6303053.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .								
		<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Blows</th> </tr> </thead> <tbody> <tr> <td>0.20 - 0.50</td> <td>4</td> </tr> <tr> <td>0.50 - 0.80</td> <td>3</td> </tr> <tr> <td>0.80 - 1.10</td> <td>3</td> </tr> </tbody> </table>	Depth (m)	Blows	0.20 - 0.50	4	0.50 - 0.80	3	0.80 - 1.10	3		SP	Moist, orange, loose, fine to medium grained, SAND with a trace of silt.
Depth (m)	Blows												
0.20 - 0.50	4												
0.50 - 0.80	3												
0.80 - 1.10	3												
0.71m	0.70m	0.70m PRI / EC		SP	Wet, pale grey, loose, fine to medium grained, SAND .								
	1.0			SP	Wet, cream mottled dark brown, medium dense, fine to medium grained, SAND with a trace of fine gravel. <i>Coffee Rock, weakly cemented, gravel pieces angular fine to medium.</i>								
	1.5			SP	Wet, cream mottled dark brown, medium dense, fine to medium grained, SAND with a trace of fine gravel. <i>Coffee Rock, weakly cemented, gravel pieces angular fine to medium.</i>								
				SC	Wet, orange banded brown, loose, fine to medium grained, SAND with some clay.								
	2.0				Hole Terminated at 1.70 m Wet Collapse								

COPY OF WML LIB 1.06.GLB Log WML SOIL 7289 LOGS GPJ <<DrawingFile>> 15/10/2016 08:35 8:30:004 Developed by Dalgal



HAND AUGER: HA11

SHEET: 1 OF 1

CLIENT: Terry Pantlin	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 13/09/2016
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 22.40 m AHD
JOB NO.: 7289	POSITION: 382362.0 m E 6303085.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION								
				SM	Moist, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .								
		<p><u>Perth Sand Penetrometer</u></p> <table border="1"> <tr> <td>Depth (m)</td> <td>Blows</td> </tr> <tr> <td>0.20 - 0.50</td> <td>6</td> </tr> <tr> <td>0.50 - 0.80</td> <td>3</td> </tr> <tr> <td>0.80 - 1.10</td> <td>5</td> </tr> </table>	Depth (m)	Blows	0.20 - 0.50	6	0.50 - 0.80	3	0.80 - 1.10	5		SP	Moist, grey tending pale grey, loose, fine to medium grained, SAND .
Depth (m)	Blows												
0.20 - 0.50	6												
0.50 - 0.80	3												
0.80 - 1.10	5												
	0.5												
	1.0												
	1.5												
				SW	Wet, dark brown, dense, fine to coarse grained, gravelly SAND with a trace of silt. <i>Coffee Rock, weakly cemented, gravel pieces angular fine to medium.</i>								
				SP	Wet, pale grey, loose, fine to medium grained, SAND .								
	2.0				Hole Terminated at 1.90 m Wet Collapse								

COPY OF WML LIB 1.06/CLB Log WML SOIL 7289 LOGS.GPJ <<DrawingFile>> 15/10/2016 08:35 8:30:004 Developed by Dataplot

1.59m

Certificate of Analysis

Client Name:	WML Consultants Attn: Alex Pope		
Address:	PO Box 2023, Bunbury, WA, 6231		
Phone No:	9722 3544	Order No:	
Lab No:	9072	Email:	apope@wml.com.au
Date samples received:	19/9/16	Report date:	4/10/16

Sample details: 5 soil samples for Phosphorus Retention Index taken by client
 Samples ex Padbury Road labelled HA1 0.4m, HA3 0.4m, HA6 1.1m, HA8 0.5m,
 HA10 0.7m

Test Methods: Samples are tested on an as received basis and results are expressed on a dry weight basis.

Test Results:

Sample Identification	Phosphorus Retention Index
HA1 0.4m	-2
HA3 0.4m	140
HA6 1.1m	163
HA8 0.5m	-2
HA10 0.7m	-2

Comments:

- Samples HA1, HA8 and HA10 have a significant inherent phosphorus level which is being extracted into the solution, leading to negative PRI results.
- In sandy soils the Phosphorus Retention Index is usually less than 5
- Very strongly adsorbing soils include lateritic loams, iron rich peats, Karri loams with PRI >70

Phosphorus Retention Index (PRI) – The PRI is defined as the ratio of amount of P adsorbed to 5g soil, expressed as mg P/kg of soil, and concentration in solution (mg P/L) after addition of 100 mL of a 10 mg/L P solution in 0.02 M KCl and equilibration for 16 hours. The practical scale of PRI is from 0 to about 1000 (above which results become meaningless). A PRI of 20 indicates that 5 mg P/L remains in solution after the initial addition of 10 mg P/L in 100 mL to 5g of soil.

Please contact me on 9721 7170 or 0428 77 1937 if you have any queries about this report.



TEST REPORT

Sheet No. 1 of 1

CLIENT: W.M.L Consultants
PROJECT: Lot 383 Padbury Road, Dardanup
LOCATION: HA 1

SAMPLE NO: CT 58171
JOB NO: 24-1-437

PROPOSED USE: -
CLIENT REF: -

FIELD DESCRIPTION: Sand
DATE SAMPLED: 19-Sep-16
DATE TESTED: 21-Sep-16
DEPTH mm: -

EMERSON CLASS
AS 1289.3.8.1

Type of Water Used	-
Temperature of Water Used (°C)	-
Emerson class Number	N/A

Notes: Material not testable to method AS 1289 3.8.1
Sample site selected by Client
Sampled by Client

Approved Signatory: H.Yama 
Date: 23-Sep-16

Report Number: CT 58171 / 1



NATA Accredited Laboratory
No 20040
Accredited for compliance
with ISO/IEC 17025
This document shall not be
reproduced,
except in full

TEST REPORT

Sheet No. 1 of 1

CLIENT: W.M.L Consultants
PROJECT: Lot 383 Padbury Road, Dardanup
LOCATION: HA 3

SAMPLE NO: CT 58172

JOB NO: 24-1-437

FIELD DESCRIPTION: Silty Sand

DATE SAMPLED: 19-Sep-16

DATE TESTED: 21-Sep-16

DEPTH mm: -

PROPOSED USE: -
CLIENT REF: -

EMERSON CLASS
AS 1289.3.8.1

Type of Water Used	Tap
Temperature of Water Used (°C)	15
Emerson class Number	5

Notes:

Sample site selected by Client
Sampled by Client

Approved Signatory: H.Yama
Date: 23-Sep-16



Report Number: CT 58172 / 1



NATA Accredited Laboratory
No 20040
Accredited for compliance
with ISO/IEC 17025
This document shall not be
reproduced,
except in full

TEST REPORT

Sheet No. 1 of 1

CLIENT: W.M.L Consultants
PROJECT: Lot 383 Padbury Road, Dardanup
LOCATION: HA 6

SAMPLE NO: CT 58173
JOB NO: 24-1-437
FIELD DESCRIPTION: Sandy Gravel
DATE SAMPLED: 19-Sep-16
DATE TESTED: 22-Sep-16
DEPTH mm: -

PROPOSED USE: -
CLIENT REF: -

EMERSON CLASS
AS 1289.3.8.1

Type of Water Used	Tap
Temperature of Water Used (°C)	15
Emerson class Number	3

Notes:

Sample site selected by Client
Sampled by Client

Approved Signatory: H.Yama
Date: 23-Sep-16
Report Number: CT 58173 / 1



NATA Accredited Laboratory
No 20040
Accredited for compliance
with ISO/IEC 17025
This document shall not be
reproduced,
except in full

TEST REPORT

Sheet No. 1 of 1

CLIENT: W.M.L Consultants
PROJECT: Lot 383 Padbury Road, Dardanup
LOCATION: HA 8

SAMPLE NO: CT 58174
JOB NO: 24-1-437

FIELD DESCRIPTION: Sand
DATE SAMPLED: 19-Sep-16
DATE TESTED: 22-Sep-16
DEPTH mm: -

PROPOSED USE: -
CLIENT REF: -

EMERSON CLASS
AS 1289.3.8.1

Type of Water Used	-
Temperature of Water Used (°C)	-
Emerson class Number	N/A

Notes: Material not testable to method AS 1289 3.8.1
Sample site selected by Client
Sampled by Client

Approved Signatory: H.Yama
Date: 23-Sep-16
Report Number: CT 58174 / 1



NATA Accredited Laboratory
No. 20040
Accredited for compliance
with ISO/IEC 17025
This document shall not be
reproduced,
except in full

TEST REPORT

Sheet No. 1 of 1

CLIENT: W.M.L Consultants
PROJECT: Lot 383 Padbury Road, Dardanup
LOCATION: HA 10

SAMPLE NO: CT 58175
JOB NO: 24-1-437

FIELD DESCRIPTION: Sand
DATE SAMPLED: 19-Sep-16
DATE TESTED: 22-Sep-16
DEPTH mm: -

PROPOSED USE: -
CLIENT REF: -

EMERSON CLASS
AS 1289.3.8.1

Type of Water Used	Tap
Temperature of Water Used (°C)	15
Emerson class Number	3

Notes:

Sample site selected by Client
Sampled by Client

Approved Signatory: H.Yama
Date: 23-Sep-16
Report Number: CT 58175 / 1



NATA Accredited Laboratory
No. 20040
Accredited for compliance
with ISO/IEC 17025
This document shall not be
reproduced,
except in full

Bore Hole HA3-B

The bore hole work carried out on the 27th February 2017 showed that there were deep sands at the eastern end of proposed lot 3 (hole HA3-B). This confirmed the Land Resources soil-landform mapping and a site inspection that this rear part of the north east corner of Lot 383 is part of a sandy ridge.

The hole was dug at the end of summer and water was found at 1.7m. With such deep sands, the winter water table would be below the 500cm from the natural surface. This is the case with all bore holes that were dug into deep sands on this property.



HAND AUGER: HA7-B

SHEET: 1 OF 1

CLIENT: Graham Houghton	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Additional Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 27/02/2017
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.40 m AHD
JOB NO.: 7549	POSITION: 382667.0 m E 6302960.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION
				SM	Dry, dark grey, loose, fine to medium grained, silty SAND with some fine roots. TOPSOIL .
				CL	Dry, brown, stiff, sandy CLAY .
	0.5			SC	Moist, dark brown, medium dense, fine to coarse grained, clayey SAND .
	1.0			CL	Moist, pale grey mottled orange, stiff, gravelly sandy CLAY .
	1.5				Hole Terminated at 1.10 m Hard Digging
	2.0				

Not Encountered



HAND AUGER: HA7-A

SHEET: 1 OF 1

CLIENT: Graham Houghton	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Additional Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 27/02/2017
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.20 m AHD
JOB NO.: 7549	POSITION: 382719.0 m E 6303010.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION
Not Encountered	0.5			SM	Dry, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .
				CL	Dry, brown, stiff, sandy CLAY .
				SP	Moist, pale grey mottled orange, medium dense, fine to medium grained, SAND . <i>tending SAND with some clay</i> .
				SC	Moist, pale grey slightly mottled orange, medium dense, fine to coarse grained, gravelly clayey SAND .
				GC	Moist, pale grey mottled orange, dense, fine to medium, sandy clayey GRAVEL .
	1.0				
	1.5				Hole Terminated at 1.10 m Refusal
	2.0				

COPY OF WML LIB 1.06.GLB Log WML SOIL 7549 LOGS.GPJ <<DrawingFile>> 07/03/2017 13:06 10.0.000 Developed by Daigel



HAND AUGER: HA3-B

SHEET: 1 OF 1

CLIENT: Graham Houghton	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Additional Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 27/02/2017
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 22.20 m AHD
JOB NO.: 7549	POSITION: 382776.0 m E 6303285.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION
				SM	Dry, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .
	0.5			SP	Moist, pale grey, medium dense, fine to medium grained, SAND .
	1.0				
	1.5			SP	Wet, pale grey brown, medium dense, fine to medium grained, SAND .
	2.0				
					Hole Terminated at 2.00 m Target depth

COPY OF WML LIB 1.06.GLB Log_WML_SOIL_7549 LOGS.GPJ <<DrawingFile>> 07/03/2017 13:06 10.0.0.000 Developed by Dvigel

