Bushfire management plan/Statement addressing the Bushfire Protection Criteria coversheet

Site address: Pt Lots 556, 557 and 3016 Burrup Road, Burrup

Site visit: Yes ☑ No ☐

Date of site visit (if applicable): Day 14th Month January Year 2022

Report author or reviewer: Ian Macleod

WA BPAD accreditation level (please circle):

Not accredited ☐ Level 1 BAL assessor ☐ Level 2 practitioner ☑ Level 3 practitioner ☐

If accredited please provide the following.

BPAD accreditation number: 39131 Accreditation expiry: Month November Year 2022

Bushfire management plan version number: v1.0

Bushfire management plan date: Day 11th Month February Year 2022

Client/business name: Clough Group

	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)?		✔
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 bushfire protection criteria elements)?	✔	

Is the proposal any of the following (see SPP 3.7 for definitions)?	Yes	No
Unavoidable development (in BAL-40 or BAL-FZ)		✔
Strategic planning proposal (including rezoning applications)		✔
High risk land-use	✔	
Vulnerable land-use		✔

None of the above ☐

Note: Only if one (or more) of the above answers in the tables is yes should the decision maker (e.g. local government or the WAPC) refer the proposal to DFES for comment.

Why has it been given one of the above listed classifications (E.g. Considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

The proposed development has one compliant access/egress route, and the site is considered a high risk land use.

The information provided within this bushfire management plan to the best of my knowledge is true and correct:

Signature of report author or reviewer 

Date 11th February 2022

Bushfire Management Plan

Perdaman Urea Project

Pt Lot 3016 on Plan 42282
Pt Lots 556 & 557 on Plan 406755
Burrup Road, Burrup

City of Karratha

Planning Stage:	Development Application
Planning Development Type:	Construction of a Class 4 - 9 Buildings
Bushfire Policy – Specific Development or Use Type:	High Risk Land Use

Job Number:	211130
Assessment Date:	14 January 2022
Report Date:	11 February 2022

BPP Group Pty Ltd t/a Bushfire Prone Planning
ACN: 39 166 551 784 | ABN: 39 166 551 784

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Guildford WA 6935

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DOCUMENT CONTROL

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Author:	Ian Macleod (BPAD Level 2 - No. 39131)	
Co-Author:	Select.	
Review/Authorise:	Kathy Nastov (BPAD Level 3 - No. 27794)	

VERSION HISTORY		
Version	**Version Details**	**Date**
1.0	Original Document Issue	11 February 2022
-		

BMP (Standard DA-Non-Tourism) Template v8.5

DISTRIBUTION				
Destination	**Version**	**No. Copies**	**Hard Copy**	**Electronic Copy**
Person/Business: Steve Gibbs/Clough Group **Email: Steve.Gibbs@cloughgroup.com**	1.0		☐	☒
Person/Business: **Email:**			☐	☐

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EXECUTIVE SUMMARY

This Bushfire Management Plan (BMP) is to accompany a development application for the proposed Perdaman Urea Plant, which is to be located within the Burrup Strategic Industrial Area on the Burrup Peninsula.

The BMP will address project Site C which is the location of the proposed urea plant, and project Site F where the administration, maintenance, storage and warehousing facilities associated with the operation of the plant will be located.

Sites C and F are separated by a low lying saline flat. A vehicular causeway will be constructed across the flatland to connect the two sites.

The assessments and bushfire protection measures detailed in the BMP, assume that environmental approval will be achieved or clearing permit exemptions will apply. It is advised that the proponent seek further advice from an Environmental Consultant or the WA Department of Biodiversity Conservation and Attractions for further information on the condition and species contained within the proposed development area and the requirement for referral of the proposal.

The proposed development site will be cleared of vegetation during the construction phase. The western portion of Site F will be cleared to accommodate laydown and storage areas during the construction phase. Once construction is complete, these areas are expected to return to their natural vegetative state.

The proposed development of Sites C and F will be contained within the boundaries of the subject lots. A vehicular causeway will cross a low lying saline wetland to join the 2 sites. The causeway will have multiple culverts to allow continued flow of water via drainage or tidal action.

The proposed development will provide an area of land within each lot that can be considered suitable for development as BAL-40 or BAL-FZ construction standards will not be required to be applied. This meets the requirements established by the Acceptable Solutions Element 1.

Future buildings on the lot(s) of the proposed development can be surrounded by an APZ that will ensure the potential radiant heat impact of a bushfire does not exceed 29 kW/m2 (BAL-29). The required APZ specifications of width, location and management can be achieved.

Asset protection zones can be contained solely within the boundaries of each lot. Onsite vegetation will be required to be removed, the authority for which may need to be received from the local government and/or other relevant authority. Retained vegetation within the APZ will be managed in accordance with the technical requirements established by the Schedule 1: 'Standards for Asset Protection Zones (Guidelines). This meets the requirements established by the Acceptable Solutions Element 2.

The proposed development will be serviced by the existing Burrup Road, and a new public road is to be constructed by Main Roads Western Australia to replace a portion of the existing Hearson Cove Road. Both roads are/will be compliant with the relevant construction standards.

Burrup Road is a no through road that leads into the Burrup Peninsula. Due to the unique nature of the peninsular landform, and the rugged topography, a secondary access route in a different direction to a different destination is unable to be provided for this proposed development. A performance assessment is provided in Section 5.4 of this BMP.

All private driveways in the site will comply with or exceed the technical requirements for private driveways. The driveways are generally 8 metres wide, therefore passing bays will not be required. Turnaround areas are located throughout the site and will comply with the technical requirements.

An existing water line runs along Burrup Road which will be connected to for supply to the sites. A fire water system is to be installed for the proposed development. Hydrants will be placed throughout the site in compliance with Australian standards, and the requirements of any other relevant authority. Additionally, two fire fighting water tanks will be installed in Site C.

Buildings of Class 4 to Class 9 are not required by the Building Code of Australia (BCA) to be constructed to comply with bushfire performance requirements. However, the Administration Building and the Control Room building are to be adopted as safer onsite locations in the event of a bushfire. These two buildings should be constructed to a BAL rating of BAL-29 as a minimum. The 2 buildings will not be affected by flame contact or high levels of radiant heat flux.

This project is considered a 'high risk land use' with respect to SPP 3.7and a Bushfire Risk Assessment Report has been developed for the site. The development must comply with the requirements of this Report.

1 PROPOSAL DETAILS

1.1 Description and Associated Plans and Maps

Proponent:	Clough Group
Bushfire Prone Planning Commissioned to Produce the Bushfire Management Plan (BMP) By:	Clough Group
For Submission To:	City of Karratha
Purpose of the BMP:	To accompany a planning application
'Development' Site Total Area:	Approximately 65 hectares
Description of the Proposed Development/Use:	
This Bushfire Management Plan (BMP) is to accompany a development application for the proposed Perdaman Urea Plant. The plant is to be located within the Burrup Strategic Industrial Area on the Burrup Peninsula. The BMP will address project Site C which is the location of the proposed urea plant, and project Site F where the administration, maintenance, storage and warehousing facilities associated with the operation of the plant will be located. Sites C and F are separated by a low lying saline flat. A vehicular causeway will be constructed across the flatland to connect the two sites.	

Figure 1.1

Perdaman Urea Plant Layout Map -Site C

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

Water Treatment
Seawater Cooling Tower
Storage Building
Urea Unit 1
BURRUP
Ammonia Unit
Closed Cooling Water System
Urea Unit 2
Storage Substation
Power Generation Unit
Air Separation Unit
Control Room
Gate House
BURRUP RD
HEARSON COVE RD

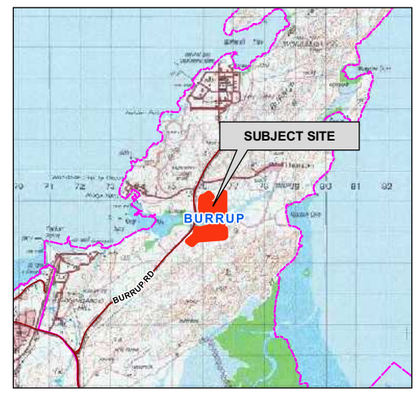
------ LEGEND ------

- Flare
- Tanks
- Fire Water Tank
- Structures
- Driveways
- Ponds
- Clearing Area
- Subject Site
- Cadastre

0 50 100 150 200 250

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 01-02-2022
SCALE (A3): 1 : 4000

BUSHFIRE PRONE PLANNING

Figure 1.2

Perdaman Urea Plant Layout Map -Site F

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

BURRUP RD
HEARSON COVE RD
BURRUP
Laboratory
Maintenance
Administration
Warehouse
Chemical Storage

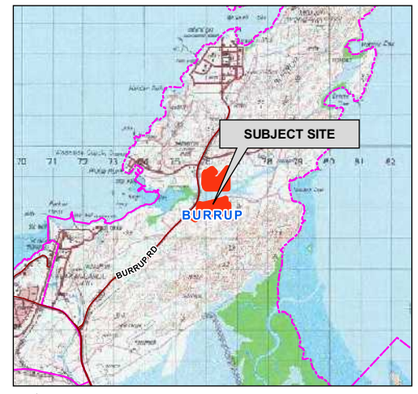
------ LEGEND ------

- Structures
- Driveways
- Ponds
- Clearing Area
- Subject Site
- Cadastre

0 50 100 150 200 250

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

N

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 01-02-2022
SCALE (A3): 1 : 4000

Figure 1.3

Perdaman Urea Plant
Bushfire Prone Areas Map

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

DAMPIER ARCHIPELAGO
BURRUP RD
VILLAGE RD
MOF RD
KING BAY RD
HEARSON COVE RD
BURRUP
THE ESPLANADE
PARKER POINT RD
DAMPIER VFRS
DAMPIER
DAMPIER RD
DAMPIER RD

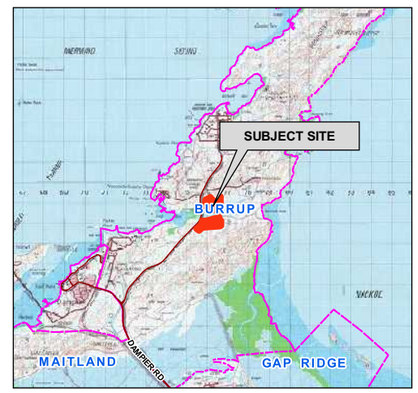
------ LEGEND ------

- Hydrant
- DFES Station
- Bush Fire Prone Areas 2021
- Subject Site
- Locality
- Rivers & Creeklines
- Cadastre

0 500 1,000 1,500 2,000 2,500

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 26-01-2022
SCALE (A3): 1 : 40000

BUSHFIRE PRONE PLANNING

1.2 The Specific 'Land Use' and the Bushfire Planning Requirements

SPP 3.7, the associated Guidelines and Position Statements, define certain land uses that require additional and/or alternative bushfire related assessment and additional information to be provided. This is necessary to facilitate planning application assessment and for subsequent operational use.

When such a proposal is unable to fully achieve the implementation of all required bushfire protection measures - as established by the 'acceptable solutions' contained in the Guidelines and Position Statements – further assessments and the development of additional protection measures are required.

The land use classification that applies to the proposal is identified in Table 1.2, along with the required additional assessments and information and the form and location in which this is provided.

Table 1.2: The determined land use and assessment/information requirements.

THE PROPOSED LAND USE CLASSIFICATION AND BUSHFIRE PLANNING REQUIREMENTS		
Assessment / Information / Documents Detail		
The proposed land use classification is determined to be:		High Risk
Category, type and/or operations of the land use that have determined the classification:		Combustible (flammable) materials (including hazardous materials) stored onsite
The Policies, Guidelines and Position Statements against which the proposed land use will be assessed, and which guide the information to be provided.[1]	SPP 3.7	☒
	Guidelines including the BPC	☒
The documents and the information developed and the format and location in which they are provided.	Bushfire Management Plan (BMP)	☒ Separate Document
	Risk Management Plan (RMP)	☒ Separate Document
	Additional bushfire protection measures	☒ In BMP s5.5
Note [1]: State Planning Policy 3.7 Planning in Bushfire Prone Areas; Guidelines for Planning in Bushfire Prone Areas WAPC 2021 v1.4;		

1.3 Existing Documentation Relevant to the Construction of this Plan

This section acknowledges any known reports or plans that have been prepared for previous planning stages, that refer to the subject area and that may or will impact upon the assessment of bushfire risk and/or the implementation of bushfire protection measures and will be referenced in this Bushfire Management Plan.

Table 2.1: Existing relevant documentation.

RELEVANT EXISTING DOCUMENTS		
Existing Document	Copy Provided by Client	Title
Structure Plan	N/A	
Environmental Report	No	
Landscaping (Revegetation) Plan	No	
Bushfire Risk Assessments	No	

2 ENVIRONMENTAL CONSIDERATIONS

2.1 Native Vegetation – Restrictions to Modification and/or Clearing

Many bushfire prone areas also have high biodiversity values. SPP 3.7 policy objective 5.4 recognises the need to consider bushfire risk management measures alongside environmental, biodiversity and conservation values (Guidelines s2.3).

There is a requirement to identify any need for onsite modification and/or clearing of native vegetation and whether this may trigger potential environmental impact/referral requirements under State and Federal environmental legislation. Confirmation that any proposed native vegetation modification and/or clearing is acceptable, should be received from the relevant agencies by the proponent and provided to the bushfire consultant for inclusion in the Bushfire Management Plan if it will influence the required bushfire planning assessments and outcomes. The following table details any potential environmental restrictions of which the author of this report is aware.

Table 2.2: Native vegetation and potential environmental considerations and restrictions.

NATIVE VEGETATION MODIFICATION / CLEARING - POTENTIAL ENVIRONMENTAL RESTRICTIONS IDENTIFIED				
Environmental Considerations / Features	Potential Mapping Data Source (SLIP / Local Planning)	Relevant to Proposed Development	Data Applied	Action Required
Onsite clearing of native vegetation is required.		Yes		
Environmental impact/referral requirements under State and Federal environmental legislation may be triggered.		Yes		
National Park / Nature Reserve	DBCA-011	No- Confirmed by Bushfire Consultant	Relevant Database Reviewed by Bushfire Consultant	None
Conservation Covenant	DPIRD-023	Not Known	Data Not Readily Available to Bushfire Consultant	Proponent to Seek Advice
Bush Forever Site	DPLH-019	No- Confirmed by Bushfire Consultant	Relevant Database Reviewed by Bushfire Consultant	None
RAMSAR Wetland	DBCA-010	Possible	Data Not Readily Available to Bushfire Consultant	Proponent to Seek Advice
Geomorphic and Other Wetland	DBCA-011-019, 040, 043, 044	Not Known	Data Not Readily Available to Bushfire Consultant	Proponent to Seek Advice
Threatened and Priority Ecological Communities (TECs or PECs)	DBCA-038	Not Known	Data Not Readily Available to Bushfire Consultant	Proponent to Seek Advice
Threatened and Priority Flora including Declared Rare Flora (DRFs)	DBCA-036	Not Known	Data Not Readily Available to Bushfire Consultant	Proponent to Seek Advice
Land Identified as significant through a Local Biodiversity Strategy	Local Government	Not Known	Data Not Readily Available to Bushfire Consultant	Proponent to Seek Advice

Statement of how the identified environmental feature(s) is dealt with in this Bushfire Management Plan (and the location of relevant information):

The assessments and bushfire protection measures detailed in the BMP, assume that environmental approval will be achieved or clearing permit exemptions will apply.

It is advised that the proponent seek further advice from an Environmental Consultant or the WA Department of Biodiversity Conservation and Attractions for further information on the condition and species contained within the proposed development area and the requirement for referral of the proposal.

Development Design Considerations

Establishing development in bushfire prone areas can adversely affect the retention of native vegetation through clearing associated with the creation of lots and/or asset protection zones. Where loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, it will be necessary to consider available design options to minimise the removal of native vegetation.

Table 2.3: Development design.

MINIMISE THE REMOVAL OF NATIVE VEGETATION	
Design Option	Assessment / Action
Reduction of lot yield	N/A
Cluster development	N/A
Construct building to a standard corresponding to a higher BAL as per BCA (AS 3959:2018 and/or NASH Standard)	N/A
Modify the development location	N/A
The proposed development site will be cleared of vegetation during the construction phase. The western portion of Site F will be cleared to accommodate laydown and storage areas during the construction phase. Once construction is complete, these areas are expected to return to their natural vegetative state.	
IMPACT ON ADJOINING LAND	
Is this planning proposal able to implement the required bushfire protection measures within the boundaries of the land being developed so as not to impact on the bushfire and environmental management of neighbouring reserves, properties or conservation covenants?	Yes
The proposed development of Sites C and F will be contained within the boundaries of the subject lots. A vehicular causeway will cross a low lying saline wetland to join the 2 sites. The causeway will have multiple culverts to allow continued flow of water via drainage or tidal action.	

2.2 Retained Vegetation / Re-vegetation / Landscape Plans (including POS)

Riparian zones, wetland/foreshore buffers, road verges and public open space may have plans to re-vegetate or retain vegetation as part of the proposed development. Vegetation corridors may be created between offsite and onsite vegetation and provide a route for fire to enter a development area.

All retained/planned vegetation and its management will be considered in the development of this Bushfire Management Plan.

Is re-vegetation of riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	No
N/A	
Is the requirement for ongoing maintenance of existing vegetation in riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	No
N/A	
Has a landscape plan been developed for the proposed development?	No
N/A	

3 POTENTIAL BUSHFIRE IMPACT ASSESSMENT

3.1 Assessment Input

3.1.1 Fire Danger Index (FDI) Applied

AS 3959:2018 Table 2.1 specifies the fire danger index values to apply for different regions. The values used in the model calculations are for the Forest Fire Danger Index (FFDI) and for which equivalent representative values of the Grassland Fire Danger Index (GFDI) are applied as per Appendix B. The values can be modified if appropriately justified.

Table 3.1: Applied FDI Value

FDI VALUE			
Vegetation Areas	As per AS 3959:2018 Table 2.1	As per DFES for the Location	Value Applied
All Vegetation Areas	80	N/A	80

3.1.2 Vegetation Classification and Effective Slope

Classification: Bushfire prone vegetation identification and classification has been conducted in accordance with AS 3959:2018 s2.2.3 and the Visual Guide for Bushfire Risk Assessment in WA (DoP February 2016).