1.7m



HAND AUGER: HA3-A

SHEET: 1 OF 1

CLIENT: Graham Houghton	CONTRACTOR: WML Consultants	LOGGED: AP
PROJECT: Additional Geotechnical Investigation	MACHINE: Hand-Auger	LOGGED DATE: 27/02/2017
LOCATION: Lot 383 Padbury Rd, Dardanup	CO-ORD SYSTEM: MGA94 Zone 50	SURFACE RL: 21.40 m AHD
JOB NO.: 7549	POSITION: 382632.0 m E 6303265.0 m N	CHAINAGE:

WATER	DEPTH (m)	SAMPLES OR FIELD TEST	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION
				SM	Dry, dark grey, loose, fine to medium grained, silty SAND with some fine roots. <i>TOPSOIL</i> .
	0.5			SC	Moist, orange brown, loose, fine to medium grained, SAND with some clay.
	1.0			SP	Moist, pale grey, medium dense, fine to medium grained, SAND .
	1.5			SW	Wet, brown, medium dense, fine to coarse grained, gravelly SAND . <i>Coffee Rock gravel pieces within sand matrix, tending coffee rock.</i>
	1.5				Hole Terminated at 1.50 m Hard Digging
	2.0				

COPY OF WML LIB 1.06.GLB Log WML \$OIL_7549 LOGS.GPJ <-DrawingFile>> 07/02/2017 13:06 10.0.000 Developed by Dargal

1.15m

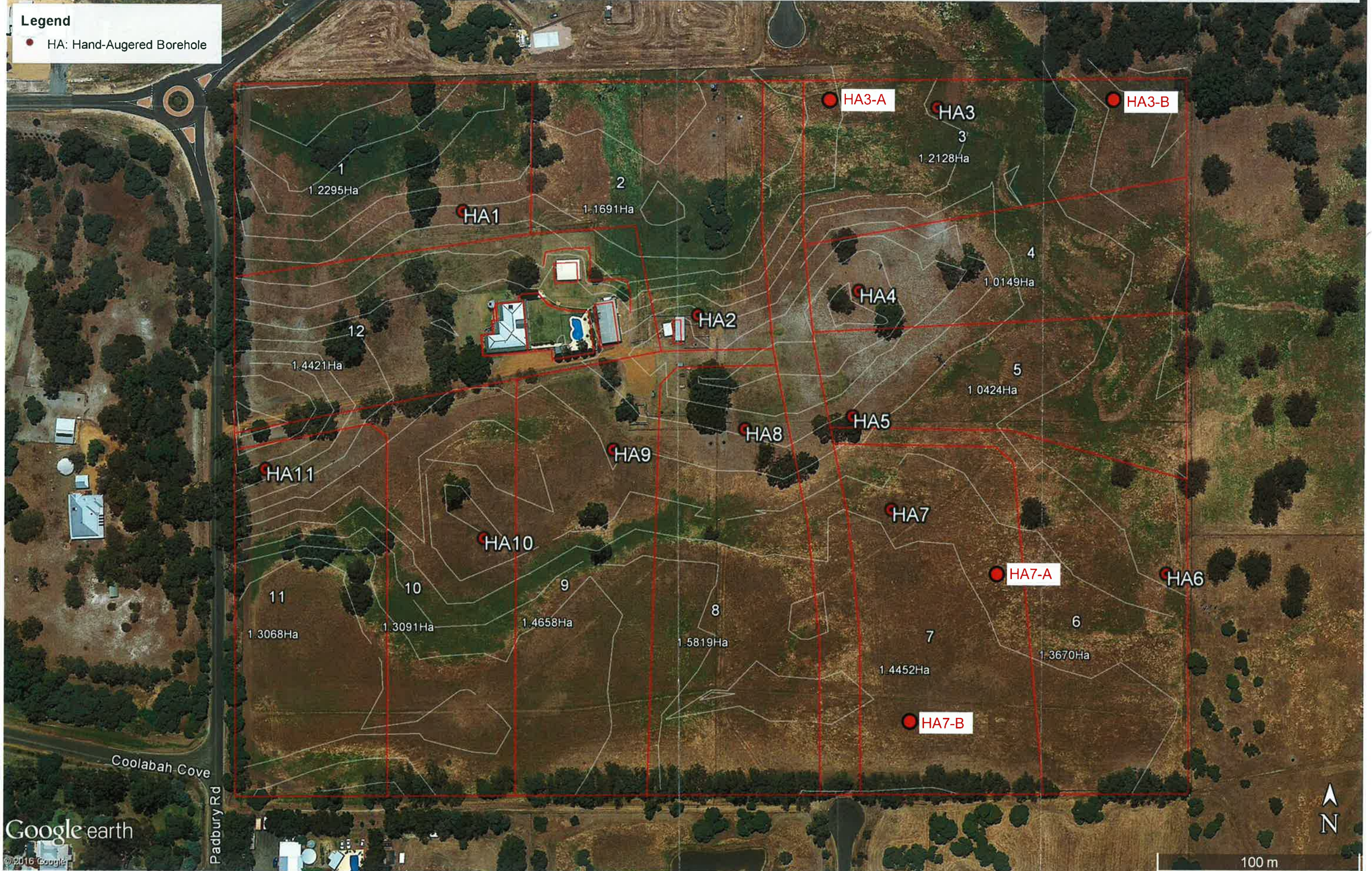
7289-G-001

Geotechnical Test Locations



Legend

- HA: Hand-Augered Borehole



Bushfire Management Plan



Bushfire Management Plan



**Lot 383 Padbury Road
Dardanup**

LUSH FIRE & PLANNING

3 Paterson Road
Pinjarra WA 6208
0418 954 873
ABN 74 232 678 543

REF: 16-056

Ver D

May 2019

Bushfire Management Plan Coversheet

This Coversheet and accompanying Bushfire Management Plan has been prepared and issued by a person accredited by Fire Protection Association Australia under the Bushfire Planning and Design (BPAD) Accreditation Scheme.

Bushfire Management Plan and Site Details

Site Address / Plan Reference:	Lot 383 DP247456 Padbury Road		
Suburb:	Dardanup West	State:	WA
		P/code:	6236
Local government area:	Dardanup		
Description of the planning proposal:	Rural residential subdivision		
BMP Plan / Reference Number:	16 - 036	Version:	D
		Date of Issue:	14/05/2019
Client / Business Name:	A Pantlin		

Reason for referral to DFES	Yes	No
-----------------------------	-----	----

Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
--	--------------------------	-------------------------------------

Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the BPC elements)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
---	--------------------------	-------------------------------------

Is the proposal any of the following special development types (see SPP 3.7 for definitions)?

Unavoidable development (in BAL-40 or BAL-FZ)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Strategic planning proposal (including rezoning applications)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Minor development (in BAL-40 or BAL-FZ)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
High risk land-use	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Vulnerable land-use	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If the development is a special development as listed above, explain why the proposal is considered to be one of the above listed classifications (E.g. considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

Local structure plan and subdivision

Note: The decision maker (e.g. the local government or the WAPC) should only refer the proposal to DFES for comment if one (or more) of the above answers are ticked "Yes".

BPAD Accredited Practitioner Details and Declaration

Name	Accreditation Level	Accreditation No.	Accreditation Expiry
Geoffrey Lush	Level 2	BPAD 27682	28/02/2020
Company		Contact No.	
Lush Fire & Planning		0418 954 873	

I declare that the information provided in this bushfire management plan is to the best of my knowledge true and correct.

Signature of Practitioner



Date

14/05/2019

Document Reference

Property Details

Street No	Lot No's	Plan	Street Name
175	383	247456	Padbury Road
Locality	Dardanup West	State WA	Postcode 6236
Local Government Area	Dardanup		
Description of the building or works	Rural residential subdivision		

Report Details

Job No	16 - 036	Assessment Date	5 September 2016
Ver	Date	Revision	
A	4 January 2017	Preliminary	
B	16 May 2017	Revised subdivision design and updated policy measures	
C	16 April 2018	Revised subdivision design and DFES comments	
D	15 May 2019	DPLH Modifications	

Accreditation Statement

Name	Geoffrey Lush	Company	Lushfire & Planning
BPAD	Level 2 Practitioner	Accreditation No Expiry	27682 February 2020

Disclaimer

The measures contained in this report do not guarantee that a building will not be damaged in a bushfire. The ultimate level of protection will be dependent upon the design and construction of the dwelling and the level of fire preparedness and maintenance under taken by the landowner. The severity of a bushfire will depend upon the vegetation fuel loadings; the prevailing weather conditions and the implementation of appropriate fire management measures.



Geoffrey Lush

14 May 2019

geoffrey@lushfire.com.au



CONTENTS

1.0	Introduction.....	1
2.0	Existing Conditions	2
3.0	Development Framework	7
3.1	Bushfire Prone Land	7
3.2	SPP 3.7 Planning in Bushfire Prone Areas.....	8
3.3	Australian Standard AS3959 (2009).....	8
3.4	Planning Bulletin 111 Planning in Bushfire Prone Areas	9
3.5	Fire Prevention Order.....	9
4.0	Proposed Development	9
5.0	The Bushfire Issue.....	11
5.1	Bushfire History.....	11
5.2	Bushfire Hazard.....	11
5.3	BAL Contour Map	14
5.4	District Context	14
6.0	Fire Mitigation Measures	17
6.1	Bushfire Protection Criteria	17
6.1.1	Element 1 Location	17
6.1.2	Element 2 Siting and Design of Development	19
6.1.3	Element 3 Vehicular Access.....	20
6.1.4	Element 4 Water.....	21
6.2	Annual Property Maintenance	22
6.3	Staging.....	23
6.4	Purchaser Advice.....	23
6.5	Implementation.....	23
7.0	Conclusion	25
8.0	References.....	26

FIGURES

Figure 1	Location Plan.....	1
Figure 2	Cadastral Plan	3
Figure 3	Existing Conditions.....	4
Figure 4	Bushfire Prone Land	7
Figure 5	Subdivision Plan.....	10
Figure 6	Vegetation Classifications	12
Figure 7	Bushfire Hazard Levels	13
Figure 8	BAL Contours.....	15
Figure 9	District Context.....	16
Figure 10	Fire Mitigation Measures	18

TABLES

Table 1	Grassland BAL Setbacks.....	14
Table 2	Implementation	24

1.0 INTRODUCTION

This bushfire management plan is prepared to support the proposed rezoning and subsequent subdivision of Lot 383 Plan 247456 Padbury Road Dardanup West. The site is located on the corner of Padbury and Keenan Roads.

The subject land is located approximately 2.5 kilometres west of the Dardanup townsite as shown in Figure 1.

This report has been prepared to demonstrate that the design of proposed subdivision has given appropriate regard to:

- State Planning Policy 3.7 Planning in Bushfire Prone Areas; and
- Guidelines for Planning in Bushfire Prone Areas (2015)

The aim of this Report is to reduce the threat to the residents in the proposed subdivision and fire fighters in the event of a bushfire within or adjacent to the development. It defines the responsibilities of relevant stakeholders and the measures required to manage the potential likelihood of fires starting on the proposed lots or the adjoining land. The assets which are highlighted for protection from bush fires are:

- Any future dwelling within the subdivision; and
- The existing development surrounding the properties.

The first priority for fire management is the preservation of life and to reduce the impact of bushfires on property and infrastructure (1).