When more than one vegetation type is present, each type is identified separately, and the applied classification considers the potential bushfire intensity and behaviour from the vegetation types present and ensures the worst case scenario is accounted for – this may not be from the predominant vegetation type.

The vegetation structure has been assessed as it will be in its mature state (rather than what might be observed on the day). Areas of modified vegetation are assessed as they will be in their natural unmodified state (unless maintained in a permanently low threat, minimal fuel condition, satisfying AS 3959:2018 s2.2.3.2(f) and asset protection zone standards). Vegetation destroyed or damaged by a bushfire or other natural disaster has been assessed on its revegetated mature state.

Effective Slope: Refers to the ground slope under each area of classified vegetation and is described in the direction relative to the view from the building or proposed development site. Effective slope is not the same as 'average slope', rather it is the slope which most significantly influences fire behaviour. This slope has a direct and significant influence on a bushfire's rate of spread and intensity.

Where there is a significant change in effective slope under an area of classified vegetation, that will cause a change in fire behaviour, separate vegetation areas will be identified to enable the correct assessment.

When the effective slope, under a given area of bushfire prone vegetation, will be different relative to multiple proposed development sites, then the effective slopes corresponding to the different locations, are separately identified.

Table 3.2: Vegetation classification and effective slope.

ALL VEGETATION WITHIN 150 METRES OF THE PROPOSED DEVELOPMENT				
Vegetation Area	Identified Vegetation Types [1] or Description if 'Excluded'	Applied Vegetation Classification [1]	Effective Slope (degrees)[2] (AS 3959:2018 Method 1)	
			Assessed	Applied Range
1	Hummock grassland G-20 Open tussock G-23	Class G Grassland	>5-10	downslope >5-10
2	Open scrub D-14	Class D Scrub	>0-5	downslope >0-5
3	Hummock grassland G-20 Open tussock G-23	Class G Grassland	>0-5	downslope >0-5
4	Hummock grassland G-20 Open tussock G-23	Class G Grassland	0	upslope or flat
5	No vegetation or low bushfire threat vegetation	Excluded as per Section 2.2.3.2 (e) & (f)	N/A	N/A
6	Hummock grassland G-20 Open tussock G-23	Class G Grassland	>0-5	downslope >0-5
7	Open scrub D-14	Class D Scrub	>0-5	downslope >0-5
8	Hummock grassland G-20 Open tussock G-23	Class G Grassland	>5-10	downslope >5-10
9	Hummock grassland G-20 Open tussock G-23	Class G Grassland	0	upslope or flat
10	No vegetation or low bushfire threat vegetation	Excluded as per Section 2.2.3.2 (e) & (f)	N/A	N/A
Representative photos of each vegetation area, descriptions and classification justification, are presented on the following pages. The areas of classified vegetation are defined, and the photo locations identified on Figure 3.1, the vegetation and topography map.				
Note[1]: Described and classified as per AS 3959:2018 Table 2.3 and Figures 2.3 and 2.4 (A)-(H) Note[2]: Effective slope measured as per AS 3959:2018 Section 2.2.5 and Appendix B Part B4				

VEGETATION AREA 1		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional spindly scrub, undulating rocky terrain.	

Photo ID: 1a

Photo ID: 1b

Photo ID: 1c

Photo ID: 1d

Photo ID: 1e

Photo ID: 1f

VEGETATION AREA 1		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional spindly scrub, undulating rocky terrain.	

Photo ID: 1g

Photo ID: 1h

Photo ID: 1i

VEGETATION AREA 2	
AS 3959:2018 Vegetation Classification Applied:	Class D Scrub
Vegetation Types Present:	Open scrub D-14
Description/Justification:	Scrub 2 to 3 metres tall, sparse in areas, spinifex and buffel grass understorey.

Photo ID: 2a

Photo ID: 2b

Photo ID: 2c

Photo ID: 2d

VEGETATION AREA 3		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional spindly scrub, rocky terrain.	

Photo ID: 3a

Photo ID: 3b

Photo ID: 3c

Photo ID: 3d

VEGETATION AREA 4		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional scrub, undulating rocky terrain.	

Photo ID: 4a

Photo ID: 4b

Photo ID: 4c

Photo ID: d

Photo ID: 4e

VEGETATION AREA 5	
AS 3959:2018 Vegetation Classification Applied:	Excluded as per Section 2.2.3.2 (e) & (f)
Vegetation Types Present:	Unvegetated or low bushfire threat vegetation.
Description/Justification:	Photos 5a &5b: Cleared and managed development sites. Photos 5c & 5d: Rocky outcrops with little or no vegetation (background). Photos 5e & 5f: Saline wetland.

Photo ID: 5a

Photo ID: 5b

Photo ID: 5c

Photo ID: 5d

Photo ID: 5e

Photo ID: 5f

VEGETATION AREA 5		
AS 3959:2018 Vegetation Classification Applied:	Excluded as per Section 2.2.3.2 (e) & (f)	
Vegetation Types Present:	Unvegetated or low bushfire threat vegetation.	
Description/Justification:	Saline wetland.	

Photo ID: 5g

Photo ID: 5h

VEGETATION AREA 6		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional spindly scrub, rocky terrain.	

Photo ID: 6a

Photo ID: 6b

VEGETATION AREA 6		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional spindly scrub, rocky terrain.	

Photo ID: 6c

Photo ID: 6d

Photo ID: 6e

Photo ID: 6f

VEGETATION AREA 7	
AS 3959:2018 Vegetation Classification Applied:	Class D Scrub
Vegetation Types Present:	Open scrub D-14
Description/Justification:	Scrub 2 to 3 metres tall, sparse in areas, spinifex and buffel grass understorey.

Photo ID: 7a

Photo ID: 7b

Photo ID: 7c

Photo ID: 7d

Photo ID: 7e

Photo ID: 7f

VEGETATION AREA 7	
AS 3959:2018 Vegetation Classification Applied:	Class D Scrub
Vegetation Types Present:	Open scrub D-14
Description/Justification:	Scrub 2 to 3 metres tall, sparse in areas, spinifex and buffel grass understorey.

Photo ID: 7g

Photo ID: 7h

Photo ID: 7i

VEGETATION AREA 8		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional scrub, undulating rocky terrain.	

Photo ID: 8a

Photo ID: 8b

Photo ID: 8c

Photo ID: 8d

Photo ID: 8e

Photo ID: 8f

VEGETATION AREA 8		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional scrub, undulating rocky terrain.	

Photo ID: 8a

VEGETATION AREA 9		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional scrub, undulating rocky terrain.	

Photo ID: 9a

Photo ID: 9b

VEGETATION AREA 9		
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland	
Vegetation Types Present:	Hummock grassland G-20	Open tussock G-23
Description/Justification:	Spinifex, buffel grass, occasional scrub, undulating rocky terrain.	

Photo ID: 9c

Photo ID: 9d

Photo ID: 9e

VEGETATION AREA 10	
AS 3959:2018 Vegetation Classification Applied:	Excluded as per Section 2.2.3.2 (f) Low Threat Vegetation
Vegetation Types Present:	Low Bushfire Threat Vegetation
Description/Justification:	Photo 10a: Saline wetland, sparse low saltbush. Photo 10b: (right side of photo) Saline wetland, sparse low saltbush. Photos 10c & 10d: (background) Rocky outcrops with little or no vegetation.

Photo ID: 10a

Photo ID: 10b

Photo ID: 10c

Photo ID: 10d

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
1	G	Grassland	>5-10
2	D	Scrub	>0-5
3	G	Grassland	>0-5
4	G	Grassland	0
5	Ex	Exempt	

KING BAY RD

BURRUP RD

AREA 5

Area 1

Area 2

Area 3

Area 4

1a 1b 1c 1d 1e 1f 1g 1h 1i

2a 2b 2c 2d

3a 3b 3c 3d

4a 4b 4c 4d 4e

5a 5b 5c 5d 5e 5f 5g 5h

Figure 3.1

Perdaman Urea Plant - Site C Existing Topography & Classified Vegetation

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

------ LEGEND ------

Photos

Subject Site

Classified Vegetation

Class D - Scrub

Class G - Grassland

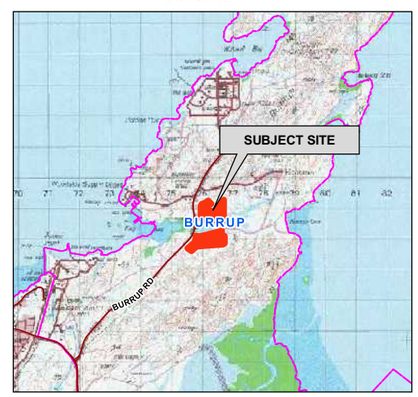
Exclusion 2.2.3.2

Cadastre

0 50 100 150 200 250

Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 09-02-2022
SCALE (A3): 1 : 4000

Figure 3.2

Perdaman Urea Plant - Site F Existing Topography & Classified Vegetation

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

HEARSON COVE RD
BURRUP RD
AREA 10
Area 6
Area 7
Area 8
Area 9

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
6	G	Grassland	>0-5
7	D	Scrub	>0-5
8	G	Grassland	>5-10
9	G	Grassland	0
10	Ex	Exempt	

------ LEGEND ------

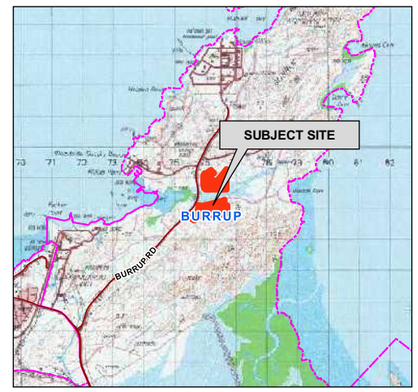
Photos
Subject Site

Classified Vegetation

Class D - Scrub
Class G - Grassland
Exclusion 2.2.3.2
Cadastre

0 50 100 150 200 250 300
Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 09-02-2022
SCALE (A3): 1 : 5000

3.1.3 Vegetation Separation Distance

The vegetation separation distance is the horizontal distance measured from the relevant parts of an existing building or a future building's planned location (within a lot), to the determined edge of an area of classified vegetation.

This separation distance applied to determining a Bushfire Attack Level (BAL) can be either:

- The *measured distance* – for which the location of the building relative to the edge of classified vegetation must be known. This will result in single determined BAL that will apply to a building. (The measured distance is a required calculation input); or
- A *calculated minimum and maximum distance (range)* that will correspond to each individual BAL. The calculated distances provide an indicative (or achievable) BAL for which the determined BAL will be dependent on the known location of the building relative to the edge of classified vegetation.

  The calculated range of distances corresponding to each BAL can be presented in different formats (tables or a BAL contour map), dependent on the form of information that is most appropriate for the proposed development/use. These distance ranges corresponding to BAL(s) will be presented in Section 3.2: 'Assessment Output".

For the proposed development/use, the applicable vegetation separation distances will be presented within the Bushfire Management Plan in this location:	In Section 3.2 'Assessment Output' as a table containing the calculated ranges of distance corresponding to each BAL and illustrated as a BAL Contour Map.

3.2 Assessment Output

UNDERSTANDING THE RESULTS OF THE BUSHFIRE IMPACT ASSESSMENT

Bushfire Attack Levels (BALs) – Their Application in the Building Environment is Different to the Planning Environment

In the building environment, a ***determined BAL*** is required for the proposed construction at the building application stage. This is to inform approval considerations and establish the bushfire construction standards that are to apply. An indicative BAL is not acceptable for a building application.

In the planning environment, through the application of SPP 3.7 and associated Guidelines, the deemed to satisfy requirement for a proposed 'development site' or sites (defined by the LPS Amendment Regulations 2015 as "that part of a lot on which a building that is the subject of development stands or is to be constructed"), is that a BAL-29 or lower rating can be achieved once all works associated with the proposal are completed. For planning approval purposes, an ***indicative BAL*** can provide the required information.

Determined Bushfire Attack Level

A determined BAL is to apply to an existing building or the 'development site' on which the building is to be constructed and not to a lot or building envelope. Its purpose is to state the potential radiant heat flux to which the building will be exposed, thereby determining the construction standard to be applied.

A determined BAL cannot be given for a future building whose design and position on the lot are unknown or the vegetation separation distance has not been established. It is not until these variables have been fixed that a determined BAL can be stated, and a BAL Certificate can be issued.

The one exception is when a building ***of any dimension*** can be ***positioned anywhere*** on a proposed lot (within R-Code building setbacks) or within a defined building envelope, and always remain subject to the same BAL, regardless of the retention of any existing classified vegetation either onsite or offsite.

Indicative Bushfire Attack Level

If a BAL is not able to achieve 'determined' status it will be an indicative BAL. It indicates the BAL that can be achieved by the proposed development/use. However, it is conditional upon an assessment variable(s) being confirmed at a later stage (e.g. the building location is established/changed, or vegetation is modified/removed to establish the vegetation separation distance).

A BAL certificate cannot be issued for an indicative BAL – unless that BAL cannot vary (refer to 'Determined BAL' above).

In table form, a single or a range of indicative BAL(s) may be presented. If a single indicative BAL is stated for a defined area (i.e. the lot or building envelope), this will be the highest indicative BAL impacting the defined area.

In BAL contour map form (refer to Section 3.2.1), the illustrated BAL contours visually identify areas of land for which if any part of an existing or proposed building is located on that land and within the BAL contours, then the highest BAL affecting that building (or part of the land on which the building will be constructed), will be the indicative BAL that is to apply.

The BAL can only become a determined BAL once the actual location of that building on the land is known and/or the required minimum vegetation separation distance corresponding to the relevant BAL contour is established (refer to Table 3.3).

3.2.1 Bushfire Attack Level Results - BAL Contour Map Format

INTERPRETATION OF THE BUSHFIRE ATTACK LEVEL (BAL) CONTOUR MAP

The contour map will present different coloured contour intervals extending from the areas of classified bushfire prone vegetation. These represent the different bushfire attack levels that will exist at varying distances away from the classified vegetation in the event of a bushfire in that vegetation.

The areas of classified vegetation to be considered in developing the BAL contours, are those that will remain as the intended end state of the subject development once earthworks, clearing and/or landscaping and re-vegetation have been completed (or each stage completed).

Each bushfire attack level corresponds to a set range of radiant heat flux that is generated by a bushfire. That range is defined by the AS 3959:2018 BAL determination methodology.

The width of each shaded BAL contour is a diagrammatic representation of the separation distances from the classified vegetation that correspond to each BAL for each separately identified area of classified vegetation. They have been calculated by the application of the unique site variables including vegetation types and structure, ground slope and applied fire weather.

(Refer to Section 3.2 'Understanding the Results of the Bushfire Impact Assessment' for the explanation of how BAL(s) for buildings will be assessed from the BAL Contour Map).

Construction of the BAL Contours

VEGETATION AREAS APPLIED TO THE DEVELOPMENT OF THE BAL CONTOUR MAP

All identified areas of classified vegetation have been applied with the following exceptions:

1. For the BAL Contour Maps Figures 3.4 and 3.6 all classified vegetation within the Clearing Areas, as shown on Figures 1.1 and 1.2, is excluded and the BAL contours are constructed into the development site from any classified vegetation outside the boundaries of the Clearing Areas.
2. The BAL Contour Map, Figure 3.8, depicts indicative BAL Contours once construction is complete and the project is in the operational stage. Hardstand areas to the west and south of the roads and buildings will be ripped and levelled. It is expected that these areas will return to their natural vegetated state, and this is considered in the BAL Contour Map. A 31 metre APZ is to be established around roads and buildings as shown on Figures 3.8 and 5.1.

VEGETATION SEPARATION DISTANCES APPLIED

The distances that have been applied to illustrating the width of each BAL contour shown in Figures 3.3 and 3.4 are stated in Table 3.3. These correspond to each Bushfire Attack Level and are specific to the proposed development site.

Table 3.3: Vegetation separation distances applied to construct the BAL contours.

BAL CONTOUR MAP – APPLIED VEGETATION SEPARATION DISTANCES								
Derived from the Application of Method 1 BAL Determination Methodology (AS 3959:2018 Section 2, Table 2.5)[1]								
Vegetation Area	Vegetation Classification	Effective Slope (degree range)	BAL and Corresponding Separation Distance (m)					
			BAL-FZ	BAL-40	BAL-29	BAL-19	BAL12.5	BAL-LOW
1	Class G Grassland	downslope >5-10	<8	8-<10	10-<16	16-<23	23-<50	>50
2	Class D Scrub	downslope >0-5	<11	11-<15	15-<22	22-<31	31-<100	>100
3	Class G Grassland	downslope >0-5	<7	7-<9	9-<14	14-<20	20-<50	>50
4	Class G Grassland	upslope or flat	<6	6-<8	8-<12	12-<17	17-<50	>50
5	Excluded AS3959:2018 2.2.3.2 (e) & (f)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Class G Grassland	downslope >0-5	<7	7-<9	9-<14	14-<20	20-<50	>50
7	Class D Scrub	downslope >0-5	<11	11-<15	15-<22	22-<31	31-<100	>100
8	Class G Grassland	downslope >5-10	<8	8-<10	10-<16	16-<23	23-<50	>50
9	Class G Grassland	upslope or flat	<6	6-<8	8-<12	12-<17	17-<50	>50
10	Excluded AS3959:2018 2.2.3.2 (e) & (f)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Note[1] All the assessment inputs applied are presented in Section 3.1.								