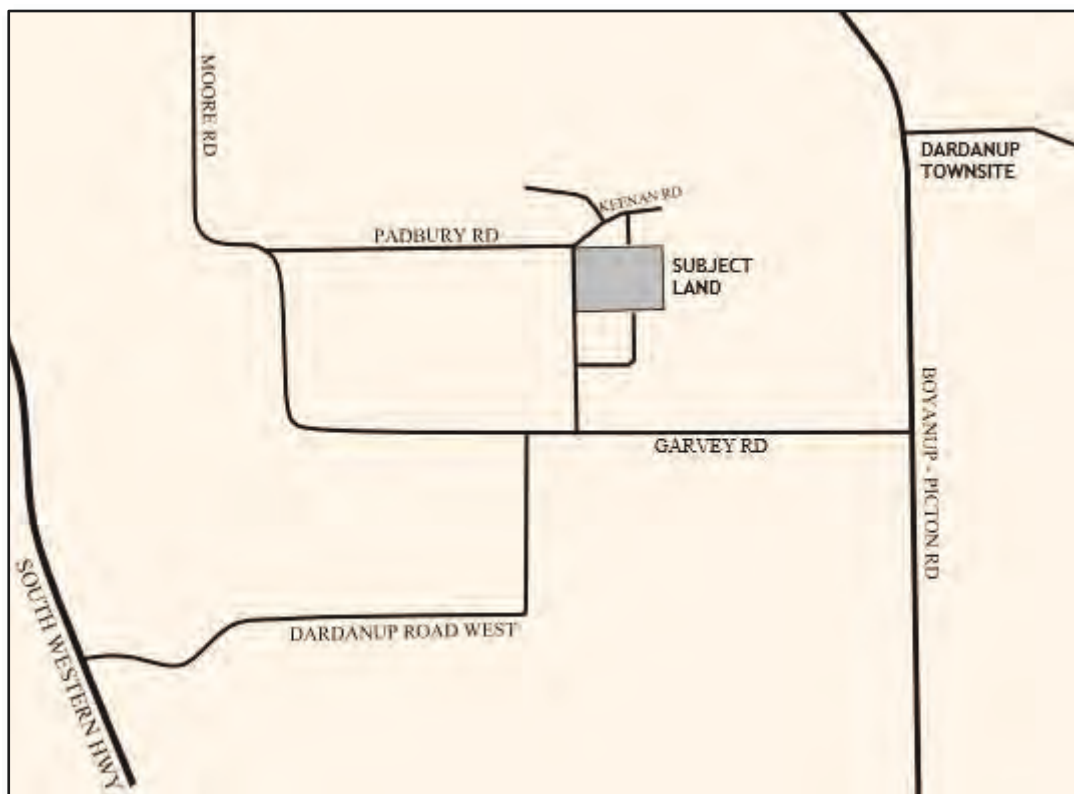


Figure 1 Location Plan

1 WAPC (2015) SPP3.7 Planning in Bushfire Prone Areas page 1

2.0 EXISTING CONDITIONS

The subject land has an area of 16.311 hectares with a frontage of 347m to Padbury Road and a depth of 468m. The cadastral information for the site is shown in Figure 2.

There is an existing dwelling, granny flat, outbuildings, and other improvements on the property. The land to the north, south and west of the property has been developed for rural residential purposes with lots generally being 2 hectares in size. The land to the east has larger un-subdivided rural lots.

The existing conditions are shown in Figure 3 and the following photographs.

The site does not contain any remnant vegetation and there is cleared pasture around the dwelling on the balance of the property. There are small areas of remnant vegetation on the adjacent and nearby road verges.

The subject land and surrounding area is flat land which has historically been used for irrigated farming and grazing. The contours for the property are shown in Figure 2 and there is a minor ridge in the middle of the property which is only 1m above the surrounding area. The gradients are minor being between 0.5 and 1.0 degrees.

There is a district drain adjacent the southern boundary. An existing fire service access is located on the southern boundary between Padbury Road and Slattery Way.

Padbury Road is a sealed local road which connects to Moore Road in the north west and to Garvey Road to the south. Keenan Way provides access to the adjoining subdivision (Killarney Glen) to the north. Slattery Way is a cul-de-sac extending to the property boundary from Keenan Way in the north and Padbury Road from the south.

The locality has a Mediterranean climate with cool wet winters and hot dry summers. It has an annual rainfall of 724mm (2). The mean maximum temperature is 30.1 °C with the highest recorded maximum temperature of 40.8 °C in January 1997.

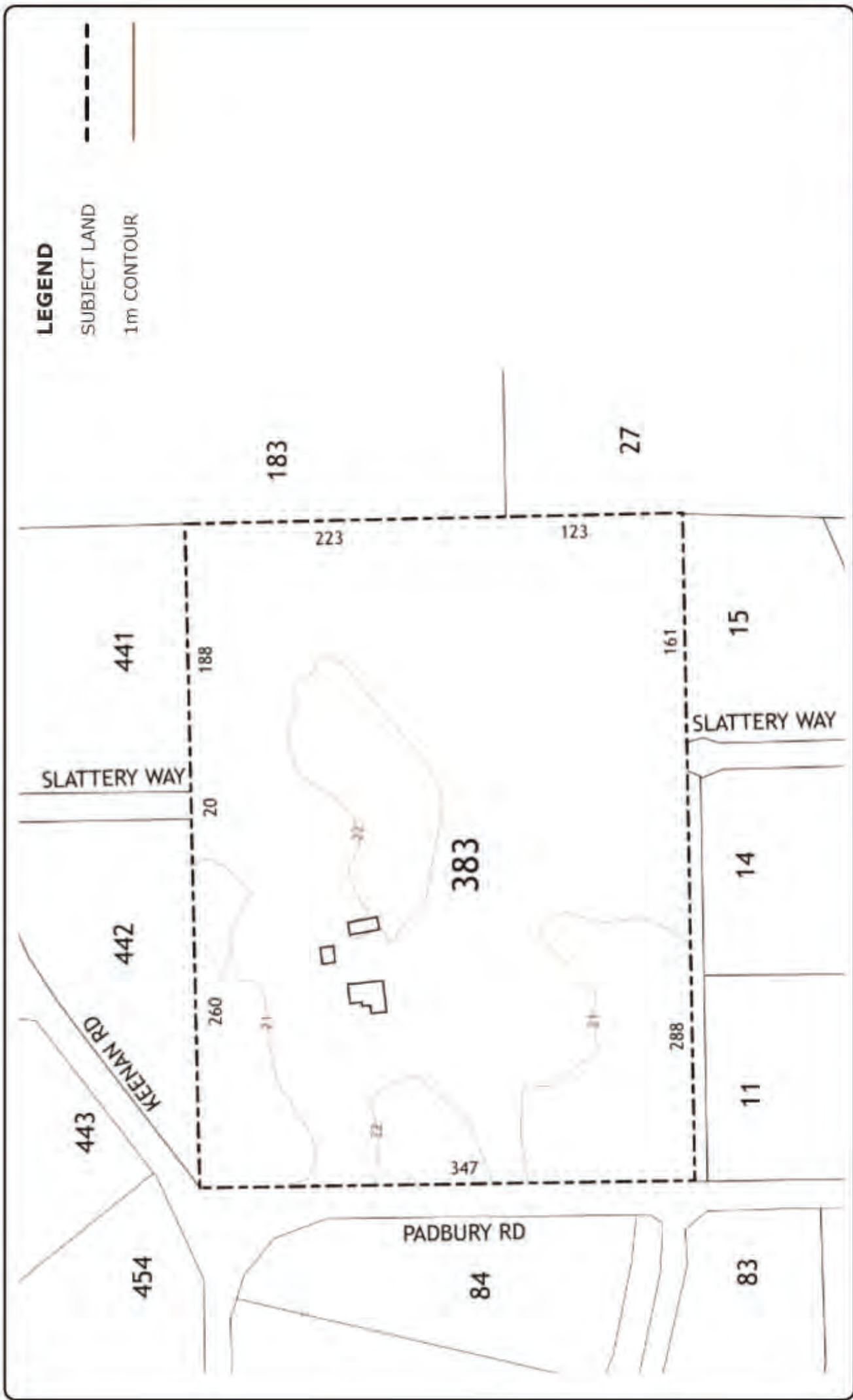
Each year there are on average:

- 52 days with temperatures over 30 °C;
- 11 days with temperatures over 35 °C; and
- 0.1 day with temperatures over 40 °C.

In summer the wind speed and direction at:

- 9:00am is typically from the east and south east between 20 and 40kph; and
- 3:00pm is typically from the west between 20 and 40kph.

2 Bureau of Meteorology – Bunbury Weather Station No 9965.



Rev	Description	Date
A	Preliminary	03/01/2017



FIGURE 2
CADASTRAL PLAN

LEGEND

- SUBJECT LAND 
- FIRE SERVICE ACCESS ROUTE 
- DRAINAGE CHANNEL 
- PHOTOGRAPH & DIRECTION 



Rev	Description	Date
A	Preliminary	03/01/2017



FIGURE 3
EXISTING CONDITIONS

Lot 383 Padbury Road



Photograph 1



Photograph 2



Photograph 3



Photograph 4



Photograph 5



Photograph 6

Lot 383 Padbury Road



Photograph 7



Photograph 8



Photograph 9



Photograph 10

Photograph 11



3.0 DEVELOPMENT FRAMEWORK

3.1 Bushfire Prone Land

An extract of the State Bushfire Prone Map for the subject land is shown in Figure 4.

The designation of bushfire prone areas triggers:

- The application of Australian Standard AS3959 Construction of Buildings in Bushfire Prone Areas under the Building Code of Australia (from the 8th April 2016);
- The provisions of the Planning and Development (Local Planning Schemes) Amendment Regulations 2015 (from the 8th April 2016); and
- The application of SPP3.7 Planning in Bushfire Prone Areas (from the 7th December 2015).

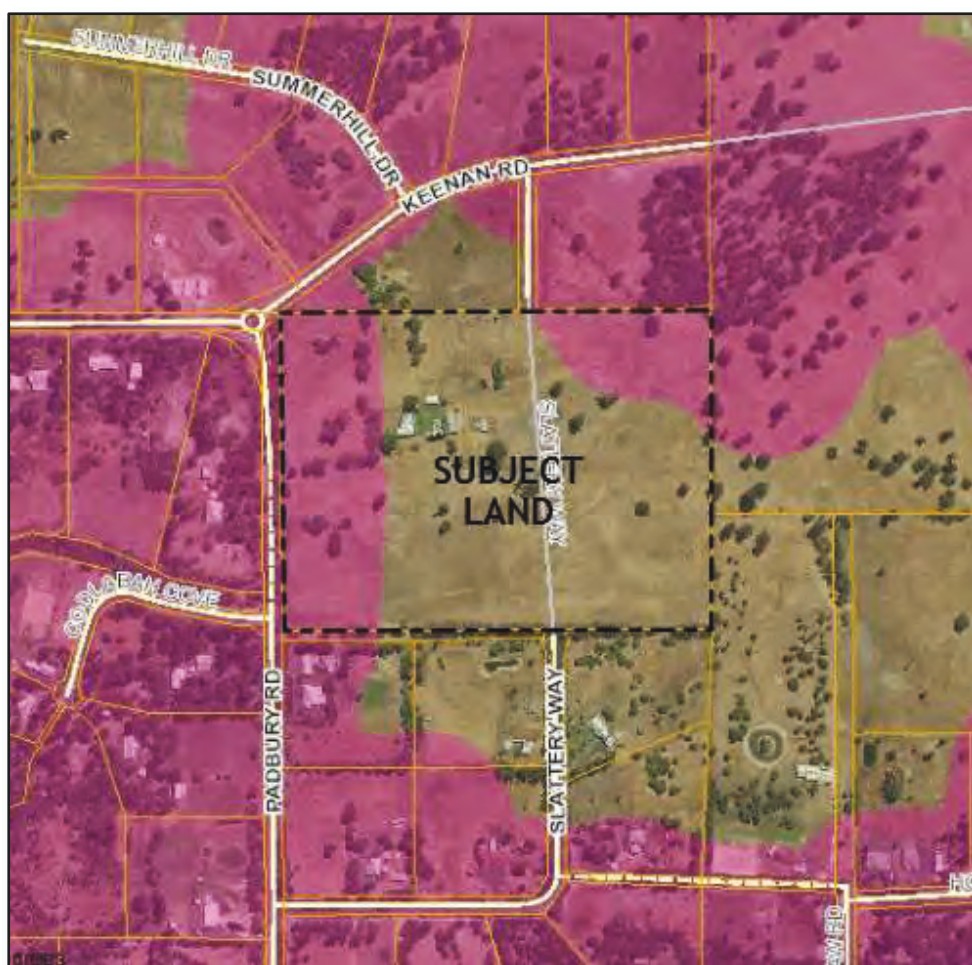


Figure 4 Bushfire Prone Land

3.2 SPP 3.7 Planning in Bushfire Prone Areas

State Planning Policy 3.7 Planning in Bushfire Prone Areas was gazetted on the 7th December 2015. The policy provides the foundation for land use planning to address bushfire risk management in Western Australia. It contains objectives and policy measures, as well as reference to the bushfire protection criteria contained in the Guidelines.

The objectives of the policy are to:

1. Avoid any increase in the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact are paramount.
2. Reduce vulnerability to bushfire through the identification and consideration of bushfire risks in decision-making at all stages of the planning and development process.
3. Ensure that higher order strategic planning documents, strategic planning proposals, subdivision and development applications take into account bushfire protection requirements and include specified bushfire protection measures.
4. Achieve an appropriate balance between bushfire risk management measures and, biodiversity conservation values, environmental protection and biodiversity management and landscape amenity, with consideration of the potential impacts of climate change.