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
1	G	Grassland	>5-10
2	D	Scrub	>0-5
3	G	Grassland	>0-5
4	G	Grassland	0
5	Ex	Exempt	

Notes	Name
01	Gate House
02	Storage Substation
03	Storage Building
04	Urea Unit 1
05	Urea Unit 2
06	Control Room
07	
08	Air Separation Unit
09	Ammonia Unit
10	
11	Water Treatment
12	Seawater Cooling Tower
13	Closed Cooling Water System
14	Power Generation Unit
15	Entrance Gate
16	
17	
18	Laboratory
19	Maintenance
20	Administration
21	Warehouse
22	Chemical Storage

Figure 3.3

Perdaman Urea Plant - Site C Vegetation Post Development

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

------ LEGEND ------

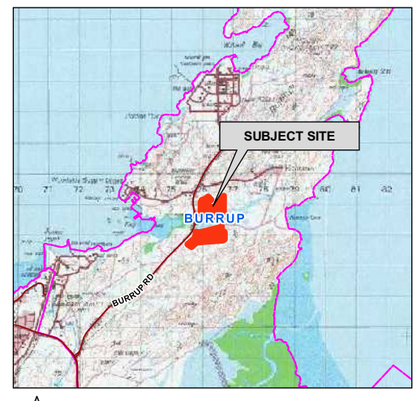
- Flare Stack
- Tanks
- Fire Water Tank
- Structures
- Driveways
- Ponds
- Asset Protection Zone
- Subject Site
- Vegetation Clearing Area
- 150m_Assessment_Area
- Cadastre

Classified Vegetation

- Class D - Scrub
- Class G - Grassland
- Exclusion 2.2.3.2

0 50 100 150 200 250
Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 13-02-2022
SCALE (A3): 1 : 4000

BUSHFIRE PRONE PLANNING

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
1	G	Grassland	>5-10
2	D	Scrub	>0-5
3	G	Grassland	>0-5
4	G	Grassland	0
5	Ex	Exempt	

Notes	Name
01	Gate House
02	Storage Substation
03	Storage Building
04	Urea Unit 1
05	Urea Unit 2
06	Control Room
07	
08	Air Separation Unit
09	Ammonia Unit
10	
11	Water Treatment
12	Seawater Cooling Tower
13	Closed Cooling Water System
14	Power Generation Unit
15	Entrance Gate
16	
17	
18	Laboratory
19	Maintenance
20	Administration
21	Warehouse
22	Chemical Storage

Figure 3.4

Perdaman Urea Plant - Site C BAL Contour Map

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

------ LEGEND ------

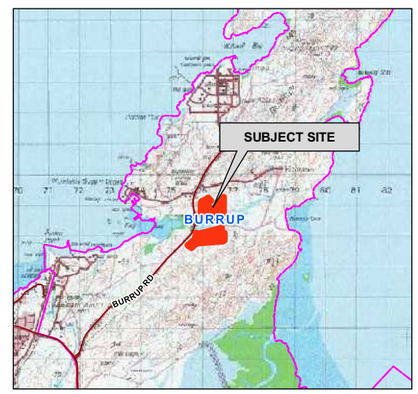
- Flare Stack
- Tanks
- Fire Water Tank
- Structures
- Driveways
- Ponds
- Asset Protection Zone
- Subject Site
- 100m BAL Buffer
- 150m_Assessment_Area
- Cadastre
- 10kW/m2 Buffer
- 2kW/m2 Buffer
- Vegetation Outline

Bushfire Attack Levels

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

0 50 100 150 200 250
Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

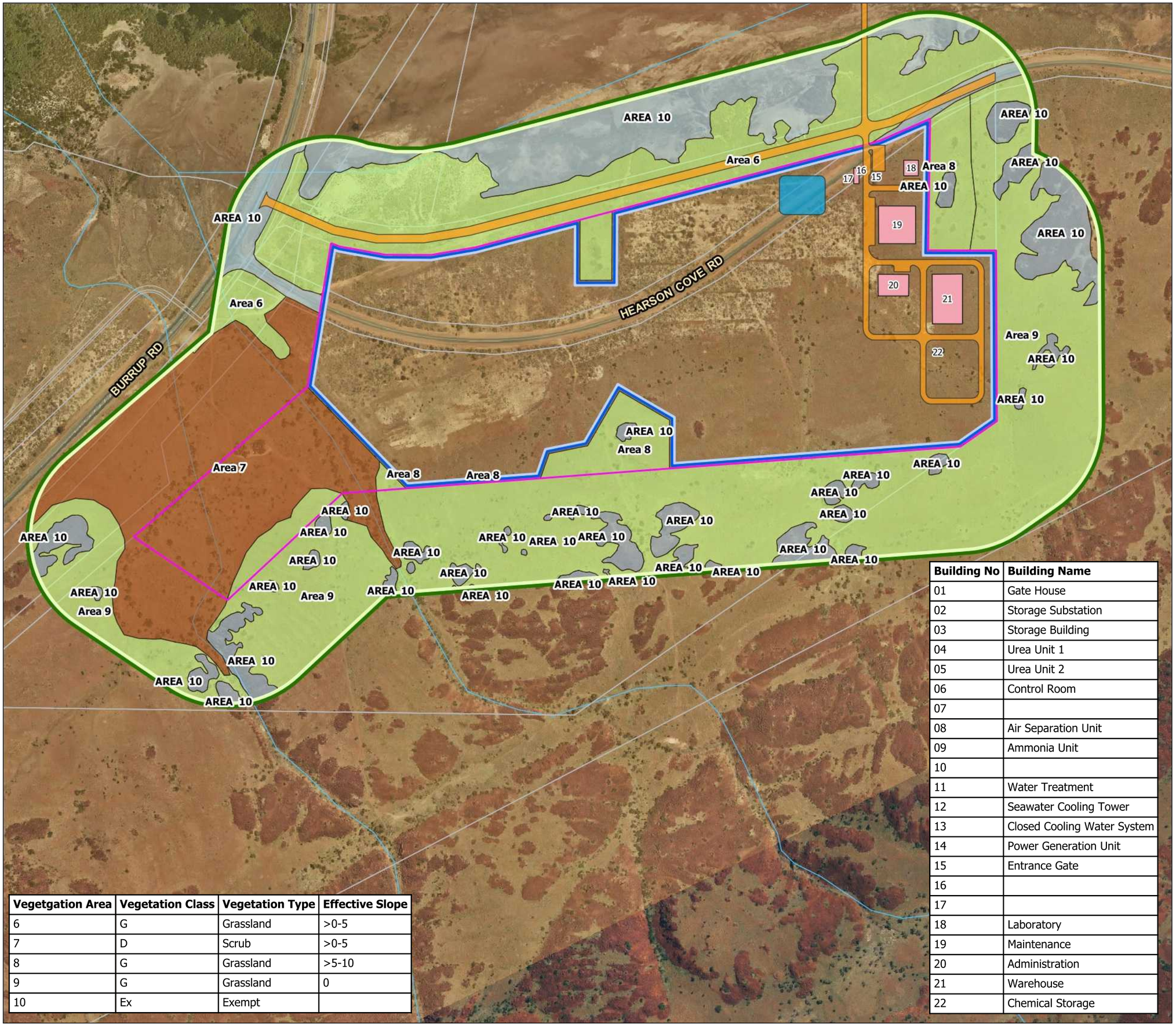
Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 13-02-2022
SCALE (A3): 1 : 4000

BUSHFIRE PRONE PLANNING

Figure 3.5

Perdaman Urea Plant - Site F Vegetation Post Development Construction Phase

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA



Vegetgation Area	Vegetation Class	Vegetation Type	Effective Slope
6	G	Grassland	>0-5
7	D	Scrub	>0-5
8	G	Grassland	>5-10
9	G	Grassland	0
10	Ex	Exempt	

Building No	Building Name
01	Gate House
02	Storage Substation
03	Storage Building
04	Urea Unit 1
05	Urea Unit 2
06	Control Room
07	
08	Air Separation Unit
09	Ammonia Unit
10	
11	Water Treatment
12	Seawater Cooling Tower
13	Closed Cooling Water System
14	Power Generation Unit
15	Entrance Gate
16	
17	
18	Laboratory
19	Maintenance
20	Administration
21	Warehouse
22	Chemical Storage

------ LEGEND ------

- Structures
- Driveways
- Ponds
- Asset Protection Zone
- Subject Site
- Vegetation Clearing Area
- 150m_Assessment_Area
- Cadastre

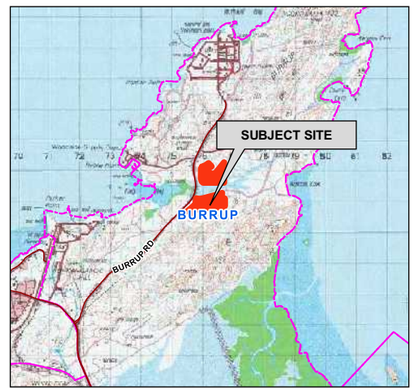
Classified Vegetation

- Class D - Scrub
- Class G - Grassland
- Exclusion 2.2.3.2

0 50 100 150 200 250

Metres

------ LOCALITY ------



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AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 13-02-2022
SCALE (A3): 1 : 5000

Figure 3.6

Perdaman Urea Plant - Site F
BAL Contour Map
Construction Phase

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

BURRUP RD
HEARSON COVE RD
AREA 6
AREA 7
AREA 8
AREA 9
AREA 10
15
16
17
18
19
20
21
22

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
6	G	Grassland	>0-5
7	D	Scrub	>0-5
8	G	Grassland	>5-10
9	G	Grassland	0
10	Ex	Exempt	

Building No	Building Name
01	Gate House
02	Storage Substation
03	Storage Building
04	Urea Unit 1
05	Urea Unit 2
06	Control Room
07	
08	Air Separation Unit
09	Ammonia Unit
10	
11	Water Treatment
12	Seawater Cooling Tower
13	Closed Cooling Water System
14	Power Generation Unit
15	Entrance Gate
16	
17	
18	Laboratory
19	Maintenance
20	Administration
21	Warehouse
22	Chemical Storage