The Policy requires that planning proposals, subdivision and development applications should have on completion:

- A moderate bushfire hazard level (BHL); and/or
- A Bushfire Attack Level (BAL) rating of between BAL-12.5 to BAL-29 applies.

3.3 Australian Standard AS3959 (2009)

AS3959 Construction of Building in Bush Fire Prone Areas (3) provides measures for improving the ability of buildings to withstand burning debris, radiant heat and flame contact during a bush fire. The lower the separation distance from bushfire prone vegetation, the higher the standard of construction is required for buildings. The construction requirements relate to:-

- Subfloor Supports;
- Floor;
- External Walls;
- External Elements and Doors
- Roofs;
- Verandas, Decks, Steps; and
- Water and gas pipes.

It is emphasised that only applying the Standard's construction measures is not a complete response to bush fire safety. The measures contained in the Standard cannot guarantee that a building will survive a bushfire event on every occasion. This is due to the unpredictable nature and behaviour of fire and extreme weather conditions.

3 Standards Australia (2009) AS 3959 – Construction of Buildings in Bush Fire Prone Areas. Sydney. Standards Australia International Ltd.

3.4 Planning Bulletin 111 Planning in Bushfire Prone Areas

A revised version of Planning Bulletin 111 was released in October (2016) to provide improved guidance for the administration of SPP3.7.

It states that the overarching policy intentions for Planning in Bushfire Prone Areas are:

- That strategic planning documents or proposals, subdivision and development applications within a bushfire prone area, should demonstrate a Bushfire Attack Level (BAL) of 29 or below; and
- Proposals that on completion, are extreme and/or BAL-40 or BAL-Flame Zone will generally not be supported (subject to exemptions relating to minor or unavoidable development).

3.5 Fire Prevention Order

Within the Small Holdings Zone which includes the subject land, Council's Fire Prevention Order requires:

- Bare earth firebreaks of 2m width and 4m in height must be maintained within and adjacent to the lot boundary.
- Fire hazards on properties must be slashed to a height of no more than 50mm and flammable material must be removed.
- Must have a 20 metre low fuel area around all buildings and haystacks or groups thereof.

Fire prevention measures must be completed by the 30th November each year and maintained until the 26th April.

4.0 PROPOSED DEVELOPMENT





The proposed subdivision is shown in Figure 5. This consists of creating ten (10) lots ranging in size from 1.0ha to 2.6ha. Figure 5 also shows the building exclusion areas and the boundary setbacks contained in the Planning Scheme being:

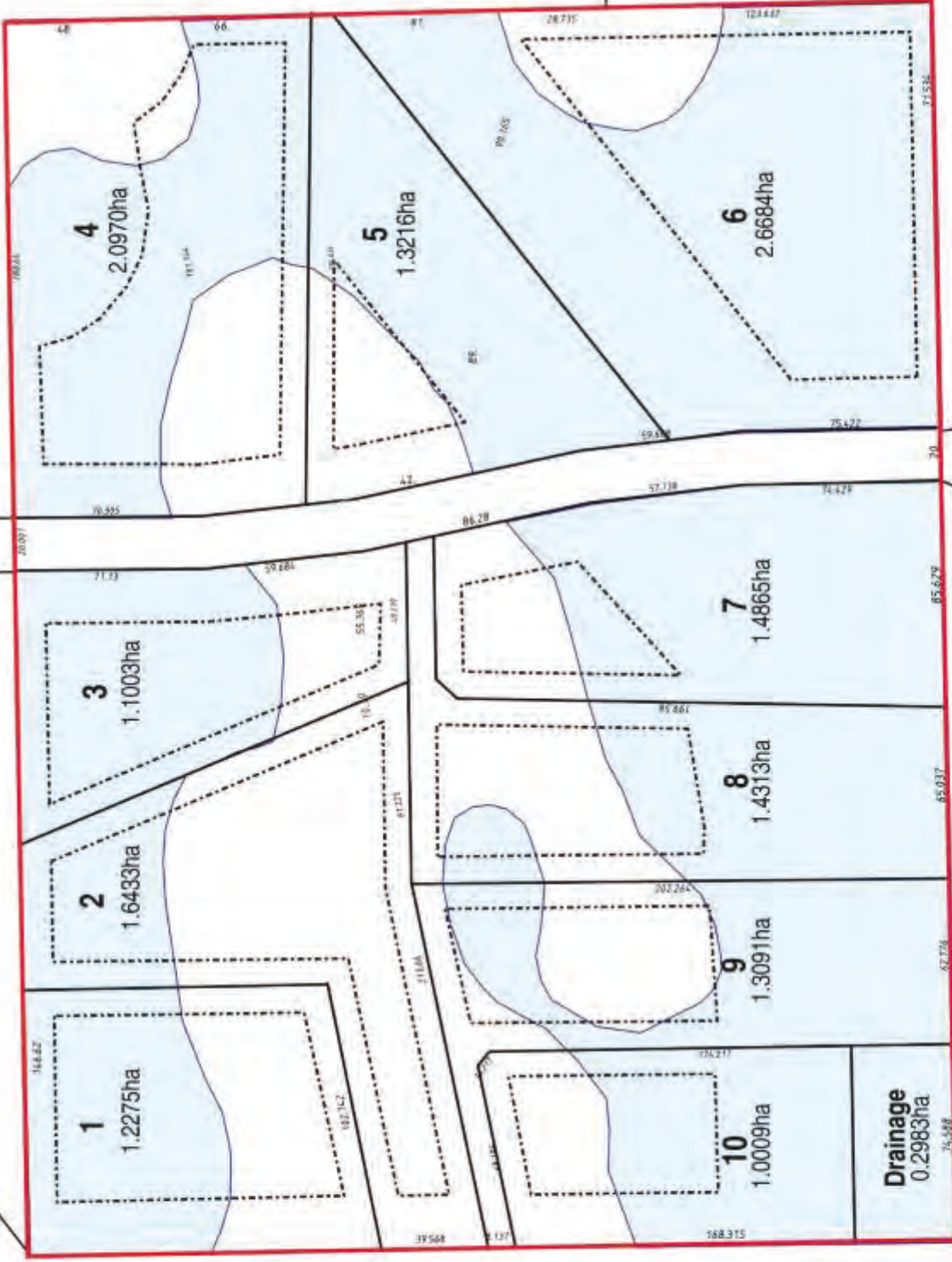
- 20m from the front boundary; and
- 10m from the side and rear boundaries.

Slattery Way will be extended through the subdivision being a 20m wide road reserve connecting to the existing road on the northern and southern boundaries. There are two battle axe lots with the access leg being 10m wide and 49m and 68m long respectively.

A drainage reserve will be located in the south western corner of the site with an area of 0.2983ha. A water tank reserve will be located on the southern boundary with an area of 0.09ha.

LEGEND

-  SUBJECT LAND
-  PROPOSED LOT BOUNDARY
-  BUILDING EXCLUSION AREA
-  DEVELOPMENT SETBACK
- 20m FRONT
- 10m SIDE & REAR
- 50m WATERCOURSE



Rev	Description	Date
A	Preliminary	03/01/2017
B	Subdivision plan	12/05/2017
C	Subdivision design	11/04/2018
D	Subdivision design	10/04/2019

**FIGURE 5
PROPOSED SUBDIVISION**

5.0 THE BUSHFIRE ISSUE

5.1 Bushfire History

The annual fire season extends from approximately mid-October to mid-May. This is the normal period where weather conditions are conducive to the ignition and spread of bushfires. The fire risk increases once vegetation has cured which is generally later in the season.

Bush fires occur annually within the locality with sufficient intensity to cause property damage and potentially to be life threatening.

5.2 Bushfire Hazard

A Bushfire Hazard Level assessment provides a 'broadbrush' means of determining the potential intensity of a bushfire for a particular area.

The bush fire hazard primarily relates to the vegetation on the site, the type and extent (area) of vegetation and its characteristics. The methodology for determining the bushfire hazard level is contained in the Guidelines for Planning in Bushfire Prone Areas (Section 4.1 and Appendix 2). This classifies vegetation based on tree height and the percentage of canopy cover. The classification of the vegetation also takes into account The Visual Guide for Bushfire Risk Assessment in Western Australia (WAPC 2016).

The vegetation classifications are shown in Figure 6.

The Bushfire Hazard Level assessment is shown in Figure 7 and this includes the classification of the hazard vegetation.

The subject generally has a moderate hazard rating which is primarily due to pasture / grassland areas being assigned a moderate hazard level. Land with a moderate bushfire hazard rating can be developed in accordance with the policy measures in SPP3.7 which includes compliance with the Bushfire Protection Criteria.

Land with an extreme bushfire hazard rating should not be developed unless it can be shown that the hazard can be permanently reduced to a moderate level.

- LEGEND**
- SUBJECT LAND
 - 150m MAPPING BOUNDARY
 - VEGETATION CLASS
 - FOREST
 - WOODLAND
 - UNMANAGED GRASSLAND AND PASTURE
 - LOW THREAT VEGETATION NON VEGETATED AREAS

NOTES

The assessment of this site / development was undertaken on the **5 September 2016** for the purpose of determining the Bushfire Attack Level in accordance with AS 3959 - 2009 Simplified Procedure (Method 1).



Rev	Description	Date
A	Preliminary	12/05/2017



FIGURE 6
VEGETATION CLASSIFICATIONS



LEGEND

- SUBJECT LAND —
- 100m MAPPING BOUNDARY —
- BUSHFIRE HAZARD LEVEL
- EXTREME ■
- MODERATE ■
- LOW ■

NOTES

- 1) BUSHFIRE HAZARD LEVEL PREPARED IN ACCORDANCE WITH APPENDIX 2 OF GUIDELINES.
- 2) LAND CLASSIFIED AS LOW THREAT VEGETATION OR A NON VEGETATED AREA WHICH ARE WITHIN 100m OF VEGETATION THAT HAS A MODERATE OR EXTREME HAZARD RATING IS AUTOMATICALLY ASSIGNED A MODERATE HAZARD LEVEL.
- 3) DATE OF INSPECTION - 05/09/2016



Rev	Description	Date
A	Preliminary	03/01/2017
B	BHL Methodology	12/05/2017

**FIGURE 7
BUSHFIRE HAZARD LEVELS**

5.3 BAL Contour Map

A BAL Contour Map is shown in Figure 8. A BAL Contour Map is a plan of the subject lot/s illustrating the potential radiant heat impacts and associated indicative BAL ratings in reference to any classified vegetation remaining within 100 metres of the assessment area after the development is completed.

The assumptions for the preparation of the BAL Contour Map are:

- a) That the pasture areas in the adjoining properties has been classified as 'grassland' as the applicant does not have any control over these areas;
- b) That the paddock areas within each lot will be maintained as Low Threat Vegetation. Where this does not occur then an increased BAL rating may apply when development occurs; and
- c) That any landscaping or revegetation will be classified as low threat vegetation pursuant to AS3959 Clause 2.2.3.2

Where an adjoining lot has Grassland vegetation then assuming that there is a minimum 10m side boundary setback a BAL-29 rating would apply as shown in Table 1.

Table 1 Grassland BAL Setbacks

Vegetation Classification	Bushfire Attack Levels (BALs)				
	BAL - FZ	BAL - 40	BAL - 29	BAL - 19	BAL - 12.5
	Distance (m) of the site from the predominant vegetation class				
	All upslopes and flat land				
G Grassland	< 6	6 - < 8	8 - < 12	12 - < 17	17 - < 50

5.4 District Context

The relationship of the subject land to the surrounding area is shown in Figure 9.

The subject is located in the centre of the Dardanup Small Holdings area which extends between Moore Road and the Picton - Boyanup Road and this area includes the Copplestone and West Dardanup locations.

The proposed roads are in accordance with the approved Dardanup Small Holdings Structure Plan. The future extension of Keenan Road to the Dardanup townsite will improve the accessibility to the area.

LEGEND

- SUBJECT LAND
- 100m MAPPING BOUNDARY
- UPSLOPE
- FLAT LAND
- VEGETATION PLOTS

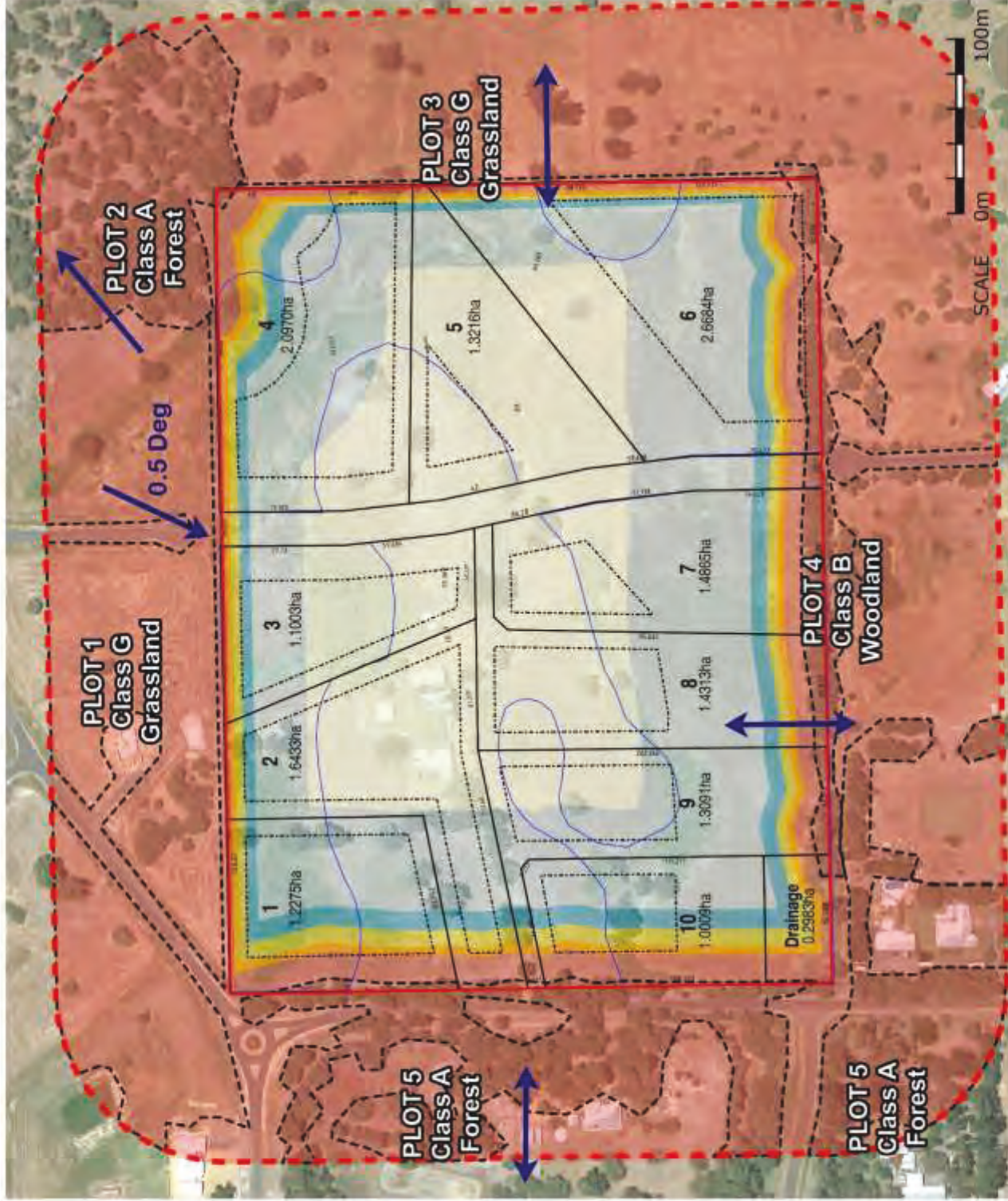
BAL LEVELS

- BAL - Flame Zone
- BAL - 40
- BAL - 29
- BAL - 19
- BAL - 12.5
- BAL - Low
- BUILDING EXCLUSION AREA

SCHEME SETBACKS

- 20m FRONT
- 10m SIDE & REAR
- 50m WATERCOURSE

Location Details Lot 383 Padbury Rd
 Assessment Date 05/09/2016
 Prepared by: G Lush
 Accreditation Level Level 2
 Accreditation No BPAD 27682
 Expiry Date: February 2020
 Aerial Photo: Nov 2015



Rev	Description	Date
A	Preliminary	03/01/2017
B	Subdivision Plan	12/05/2017
C	Building Exclusion & Setbacks	20/03/2018
D	Subdivision Design	10/04/2019

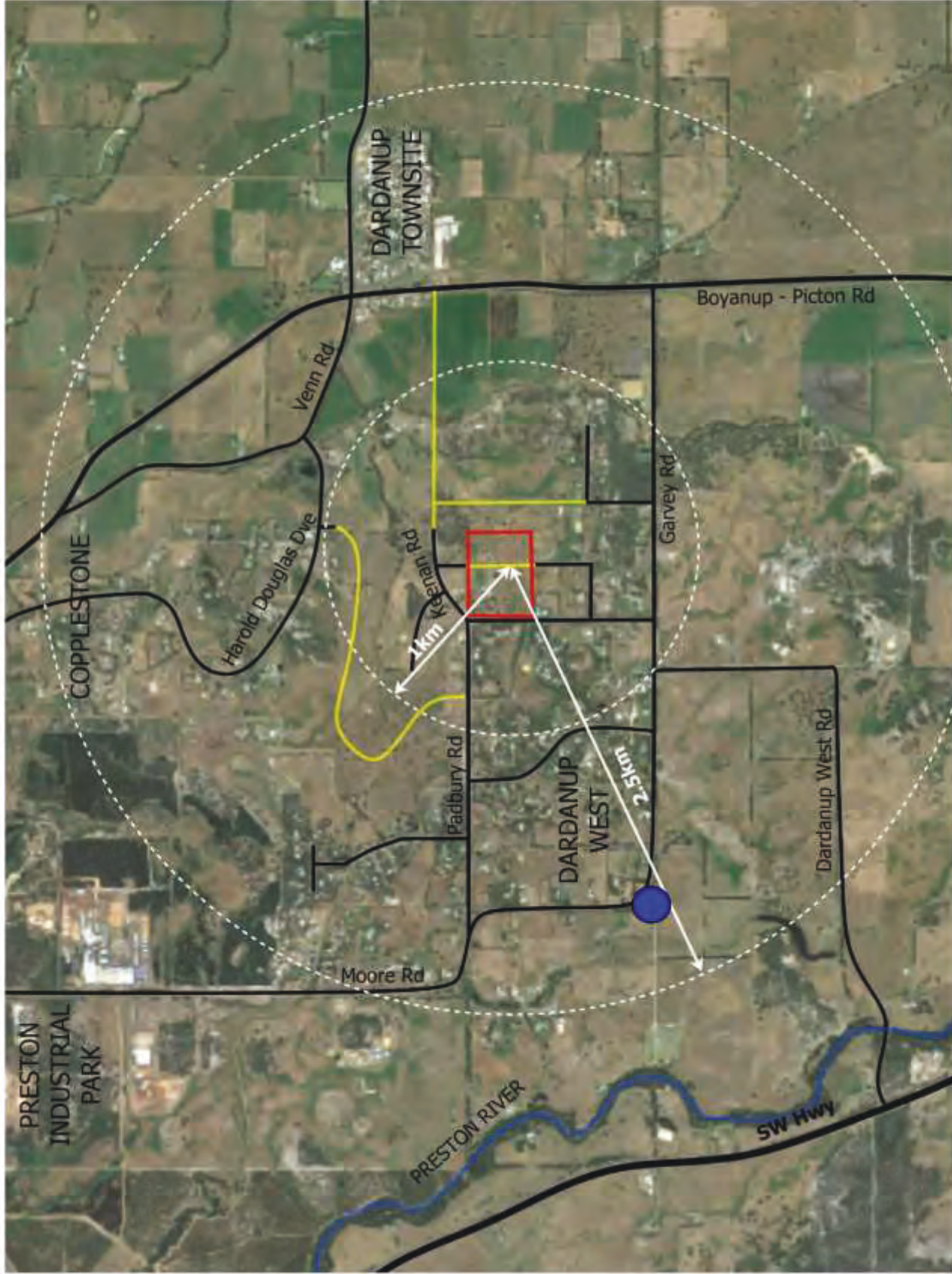


Ref No 16-056

**FIGURE 8
BAL CONTOURS**

LEGEND

- SUBJECT LAND
- EXISTING ROAD
- PROPOSED ROAD
- DARDANUP WEST FIRE STATION



Rev	Description	Date
A	Preliminary	12/05/2017



**FIGURE 9
DISTRICT CONTEXT**

6.0 FIRE MITIGATION MEASURES

In formulating the proposed mitigation measures regard has been given to the objectives, general principles, guidance statements and performance criteria contained in the Guidelines for Planning in Bushfire Prone Areas and specifically the Bushfire Protection Criteria. The mandatory requirements in the Bushfire Protection Criteria are referred to as “acceptable solutions” and these are designated below in brackets after each heading.

The fire management recommendations for the subject land and are shown on Figure 10 and discussed further in the following sections.

6.1 Bushfire Protection Criteria

The Bushfire Protection Criteria are contained in Appendix 4 of the Guidelines for Planning in Bushfire Prone Areas (2015).

The criteria contain a set of performance criteria and acceptable solutions that new subdivision and developments are required to meet in bush fire prone areas. The main components are:

- Element 1 Location;
- Element 2 Siting and Design of Development;
- Element 3 Vehicular Access; and
- Element 4 Water.

6.1.1 Element 1 Location

A1.1 Development Location

This provision stipulates that the development is to be located so that it has or will have:

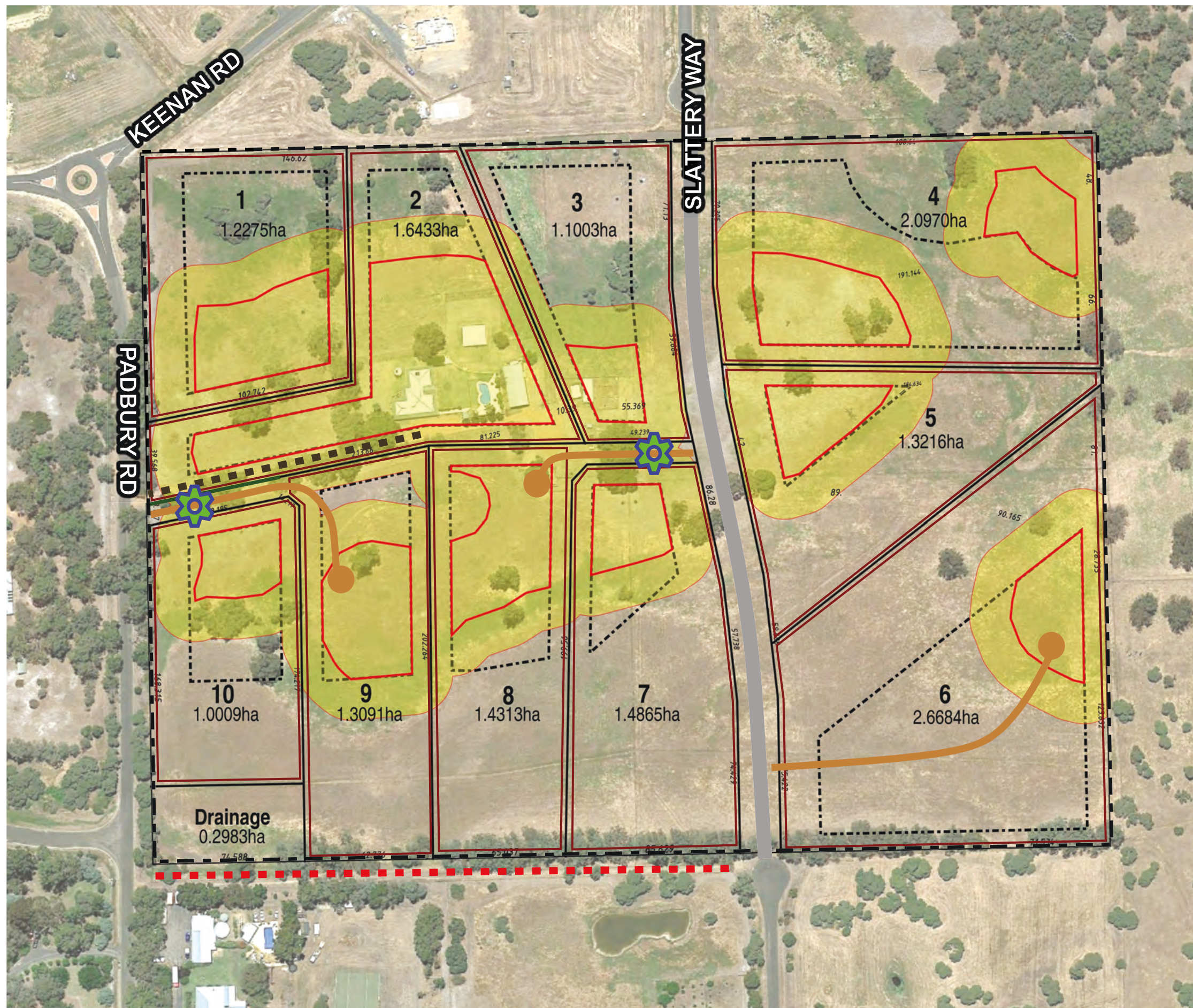
- A moderate to low bushfire hazard level; or
- A Bushfire Attack Level rating of BAL-29 or below.