------ LEGEND ------

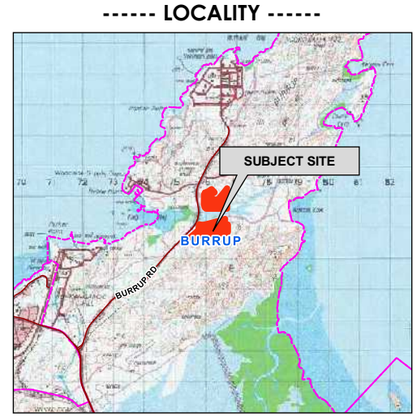
- Structures
- Driveways
- Ponds
- Asset Protection Zone
- Subject Site
- 100m BAL Buffer
- 150m_Assessment_Area
- Cadastre
- 10kW/m2 Buffer
- 2kW/m2 Buffer
- Vegetation Outline

Bushfire Attack Levels

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

0 50 100 150 200 250
Metres

------ LOCALITY ------



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AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 13-02-2022
SCALE (A3): 1 : 5000

Figure 3.7

Perdaman Urea Plant - Site F Vegetation Post Development Operational Phase

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

HEARSON COVE RD
BURRUP RD
AREA 10
Area 6
Area 7
Area 8
Area 9
31 m
15
16
17
18
19
20
21
22

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
6	G	Grassland	>0-5
7	D	Scrub	>0-5
8	G	Grassland	>5-10
9	G	Grassland	0
10	Ex	Exempt	

Building No	Building Name
01	Gate House
02	Storage Substation
03	Storage Building
04	Urea Unit 1
05	Urea Unit 2
06	Control Room
07	
08	Air Separation Unit
09	Ammonia Unit
10	
11	Water Treatment
12	Seawater Cooling Tower
13	Closed Cooling Water System
14	Power Generation Unit
15	Entrance Gate
16	
17	
18	Laboratory
19	Maintenance
20	Administration
21	Warehouse
22	Chemical Storage

------ LEGEND ------

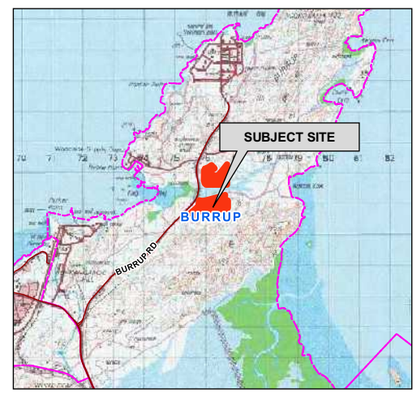
- Structures
- Driveways
- Ponds
- Asset Protection Zone
- APZ Distance (m)
- Subject Site
- 150m_Assessment_Area
- Cadastre

Classified Vegetation BAL

- Class D - Scrub
- Class G - Grassland
- Exclusion 2.2.3.2

0 50 100 150 200 250
Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 08-02-2022
SCALE (A3): 1 : 5000

BUSHFIRE PRONE PLANNING

Figure 3.8

Perdaman Urea Plant - Site F
BAL Contour Map
Operational Phase

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

BURRUP RD
HEARSON COVE RD

Vegetation Area	Vegetation Class	Vegetation Type	Effective Slope
6	G	Grassland	>0-5
7	D	Scrub	>0-5
8	G	Grassland	>5-10
9	G	Grassland	0
10	Ex	Exempt	

Building No	Building Name
01	Gate House
02	Storage Substation
03	Storage Building
04	Urea Unit 1
05	Urea Unit 2
06	Control Room
07	
08	Air Separation Unit
09	Ammonia Unit
10	
11	Water Treatment
12	Seawater Cooling Tower
13	Closed Cooling Water System
14	Power Generation Unit
15	Entrance Gate
16	
17	
18	Laboratory
19	Maintenance
20	Administration
21	Warehouse
22	Chemical Storage

------ LEGEND ------

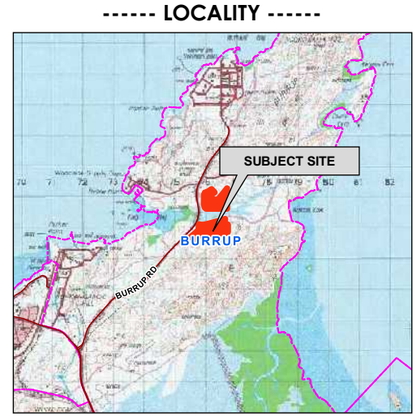
- Structures
- Driveways
- Ponds
- Asset Protection Zone
- APZ Distance (m)
- Subject Site
- 100m BAL Buffer
- 150m_Assessment_Area
- Cadastre
- 10kW/m2 Buffer
- Vegetation Outline

Bushfire Attack Levels

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

0 50 100 150 200 250
Metres

------ LOCALITY ------



AERIAL IMAGERY: Landgate/SLIP

BUSHFIRE PRONE PLANNING

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 08-02-2022
SCALE (A3): 1 : 5000

3.2.2 Bushfire Attack Level Results - Derived from The BAL Contour Map

Table 3.4: Indicative and determined BAL(s) for existing and/or proposed building works.

BUSHFIRE ATTACK LEVEL FOR EXISTING/PLANNED BUILDINGS/STRUCTURE		
BAL Determination Methodology Applied[1]	Method 1 as per AS 3959:2018 s2.2.6 and Table 2.5.	
Building #	Building/Structure Description (planned)	Indicative BAL
01	Gate House	BAL-LOW
02	Storage Substation	BAL-LOW
03	Storage Building	BAL-12.5
04	Urea Unit 1	BAL-12.5
05	Urea Unit 2	BAL-LOW
06	Control Room	BAL-LOW
07	-	BAL-LOW
08	Air Separation Unit	BAL-LOW
09	Ammonia Unit	BAL-12.5
10	-	BAL-12.5
11	Water Treatment	BAL-12.5
12	Seawater Cooling Tower	BAL-19
13	Closed Cooling Water System	BAL-19
14	Power Generation Unit	BAL-12.5
15	Entrance Gate	BAL-LOW (Construction phase)
		BAL-12.5 (Operational phase)
16	-	BAL-LOW (Construction phase)
		BAL-12.5 (Operational phase)
17	-	BAL-LOW (Construction phase)
		BAL-12.5 (Operational phase)
18	Laboratory	BAL-29
19	Maintenance	BAL-19
20	Administration	BAL-12.5
21	Warehouse	BAL-12.5
22	Chemical Storage	BAL-LOW (Construction phase)
		BAL-12.5 (Operational phase)
Note[1] Assessment inputs applied are presented in Section 3.1.		

3.2.3 Determined Separation Distances Corresponding to 10kW/m^2 and 2 kW/m^2 of Radiant Heat Flux

Acceptable solutions with regard to radiant heat exposure during a bushfire emergency event can apply to certain land uses. These solutions establish the requirements for safer onsite shelter locations to be subject to radiant heat flux no greater than 10 kW/m^2 for a building or 2 kW/m^2 for an open area.

Table 3.5: Specific vegetation separation distances for 'vulnerable land use' application.

SEPARATION DISTANCES CORRESPONDING TO 10 kW/m^2 AND 2 kW/m^2 OF RADIANT HEAT FLUX			
BAL Determination Methodology Applied[1]		Method 2 as per AS 3959:2018 Appendix B.	
Vegetation Area	Vegetation Classification	Separation Distance Corresponding to 10 kW/m^2 (metres)	Separation Distance Corresponding to 2 kW/m^2 (metres)
1	Class G Grassland	38.7	105
2	Class D Scrub	49.3	126
3	Class G Grassland	33.9	96
4	Class G Grassland	29.5	87
6	Class G Grassland	33.9	96
7	Class D Scrub	49.3	126
8	Class G Grassland	38.7	105
9	Class G Grassland	29.5	87
Note[1] Assessment inputs applied are presented in Section 3.1. AS 3959:2018 method 2 calculation input/output summary data is presented for reference in Appendix 4.			

4 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

In response to the Bushfire Management Plan requirements established by Appendix 5 of the Guidelines for Planning in Bushfire Prone Areas (WAPC 2021 v1.4), the following statements are made to assist in the understanding of whether the proposal is likely to be able to comply with the bushfire protection criteria now or in subsequent planning stages.

Spatial Context - Broader Landscape Considerations	
Wider road network and access constraints	The proposed development is located on the Burrup Peninsula. Consequently, there is limited road access available to different destinations. Burrup Road leads south from the proposed development site to Dampier Road where access is available to the townsites of Dampier and Karratha. Burrup Road also leads north to the North West Shelf Visitors Centre and the Karratha Gas Plant. Burrup Road is a no through road. The distance from the proposed development to a point where access to two suitable destinations in two different directions is available is 6 kms, at the intersection of Burrup Road and Dampier Road.
Proximity of settlements and emergency services	The nearest settlement to the subject site is Dampier at a distance of approximately 8 kms by road. The Dampier VFRS is located in Dampier and 9kms (9 minutes travel) from the proposed development. The Karratha townsite is located 18 kms by road from the development site. The Karratha VFRS and Nickol Bay BFB are both located in Karratha at a distance of 23.5 kms (24 minutes).
Bushfire prone vegetation types and extent (including conserved vegetation)	Vegetation in the surrounding area is generally spinifex and buffel grass with intermittent areas of scrub. A feature of the surrounding environment are long ridges of rocky outcrops and some low areas of saline wetlands and mangroves. These areas would provide some protection against the spread of bushfire.
Topography and fire behaviour interactions.	Topography on and near the proposed development varies from flat, at the low saline wetlands, to undulating approaching the rocky outcrops, and steep up the unvegetated outcrops. Bushfire rates of spread can double for every ten degrees of upslope travel while downslope travel will slow the rate of spread. The proposed development is generally located in the lower areas and should not be affected by bushfire travelling up long steep upslopes.
Potential for extreme fire behaviour and pyro convective events.	Possible but limited likelihood due to the surrounding vegetation types and fuel loads.
Environmental Considerations	
Constraints to implementing required and/or additional bushfire protection measures	It is not expected that the environmental considerations will pose constraints on the required bushfire protection measures.
Provision of Access Within the Subject Site	
Potential constraints	There are no constraints to access within the subject site.
Potential Bushfire Impacts	
Flame and radiant heat and ability to establish an APZ	The development sites are to be predominantly cleared of native vegetation and maintained to a low bushfire threat state. The highest BAL rating for the proposed structures will be BAL-29, with most having vegetation separation distances that will provide BAL ratings within the range of BAL-LOW to BAL-12.5. This will prevent flame contact and reduce radiant heat levels from the classified vegetation.