As shown in Figure 7 the subject land has a moderate bushfire hazard rating.

The potential BAL Contours are shown in Figure 8. This illustrates the potential radiant heat impacts and associated indicative BAL ratings in reference to the classified vegetation which is predominantly located on the adjoining properties. It assumes that the paddock areas within each lot will be maintained as Low Threat Vegetation. Where this does not occur then an increased BAL rating may apply when development occurs.

Figure 8 also shows the building exclusion areas and the minimum boundary setbacks provided for in the Planning Scheme ie 20m front boundary; 10m side and rear boundaries. There are minor portions of lots which have a BAL-40 or BAL-FZ rating encroaching past these setbacks. However, any BAL assessment that results in a BAL 40 or FZ rating will then trigger a Development Application pursuant to Clause 78D Part 10A of the Planning and Development (Local Planning Schemes) Regulations 2015. As part of this application local government can require the dwelling to be sited so as to achieve a BAL-29 rating.

It is also noted that a 20m asset protection zone will provide a BAL-12.5 rating from Class G Grasslands either on upslopes or downslopes of less than 5 degrees.



LEGEND

- SUBJECT LAND - - - - -
- EXISTING DRIVEWAY - - - - -
- EXISTING FIRE SERVICE ACCESS ROUTE - - - - -
- DEVELOPABLE LAND [Red outline]
 This reflects the net area where dwellings can be constructed after excluding:
 - Land with a BAL-40 or BAL-FZ rating;
 - Land within the minimum boundary setbacks prescribed in the Planning Scheme; and
 - Building exclusion areas shown on the local structure plan.
- ASSET PROTECTION ZONE [Yellow fill]
 The plan shows an indicative 20m asset protection zone around the Developable Land. In practice this will vary depending upon the BAL-29 setback distance.
- 3m BOUNDARY FIREBREAK [Red line]
- 50,000L STATIC WATER SUPPLY TANK AND RESERVE [Orange circle]
- DRIVEWAYS LONGER THAN 50m. [Orange line]
 These are to have a 4m wide trafficable surface with 6m horizontal clearance to vegetation. A 17.5m diameter turning circle shall be provided in proximity to the dwelling.
- 10m WIDE BATTLE AXE LEGS [Blue gear icon]
 No trees are to be planted along the driveways.

FIGURE 10
BUSHFIRE MITIGATION MEASURES



Rev	Description	Date
A	Preliminary	04/01/2017
B	Update provisions	15/05/2017
C	Revised plan	11/04/2018
D	Subdivision design	14/05/2019



Recommendations

1. That dwellings be located so as to have a maximum BAL-29 rating.
2. That any application for a building permit for a dwelling is to include an individual BAL assessment to confirm that sufficient land has been cleared to provide for BAL-29 setbacks.

6.1.2 Element 2 Siting and Design of Development

A2.1 Asset Protection Zone (APZ)

An asset protection zone is a “low fuel zone” located around a building. The APZ is by default the distance between the building and the hazard vegetation provided that this is not less than a BAL-29 rating.

The requirements for the asset protection zone are as follows:

- a) Width: Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL-29) in all circumstances.
- b) Location: the APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity (see explanatory notes).
- c) Management: the APZ is managed in accordance with the following requirements:
 - Fences: within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.
 - Objects: within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.
 - Fine Fuel load: combustible dead vegetation matter less than 6 millimetres in thickness reduced to and maintained at an average of two tonnes per hectare.
 - Trees (> 5 metres in height): trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy.
 - Shrubs (0.5 metres to 5 metres in height): should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m² in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.
 - Ground covers (<0.5 metres in height): can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 millimetres in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.
 - Grass: should be managed to maintain a height of 100 millimetres or less.

Recommendations

3. That the vegetation within the BAL setback is to be maintained as an asset protection zone in accordance with the APZ specifications.

6.1.3 Element 3 Vehicular Access

A3.1 Two Access Routes

The subject land has access from two directions (south and west) from Padbury Road and also Slattery Way.

A3.2 Public Roads

The proposed subdivision roads will be designed in accordance with the standards specified in the Local Government Subdivisional Guidelines (4) which meet required specification for bushfire access.

A3.3 Cul – de-sacs

This is not applicable to the subdivision.

A3.4 Battle-Axes

There are two battle axe legs in the proposed subdivision for Lots 8 and 9. These are 68 and 50m long with a width of 10m which exceeds the minimum requirement in Table 6 of the Guidelines. The Guidelines indicated that battle axe legs should be avoided in bushfire prone areas as they do not provide two way access and can be potentially blocked by falling trees.

The possible alternative design solutions for Lots 8 and 9 would be to:

1. Reconfigure the design of Lots 7, 8, 9 and 10 re move the battle axe legs; or
2. Construct a public road across the northern boundary of these lots which would also remove the battle axe legs.

Option 1 is not viable due to the extent of the building exclusion, low lying areas on the southern portion of the lots.

Option 2 is not viable because:

- the road and associated road reserve, will result in the reduction of usable land for the construction of the dwelling, given the low lying nature of the land; and
- the road construction is not required for connectivity by the local government, given the close proximity of cross roads to the north and south of the site.

Further it is noted that there is an existing fire service access route along the southern boundary which already provides an east west access. Slattery Way extends south from the site connecting into Padbury Road less than 300 south of the site boundary. In summary there is already a highly connective road network and the provision of a further road to access two lots, which only have pasture, is difficult to justify.

A3.5 Private Driveways Longer than 50 metres

The driveways to proposed Lot 8, 8 and 9 will exceed 50m due to the length of the battle axe legs. The driveways for the other lots may exceed 50m in length depending upon

4 Institute of Public Works Engineering Australia WA Division Inc. (2009) Local Government Subdivisional Guidelines Perth

Lot 383 Padbury Road

where the dwelling is located. If it does, then it must comply with the following provisions:

- A minimum trafficable surface of 4m width;
- A horizontal clearance of 6m to vegetation;
- A maximum grade of 1:10;
- Curves with a minimum 8.5m inner radius;
- Passing bays every 200 metres with a minimum length of 20 metres and a minimum width of two metres (i.e. the combined width of the passing bay and constructed private driveway to be a minimum six metres);
- Turn-around areas designed to accommodate type 3.4 fire appliances and to enable them to turn around safely every 500 metres (i.e. kerb to kerb 17.5 metres) and within 50 metres of a house;
- Any bridges or culverts are able to support a minimum weight capacity of 15 tonnes; and
- An all-weather surface (i.e. compacted gravel, limestone or sealed).

A3.6 Emergency Access Ways (EAW)

This is not applicable to the subdivision.

A3.7 Fire Service Access Routes

This is not applicable to the subdivision.

A3.8 Firebreak Width

As all the proposed lots are greater than 0.5ha in area it is required to have a 3m wide boundary firebreak.

Recommendations

4. Any new driveway shall have a minimum 4m wide trafficable surface and any access gate shall be a minimum width of 3.6m.
5. Where a driveway is more than 50m in length a turnaround area suitable to a fire appliance shall be provided within proximity to the dwelling.
6. That all lots shall provide a minimum 3m wide boundary firebreak.

6.1.4 Element 4 Water

A4.1 Reticulated Areas

This is not applicable to the subdivision.

A4.2 Non-reticulated areas

A water tank with a hydrant or standpipe is required in non-reticulated areas. This is to have a minimum volume of 50,000L per 25 lots.

Council has instructed that the water tank is to be provided at the West Dardanup fire brigade station located on Garvey Road

A4.3 Non-reticulated areas - One Additional Lot

This is not applicable to the subdivision.

Recommendations

7. That the developer shall fund the provision of a 50,000L water tank and fittings at the West Dardanup fire station.
8. That any new dwelling shall provide with a static water supply tank having a minimum capacity of 10,000L specifically for firefighting with:
 - a) A 50mm male camlock couplings with full flow valves;
 - b) The fittings positioned at the base of the tank so that the total tank capacity is available for firefighting purposes at any time;
 - c) An adequate hard standing access must also be provided adjacent to such connection/s and must be readily identifiable; and
 - d) A nonelectric firefighting pump (normally 5.5hp) with sufficient hose to protect the dwelling and the surrounding low fuel zone.

6.2 Annual Property Maintenance

Annual property maintenance is an important preparation for the annual fire season. This should focus on the area around the proposed dwelling and the following maintenance works should be considered:

Autumn and Winter (May-August)

- Tree pruning and remove lower branches and check that power lines are clear.
- Clear long grass, leaves, twigs and flammable shrubs.
- Overhaul the emergency water pump, fixtures and hoses.

Spring (September-November)

- Prepare boundary firebreaks.
- Carry out maintenance of strategic firebreak.
- Reduce grass levels within the hazard separation and building protection zones.
- Prune the dead material from the shrubs in the building protection zone.
- Clean out gutters, remove debris from roof.

Early summer (December onwards)

- Re-check personal and home protection gear, screens, water supplies and gutters.
- Keep yards as free as possible from combustible materials, fuels and debris.
- Avoid storing any felled trees and rubbish on your property.
- Remove dead shrubs and avoid long grasses, bracken or neglected masses of tall quick-curing annuals.
- Prepare a bushfire survival plan.

Recommendations

9. That the landowners undertake regular maintenance of their property in preparation for the annual fire season.
10. That all fire mitigation measures shall be completed by the date prescribed in Council's Fire Prevention Order.

6.3 Staging

The proposed subdivision plan does not make any provision for the staging of the development. In the event that the subdivision is staged then it is necessary to ensure that appropriate interim measures are provided.

These may include:

- Interim access or emergency access ways;
- Creation of additional low fuel zones to ensure that the recommended BAL ratings can be applied; or
- The provision of boundary firebreaks especially on any balance lot.

Recommendations

11. In the event of any staging of the subdivision a plan and statement of the proposed interim fire management measures will be submitted and approved by the Shire as an adjunct to Figure 10.

6.4 Purchaser Advice

All prospective purchasers must be made aware of the fire management issues, measures and responsibilities associated with the subdivision. This can be a notification placed upon the Certificate of Title of all lots pursuant to Section 70A of the Transfer of Land Act advising landowners of this Bushfire Management Plan and BAL requirements.

Recommendations

12. A notification be included on the certificate of titles advising that the land is subject to a Bushfire Management Plan.
13. That prospective residents be provided with a summary of this Bushfire Management Plan.

6.5 Implementation

The management of the risk posed by bushfires is a shared responsibility between landowners, government and industry. While state and local government undertakes bushfire prevention measures (e.g. planned burning), land use planning and emergency response (fire suppression); land owners in bushfire prone areas must take the necessary steps to prepare their property. These responsibilities are summarised in Table 2.

Lot 383 Padbury Road

Table 2 Implementation

No	MANAGEMENT ACTION	TIMING
1.0 Developer Prior to Issue of Titles		
1.1	Construction of subdivision roads to standards outlined in the BMP to ensure safe access and egress.	Subdivision
1.2	Make arrangements with the Shire of Dardanup to supply a 50,000L static water supply tank at the West Dardanup bushfire brigade station.	Subdivision
1.3	Construction of the battle axe driveways.	Subdivision
1.4	Preparing a notification be included on the certificate of titles for the lots advising that the land is subject to a Bushfire Management Plan.	Subdivision
1.5	In the event of any staging of the subdivision a plan and statement of the proposed interim fire management measures will be submitted and approved by the Shire.	Subdivision
2.0 Developer Prior to Sale		
2.1	Providing prospective residents with a summary of this BMP	Sale
3.0 Landowner Prior to Occupancy		
3.1	Ensuring that any application for a building permit for a dwelling is to include an individual BAL assessment to confirm that sufficient land has been cleared to provide for BAL-29 setbacks.	Development
3.2	That the proposed dwellings provide with a static water supply tank having a minimum capacity of 10,000L specifically for firefighting with the associated fittings.	Development
3.3	Any new driveway shall have a minimum 4m wide trafficable surface and any access gate shall be a minimum width of 3.6m.	Development
3.4	Where a driveway is more than 50m in length a turnaround area suitable to a fire appliance shall be provided within proximity to the dwelling.	Development
4.0 Landowners Ongoing		
	That the vegetation within the BAL setback is to be maintained as an asset protection zone in accordance with the APZ specifications.	Annually before the fire season
	That all lots shall provide a minimum 3m wide boundary firebreak.	Annually before the fire season
4.1	Undertaking regular maintenance of their property in preparation for the annual fire season.	Annually before the fire season
4.2	Ensuring that all fire mitigation measures shall be completed by the date prescribed in Council's Fire Prevention Order.	Annually before the fire season
5.0 Local Government Ongoing Management		
5.1	Ensuring Building Permit Applications and Development Applications are compliant with the building and land use planning provisions	Ongoing
5.2	Enforce compliance with its annual Fire Prevention Order.	Ongoing

7.0 CONCLUSION

The subject land is located within a bushfire prone area where fires occur on a regular basis. These fires can pose a risk to life and property. The proposed development is introducing substantial values (property and people) which must be protected from the risk posed by the potential bushfire hazard.

The subject land has moderate bushfire hazard level due to the surrounding farming properties and associated cropping and pasture areas. This rating is also influenced by the extent of remnant vegetation scattered along the road reserves. Any proposed dwelling can be sited so as to ensure that there is a moderate hazard level reflected by having a maximum BAL-29 rating and most likely a BAL -12.5 rating.

The purpose of this Bushfire Management Plan is to minimise the impact of a bush fire to people residing on the proposed lots. It demonstrates that the proposed development complies with the criteria within State Planning Policy 3.7 and the Guidelines for Planning in Bushfire Prone Areas.

The proposed subdivision and development complies with the objectives of State Planning Policy 3.7 as:

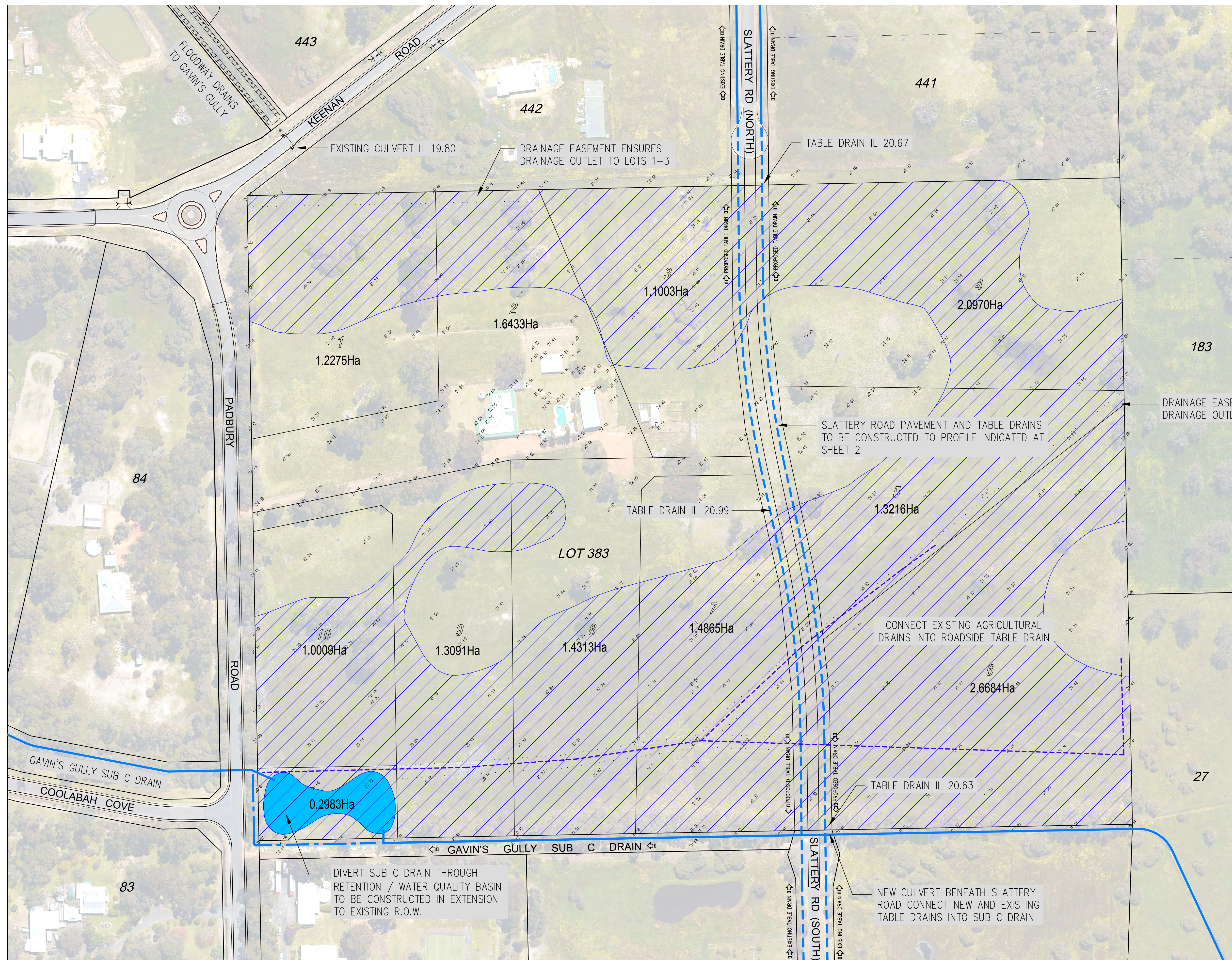
1. It avoids any increase in the threat of bushfire to people, property and infrastructure;
2. It reduces vulnerability to bushfire through the identification and consideration of bushfire risks in the design of the development and the decision-making process;
3. The design of the subdivision and the development take into account bushfire protection requirements and include specified bushfire protection measures; and
4. The subdivision achieves an appropriate balance between bushfire risk management measures and, biodiversity conservation values, environmental protection and biodiversity management and landscape amenity, with consideration of the potential impacts of climate change.

The recommendations in this report should not be construed to assure total bush fire protection and do not guarantee that a building will not be damaged in a bush fire. The severity of a bush fire will depend upon the vegetation fuel loadings; the prevailing weather conditions and the implementation of appropriate fire management measures.

8.0 REFERENCES

- Cheney P & Sullivan A (2008) *Grassfires – Fuel, Weather and Fire Behaviour*. CSIRO Publishing Collingwood
- DFES (2011) *Firebreak Location, Construction and Maintenance Guidelines*
- DFES (2012) *Prepare Act Survive* Perth DFES
- Ellis, S, Kanowski, P & Whelan, R (2004), *National Inquiry on Bushfire Mitigation and Management*, Canberra. Council of Australian Governments.
- Emergency Management Australia (2002) *Manual No 7 Planning Safer Communities – Land Use Planning for Natural Hazards* Commonwealth Attorney General's Department
- DFES (2010) *Planning for Bush Fire Protection*. Perth. Western Australian Planning Commission.
- DFES (2005) *Western Australian Emergency Risk Management Guide* FESA Perth
- DFES (2007) *Visual Fuel Load Guide*. Perth. Fire & Emergency Services Authority of Western Australia.
- DFES (undated) *Homeowner's Bush Fire Survival Manual*.
- Handmer J. & Haynes K. (Eds).(2008). *Community Bushfire Safety*. Collingwood CSIRO Publishing.
- Institute of Public Works Engineering Australia WA Division Inc. (2009) *Local Government Subdivisional Guidelines* Perth
- Keelty J (2011) *A Shared Responsibility – The Report of the Perth Hills Bushfire February 2011* Review Government Printer Perth
- Keelty M (2012) *Appreciating the Risk – Report of the Special Inquiry into the November 2011 Margaret River Bushfire* Government Printer Perth
- Leading Emergency Services (2011) *Major Incident Review, Lake Clifton, Roleystone and Red Hills Fires*
- Leonard J (2009) *Report to the 2009 Victorian Bushfires Royal Commission Building performance in Bushfires* CSIRO
- Middelmann, M. H. (Editor) (2007) *Natural Hazards in Australia: Identifying Risk Analysis Requirements*. Geoscience Australia, Canberra
- Ramsay C. & Rudolph L. (2006) *Landscape and Building Design for Bushfire Areas*. Collingwood CSIRO Publishing.
- Ramsay. GC & Dawkins D (1993) *SAA HB36-1993 Buildings in Bushfire Prone Areas – Information and Advice*. Sydney. Standards Australia International Ltd.
- Standards Australia (2009) *AS/NZS ISO 31000 Risk Management- Principles and Guidelines* Sydney. Standards Australia International Ltd.
- Standards Australia (2004) *AS/NZS 4360 Risk Management*. Sydney. Standards Australia International Ltd.
- Standards Australia (2009) *AS 3959 – Construction of Buildings in Bush Fire Prone Areas*. Sydney. Standards Australia International Ltd.
- State Emergency Management Committee (2013) *Westplan – State Emergency Management Plan for Fire* DFES Perth
- State Emergency Management Committee (2014) *State Emergency Management Policy 2.9 – Management of Emergency Risks* DFES Perth
- Victorian Bushfires Royal Commission (2010) *Final Report* Government Printer Melbourne
- Webster J (2012) *Essential Bushfire Safety Tips* CSIRO Publishing Collingwood

Stormwater Management Plan



- GAVIN'S GULLY SUB C DRAIN
Water Corporation
- ROAD SIDE TABLE DRAIN
Shire of Dardanup
- AGRICULTURAL DRAIN
Private Ownership
- BUILDING EXCLUSION AREAS
Areas susceptible to seasonal waterlogging and
inundation and unsuitable for development



UNIT 14 - 8 EDWARD STREET
BUNBURY WA 6230

PO BOX 1702
BUNBURY WA 6231

TELEPHONE 9792 4355
FACSIMILE 9792 4366
E-MAIL engineer@dv.net.au

MR TERRY PANTLIN

THIS DOCUMENT REMAINS THE PROPERTY OF
DIRK VAN NOORT

IT SHALL NOT BE USED OR COPIED WITHOUT PERMISSION

THE DOCUMENT REMAINS PRELIMINARY UNTIL ENDORSED "FOR CONSTRUCTION"