Embers/firebrands, smoke and fire-driven wind	Ember attack and airborne debris may affect the subject site. The appropriate protection measures of building construction, where appropriate, and strict management of the APZ will mitigate the risk to what is considered an acceptable level.
Issues to be Considered (additional assessments/documents)	
Specific land uses to be addressed	The proposed development is assessed as a high risk land use.
Additional documents	A bushfire High Risk Land Use Risk Assessment and Management Report will be required.

5 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA ESTABLISHED BY THE GUIDELINES

For a development application that is not a 'Tourism Land Use' to be considered compliant with SPP 3.7, it must satisfy (achieve) the intent of each of the four elements of the bushfire protection criteria. These criteria are established by the *Guidelines for Planning in Bushfire Prone Areas WAPC 2021 v1.4*). Compliance can be achieved by either:

- Meeting all applicable acceptable solutions corresponding to each element (i.e. the minimum bushfire protection measures that are deemed to satisfy planning requirements); or
- Where an acceptable solution cannot be met, by developing a performance solution that satisfies the established requirements.

5.1 Local Government Variations to Apply

Local governments may add to or modify the acceptable solutions of the Bushfire Protection Criteria (BPC) and/or apply technical requirements that vary from those specified in the Guidelines for Planning in Bushfire Prone Areas (WAPC). In such instances, this Proposal will be assessed against these variations and/or any specific local government technical requirements for emergency access and water. Refer to Appendices 2 and 3 for relevant technical requirements.

Will local or regional variations (endorsed by WAPC / DFES) to the applicable acceptable solutions established by the *Guidelines* or the *Position Statement: Tourism land uses in bushfire prone areas WAPC October 2019,* apply to this Proposal?	N/A

5.2 Summary of Assessment Against the Bushfire Protection Criteria

SUMMARISED OUTCOME OF THE ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA					
Element of the Bushfire Protection Criteria	Basis for the Proposal Achieving Full Compliance with SPP 3.7			The Proposal Cannot Achieve Full Compliance with SPP 3.7	
	Acceptable Solutions Met	Achieves the Intent of the Element			
	All applicable solutions are fully met	All applicable solutions are not fully met. A merit based assessment and/or a bushfire performance comparison of the proposals residual risk with that of the residual risk of the acceptable solution is conducted (refer Note 4)	A performance principle-based solution is applied	Bushfire planning development type that may not require full compliance is applied	An improvement in bushfire performance compared to the existing development is detailed (refer Note 4)
1. Location	✓			N/A	
2. Siting and Design of Development	✓				
3. Vehicular Access		✓			
4. Water	✓				

Note: The development proposal has been assessed:

1. Against the requirements established in Appendix 4 of the *Guidelines for Planning in Bushfire Prone Areas, WAPC 2021 v1.4 (Guidelines)*. The Guidelines are found at https://www.planning.wa.gov.au/8194.aspx; and
2. Applying the interpretation guidance provided in *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design (WAPC Nov 2019)*.
3. Applying any endorsed variations to the Guideline's acceptable solutions and associated technical requirements that have been established by the local government. If known and applicable these have been stated in Section 5.1 with the detail included as an appendix if required by the local government.
4. When non-compliant with SPP 3.7 and when appropriate, by utilising additional compliance pathways that include the application of merit based assessment and comparative bushfire performance. The validity of this approach is derived from relevant decisions made by the responsible authorities (refer Appendix 2).

5.3 Assessment Detail

Element 1: Location	
Intent: To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.	
Compliance: How the proposed development achieves the intent of Element 1:	By fully meeting all applicable acceptable solutions established by the bushfire protection criteria (Guidelines v1.4 WAPC 2021)

ASSESSMENT (COMPLIANCE) STATEMENTS

For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2021 v1.4)* and apply the interpretation guidance established by the *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design (WAPC Nov 2019)*.

Acceptable Solution: A1.1: Development Location

ASSESSMENT AGAINST THE REQUIREMENTS ESTABLISHED BY THE GUIDELINES

The proposed subdivision will provide an area of land within each lot that can be considered suitable for development as BAL-40 or BAL-FZ construction standards will not be required to be applied. This meets the requirements established by Acceptable Solution A1.1 and its associated explanatory note.

ASSESSMENT AGAINST THE REQUIREMENTS ESTABLISHED BY THE POSITION STATEMENT

The position statement establishes that:

- The source of risk (the hazard) to be considered in Element 1 is the "level of bushfire exposure" from the type and extent of bushfire prone vegetation and the topography of the land on which it exists; and
- "Consideration should be given to the site context" which includes the land both "within and adjoining the subject site". The "hazards remaining within the site should not be considered in isolation of the hazards adjoining the site, as the potential impact of a bushfire will be dependent on the wider risk context."

The position statement also recognises:

- That the proposed development site and its surrounding land may be part of an area "identified for development or intensification of land use prior to the release of SPP 3.7"; consequently
- Consideration by decision-makers "should also be given to improving bushfire management of the site and surrounding area, thereby reducing the vulnerability of people property and infrastructure to bushfire"; and
- The application of mitigation measures to lessen the risk to the broader area would include improvements to the local road network (including emergency access ways), improvements/additions to firefighting water supply and increasing separation distance from the hazard.

The Hazard Within the Subject Site

The proposed development sites will be, for the greater portion, cleared of vegetation.

For Site C, portions of land on the proposed lot which are located on higher ground to the north of the development will remain in their current state. No structures are located close to these areas.

For Site F, a portion of land to the south west of the proposed lot will not be cleared, along with 2 aboriginal heritage areas. No structures are to be located near these areas. Once construction is complete areas to the west and south

of the proposed buildings and driveways will be ripped and levelled. It can be expected that this area will eventually return to its natural state.

The primary bushfire threat from bushfire prone vegetation remaining within the proposed development sites will be embers. This threat will be mitigated by the application of appropriate building design, bushfire construction standards (where appropriate) and the ongoing maintenance of the APZs to ensure the buildings will not be impacted by consequential fire within combustible materials used, stored or accumulated within the APZ.

The Hazard Adjoining the Subject Site

For Site C, adjoining vegetation to the west and north is generally in the form of Grassland, being spinifex and buffel grass. Small areas of Scrub exist along a narrow creekline and beside the Yara Pilbara facility to the east. To the south of Site C is a large area of saline wetlands with little to no vegetation cover.

For Site F, operational development will be restricted to the eastern portion of the proposed lot. Vegetation adjoining this area is spinifex and buffel grass rising up to areas of rocky outcrop.

The primary bushfire threat from bushfire prone vegetation adjoining the proposed development sites will be embers. This threat will be mitigated by the application of appropriate building design, bushfire construction standards (where appropriate) and the ongoing maintenance of the APZs to ensure the buildings will not be impacted by consequential fire within combustible materials used, stored or accumulated within the APZ.

Element 2: Siting and Design of Development

Intent: To ensure that the siting and design of development (note: not building/construction design) minimises the level of bushfire impact.

Compliance: How the proposed development achieves the intent of Element 2:	By fully meeting all applicable acceptable solutions established by the bushfire protection criteria (Guidelines v1.4 WAPC 2021)

ASSESSMENT (COMPLIANCE) STATEMENTS

For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2021 v1.4)* and apply the interpretation guidance established by the *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design (WAPC Nov 2019)*.

Acceptable Solution: A2.1: Asset Protection Zone

THE APZ - DEVELOPMENT SITING AND DESIGN PLANNING REQUIREMENTS

The necessary outcome of bushfire planning for development siting and design, is to ensure that a building can be located within the developable portion of any lot (i.e. outside those parts of the lot that form the required R-Code building setbacks, or any other excluded area), and be subject to potential radiant heat from a bushfire not exceeding 29 kW/m^2 (i.e. a maximum BAL of BAL-29).

This will be achieved when the size of the "low fuel area immediately surrounding a building", the asset protection zone (APZ), is large enough. This requires a certain separation distance to exist between the building and areas of classified vegetation. These are the BAL-29 APZ dimensions and they will vary dependent on site specific parameters.

The APZ should be contained solely within the boundaries of each lot, except in instances where the neighbouring lot(s) or adjacent public land will be managed in a low-fuel state on an ongoing basis, in perpetuity.

Where possible, planning for siting and design should incorporate elements that include non-vegetated areas (e.g. roads/parking/drainage) and/or formally managed areas of vegetation (public open space/recreation areas/ services installed in a common section of land), as either part of the required APZ dimensions or to additionally increase separation distances to provide greater protection. These elements create robust and easier managed asset protection zones.