PROJECT No PAN03-A-17

SHEET REVISION LOCAL AUTHORITY SCALE DATUM

1 OF 2
3
SHIRE OF DARDANUP
1 : 1000 (@ A1)
AHD

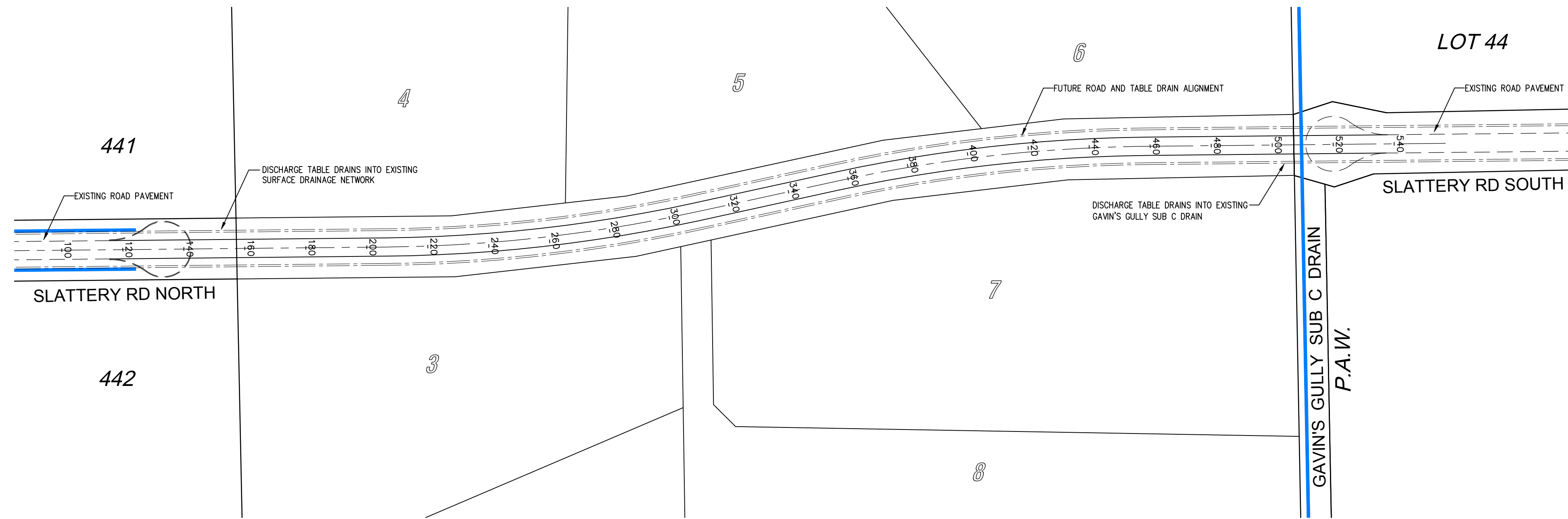
REVISION DATE	No	REVISION DESCRIPTION	DESIGN	DRAWN	CHECKED	APPROVED
24 FEBRUARY 2017	0	PRELIMINARY - NOT FOR CONSTRUCTION	DVN	DVN	DVN	
14 MARCH 2018	1	PRELIMINARY - NOT FOR CONSTRUCTION	DVN	DVN	DVN	
26 MARCH 2018	2	PRELIMINARY - NOT FOR CONSTRUCTION	DVN	DVN	DVN	
10 MAY 2019	3	LOT ARRANGEMENT AMENDED	DVN	DVN	DVN	

PROJECT

LOT 383 PADBURY ROAD DARDANUP

DRAWING TITLE

STORMWATER MANAGEMENT PLAN



STORMWATER OVERVIEW

EXISTING DRAINAGE ENVIRONMENT

THE SUBJECT LAND IS LOCATED WITHIN THE STORMWATER CATCHMENT OF GAVIN'S GULLY, PRESENTLY UNDER THE CONTROL OF THE WATER CORPORATION. GAVIN'S GULLY IS LOCATED APPROXIMATELY 500m TO THE NORTH, ALTHOUGH A SUB DRAIN (GAVIN'S GULLY SUB C) IS LOCATED ON THE SOUTHERN BOUNDARY OF THE PROPERTY. THE LAND IS PRESENTLY SERVICED VIA A SERIES OF SHALLOW AGRICULTURAL DRAINS INTENDED TO RELIEVE THE AGRICULTURAL LAND FROM LONG-TERM INUNDATION. A SMALL RIDGE RUNNING EAST - WEST AND LOCATED CENTRALLY ACROSS THE PROPERTY DIVIDES THE SITE INTO TWO SUB CATCHMENTS. NORTH OF THE RIDGE, STORMWATER MIGRATES THROUGH THE RECENTLY CONSTRUCTED SUBDIVISION DRAINS ALONG KEENAN ROAD AND SUMMERHILL DRIVE, BEING RETAINED IN A RECENTLY CONSTRUCTED DETENTION BASIN PRIOR TO ENTRY INTO GAVIN'S GULLY. SOUTH OF THE RIDGE, RUN-OFF ENTERS THE GAVIN'S GULLY SUB C DRAIN, WHICH DISCHARGES DIRECTLY TO GAVIN'S GULLY APPROXIMATELY 1.8km TO THE NORTH WEST.

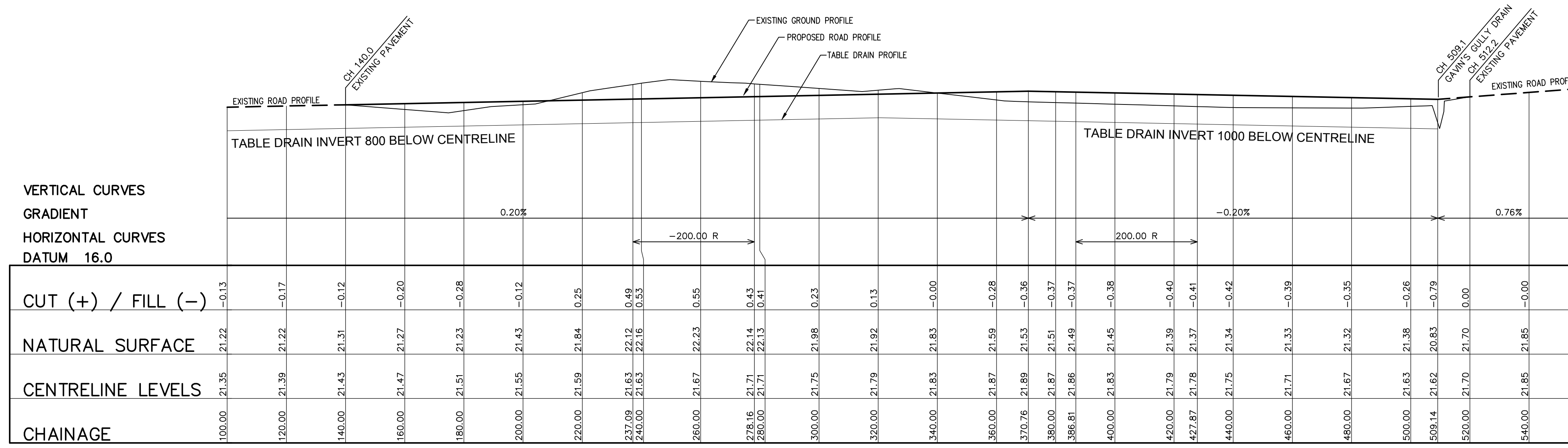
PROPOSED DEVELOPMENT

THE PROPOSED DEVELOPMENT INCLUDES CONSTRUCTION OF SLATTERY ROAD BETWEEN BE BUILT PORTIONS OF THIS ROAD TO THE NORTH AND SOUTH. CREATION OF THE NEW RESIDENTIAL PROPERTIES AND CHANGES IN THE LAND USE FROM AGRICULTURE TO RESIDENTIAL MAY CREATE ARTIFICIAL RESTRICTION TO THE "OVERLAND" FLOW OF STORMWATER WITHIN THE CATCHMENT, PARTICULARLY ACROSS NEW PROPERTY BOUNDARIES. IN ORDER TO ENSURE ONGOING DRAINAGE ROUTES THROUGH THE CATCHMENT IT IS INTENDED THAT EASEMENTS BE CREATED AT STRATEGIC LOCATIONS FOR THE PURPOSE OF PROVIDING A DRAINAGE OUTLET NOT ONLY TO NEIGHBOURING UPSTREAM PROPERTIES, BUT ALSO WITHIN THE PROPOSED SUBDIVISION.

CONSTRUCTION OF NEW ROADSIDE TABLE DRAINS WITHIN THE SUBDIVISION INCREASES THE EFFICIENCY OF THE DRAINAGE NETWORK, RESULTING IN AN INCREASE IN THE SPEED AT WHICH RUN-OFF ENTERS THE DOWNSTREAM WATERCOURSE, NAMELY GAVIN'S GULLY. GAVIN'S GULLY HAVING BEEN CONSTRUCTED TO SERVICE AGRICULTURAL LAND WITH A RELATIVELY SLOW RATE OF STORMWATER ENTRY LACKS THE CAPACITY TO ACCEPT THE HIGHER RATES OF STORMWATER RUN-OFF RESULTING FROM URBAN DEVELOPMENT. CONSEQUENTLY, IT IS NECESSARY TO PROVIDE DETENTION CAPACITY WITHIN THE NETWORK IN ORDER TO CONTROL THE OUTFLOW RATES TO THAT WHICH OCCURRED PRIOR TO DEVELOPMENT. IT IS PROPOSED THAT THIS BE ACHIEVED BY CONSTRUCTION OF A DETENTION BASIN IN THE SOUTH-WESTERN CORNER OF THE PROPERTY WHERE THE FLOW CAN BE CONTROLLED BY OUTLET STRUCTURES.

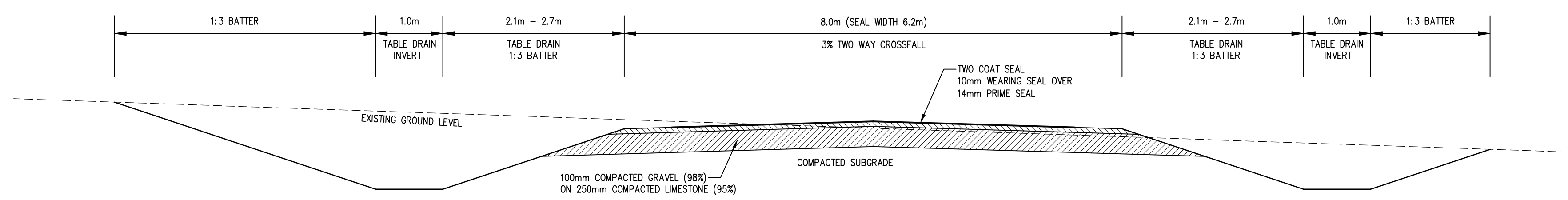
STORMWATER MANAGEMENT

ULTIMATELY, CONTROL OF STORMWATER WITHIN THE CATCHMENT IS DETERMINED BY THE CAPACITY OF GAVIN'S GULLY. THE 1:100 YEAR FLOOD LEVEL AT THE POINT WHERE THE SUB C DRAIN ENTERS THE MAIN GULLY IS ESTIMATED AT 18.6m AHD. GROUND LEVELS AT THE SUBJECT SITE VARY FROM 20.1m TO 22.7. INDICATING THAT ALTHOUGH LOWER AREAS TO THE PERIMETER OF THE SUBDIVISION SITE MAY BECOME INUNDATED DURING A MAJOR STORM EVENT, VERTICAL RELIEF WITHIN THE SITE PROVIDES PROTECTION TO FUTURE RESIDENTIAL DEVELOPMENT FROM POTENTIAL FLOODING.



SLATTERY ROAD - LONGITUDINAL SECTION

6.2m TWO COAT BITUMEN SEAL
 SCALES: HORIZONTAL 1:1000
 VERTICAL 1:100



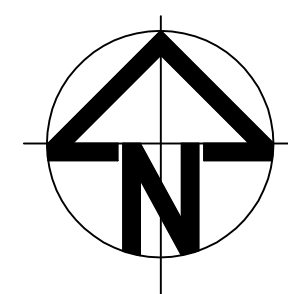
TYPICAL ROAD PAVEMENT CROSS SECTION
 TWO COAT BITUMEN SEAL & TABLE DRAIN
 SCALE 1:50



UNIT 14 - 8 EDWARD STREET
 BUNBURY WA 6230
 PO BOX 1702
 BUNBURY WA 6231
 TELEPHONE 9792 4355
 FACSIMILE 9792 4366
 E-MAIL engineer@dmv.net.au

MR TERRY PANTLIN
 THIS DOCUMENT REMAINS THE PROPERTY OF DIRK VAN NOORT
 IT SHALL NOT BE USED OR COPIED WITHOUT PERMISSION
 THE DOCUMENT REMAINS PRELIMINARY UNTIL ENDORSED "FOR CONSTRUCTION"

PROJECT No PAN03-A-17
 SHEET 2 OF 2
 REVISION 3
 LOCAL AUTHORITY SHIRE OF DARDANUP
 SCALE 1 : 1000 (@ A1)
 DATUM AHD



REVISION DATE	No	REVISION DESCRIPTION	DESIGN	DRAWN	CHECKED	APPROVED
24 FEBRUARY 2017	0	PRELIMINARY - NOT FOR CONSTRUCTION	DWN	DWN	DWN	
14 MARCH 2018	1	PRELIMINARY - NOT FOR CONSTRUCTION	DWN	DWN	DWN	
26 MARCH 2018	2	PRELIMINARY - NOT FOR CONSTRUCTION	DWN	DWN	DWN	
10 MAY 2019	3	LOT ARRANGEMENT AMENDED	DWN	DWN	DWN	

PROJECT	LOT 383 PADBURY ROAD DARDANUP
DRAWING TITLE	STORMWATER MANAGEMENT PLAN