THE ASSESSMENT

Future buildings on the lot(s) of the proposed development can be surrounded by an APZ that will ensure the potential radiant heat impact of a bushfire does not exceed 29 kW/m^2 (BAL-29). The required APZ specifications of width, location and management can be achieved.

APZ Width: The required APZ dimensions to ensure structures/buildings are subject to a maximum BAL of BAL-29 (measured from any external wall or supporting post or column to the edge of the classified vegetation), has been determined in Section 3.2 of this BMP and are:

BAL-29 APZ Dimensions		
Applicable to all proposed structures/buildings and any temporary buildings placed onsite during or after the construction phase.	Building to Vegetation Area 1	Minimum 10 metres
	Building to Vegetation Area 2	Minimum 15 metres
	Building to Vegetation Area 3	Minimum 9 metres
	Building to Vegetation Area 4	Minimum 8 metres
	Building to Vegetation Area 6	Minimum 9 metres
	Building to Vegetation Area 7	Minimum 15 metres
	Building to Vegetation Area 8	Minimum 10 metres
	Building to Vegetation Area 9	Minimum 8 metres

Element 2: Siting and Design of Development

APZ Location: Asset protection zones of the widths stated above can be contained solely within the boundaries of each lot. Onsite vegetation will be required to be removed, the authority for which may need to be received from the local government and/or other relevant authority.

APZ Management: All vegetation that will require modification/removal and future management is onsite and therefore under the control of the landowner.

Retained vegetation within the APZ will be managed in accordance with the technical requirements established by the Schedule 1: 'Standards for Asset Protection Zones (Guidelines). The APZ specifications are also detailed in Appendix 1 and the City of Karratha may have additional requirements established by their Fire Break and Fuel Load Notice (See Appendix 5).

THE APZ – REQUIRED DIMENSIONS TO SATISFY FUTURE BUILDING (AND ONGOING MANAGEMENT)

It is important for the landowner to be aware that the APZ dimensions that will be required to be physically established and maintained on each lot surrounding relevant future structures/buildings, may be different to those stated above for the BAL-29 APZ - which is the minimum dimension a planning proposal needs to show can be established to comply with SPP 3.7.

The actual APZ dimensions to be physically established and maintained, is often based on which of the following establishes the larger APZ dimension:

- The dimensions corresponding to the indicative BAL of a building; or
- The APZ dimensions established by the local government's Firebreak Notice.

If the dimensions of the APZ that are to be established are known at this time, they will be stated below.

For this proposed development the APZ extents are noted below:

- **For Site C the APZ will be established and maintained to the lot boundaries with the exception of areas to the north that extent outside the proposed clearing area (See Figure 3.4).**
- **For Site F, during the construction stage, the APZ will be established to the extents as shown on Figure 3.6.**
- **For Site F, during the operational stage, the APZ will be maintained to the dimensions as shown on Figure 3.8.**

Element 3: Vehicular Access	
Intent: To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.	
Compliance: How the proposed development achieves the intent of Element 3:	By meeting all applicable acceptable solutions except A3.2a for which a performance solution has been developed.
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2021 v1.4)*.	
Acceptable Solution: A3.1: Public Roads	
The proposed development will be serviced by the existing Burrup Road, and a new public road is to be constructed by Main Roads Western Australia to replace a portion of the existing Hearson Cove Road. Both roads are/will be compliant with the relevant construction standards.	
Acceptable Solution: A3.2a: Multiple Access Routes	
Burrup Road is a no through road that leads into the Burrup Peninsula. Due to the unique nature of the peninsular landform, and the rugged topography, a secondary access route in a different direction to a different destination is unable to be provided for this proposed development. This non-compliance is addressed in Section 5.4 below.	
Acceptable Solution: A3.2b: Emergency Access Way	
N/A. A compliant Emergency Access Way is not achievable.	
Acceptable Solution: A3.: Through Roads	
N/A	
Acceptable Solution: A3.4a: Perimeter Roads	
N/A	
Acceptable Solution: A3.4b: Fire Service Access Routes	
N/A	
Acceptable Solution: A3.5: Battle-Axe Legs	
N/A	
Acceptable Solution: A3.6: Private Driveways	
All private driveways in the site will comply with or exceed the technical requirements for private driveways. Driveways are generally 8 metres wide, therefore passing bays will not be required. Turnaround areas are located throughout the site and will comply with the technical requirements.	

Element 4: Water	
Intent: To ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.	
Compliance: How the proposed development achieves the intent of Element 4:	By fully meeting all applicable acceptable solutions established by the bushfire protection criteria (Guidelines v1.4 WAPC 2021)
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Guidelines (WAPC 2021 v1.4)*.	
Acceptable Solution: A4.1: Identification of Future Water Supply	
An existing water line runs along Burrup Road which will be connected to for supply to the site.	
Acceptable Solution: A4.2: Provision of Water for Firefighting Purposes	
A fire water system is to be installed for the proposed development. Hydrants will be placed throughout the site in compliance with Australian standards, and the requirements of any other relevant authority. Additionally, two fire fighting water tanks will be installed in Site C.	

5.4 Addressing Non-Compliance with Applicable Acceptable Solutions

Where the proposed development/use is unable to fully comply with all required planning elements, for which a corresponding set of acceptable solutions has been established, there are several methodology options that potentially can be applied to progress the proposal for consideration by the decision makers.

These are established by SPP 3.7 (and the associated Guidelines) as risk and merit based assessments, specific DPLH Position Statements or through precedence set by previous planning application cases progressing through relevant State reviewing bodies.

THE ACCEPTABLE SOLUTION(S) UNABLE TO BE COMPLIED WITH	
Acceptable Solution	Brief Description of Non-Compliance
A3.2a Multiple Access Routes	Burrup Road is a no through road that leads north into the Burrup Peninsula. Due to the unique nature of the peninsular landform, and the rugged topography, a secondary access route in a different direction to a different destination is unable to be provided for this proposed development.

THE METHODOLOGY APPLIED TO PROGRESS THE ASSESSMENT OF THE PROPOSED DEVELOPMENT /USE		
Methodology Options	Applied	Information location
Develop a Performance Assessment	☒	Section 5.4.1 of the BMP

5.4.1 Performance Assessment

Burrup Road is a no through road that leads north into the Burrup Peninsula. Due to the unique nature of the peninsular landform, and the rugged topography, a secondary access route in a different direction to a different destination is unable to be provided for this proposed development. This is a legacy issue with Burrup Road being created prior to the release of SPP 3.7 "Planning in Bushfire Prone Areas", where the requirement for two different access routes in bushfire prone areas was established.

The proposed development site is located on the eastern side of Burrup Road and approximately 6 kms from the intersection of Dampier Road, where access to two different destinations is available (Dampier and Karratha). Vegetation along this route is similar to that described for the development site and surrounds. The greater portion of the vegetation being grassland, interspersed with relatively small areas of scrub. A bushfire in this area is expected to be a wind driven grassland type fire having a short residence time and limited spotting. The Bushfire Hazard Level along the road would be considered moderate.

Burrup Road is a bitumen road constructed to accommodate heavy vehicles and exceeds normal road construction requirements including pavement width. The road is generally straight with no steep grades and has clear lines of sight over good distances. Occupants of the development site will be familiar with the road, using it to travel to and from work each day.

For the proposed development site, areas of bushfire prone vegetation will be cleared and maintained in a low bushfire threat state. For the two sites, Site C to the north and Site F to the south, both will have a suitable onsite safer location building for persons to shelter within until the passage of a fire front.

For Site F, the Administration building is located in an area assessed as BAL-12.5 and where the potential radiant heat level is less than 10kW/m^2. A radiant heat level of 10kW/m^2 is considered the maximum allowable to impact a shelter in place building. The building will be constructed to a BAL rating of BAL-29.

For Site C the Control Room is located in an area assessed as BAL-LOW and where the potential radiant heat level is less than 2kW/m^2. The building will be constructed to a BAL rating of BAL-29. Due to the particularly low potential radiant

heat level, persons will be able to shelter either inside or outside of the building. Further, persons located on Site F could either shelter in the Administration building on that Site, or travel to the Control Room building on Site C, or vice versa as there will be only a small section of bushfire prone vegetation (<200 metres) along the road joining the 2 sites.

Where early evacuation along Burrup Road to either Dampier or Karratha is not a viable option it is demonstrated that there are suitable areas located within the proposed development site where persons can safely shelter from a bushfire event. This can either be within the designated onsite safer location buildings (See Figure 5.1) or outside and within the 2kW/m^2 area on Site C as shown on Figures 3.4 and 5.1.

5.5 Additional Bushfire Protection Measures

The following bushfire protection measures are to be implemented and maintained. They are additional to those established by the relevant acceptable solutions applied to the proposed subdivision, development or use.

The relevant acceptable solutions are those against which this planning proposal has been assessed in Section 5.3 of this Bushfire Management Plan.

5.5.1 Additional Measures Established by the Developed Performance Solution

Buildings of Class 4 to Class 9 are not required by the Building Code of Australia (BCA) to be constructed to comply with bushfire performance requirements. However, the Administration Building and the Control Room building are to be adopted as safer onsite locations in the event of a bushfire. These two buildings should be constructed to a BAL rating of BAL-29 as a minimum. The 2 buildings will not be affected by flame contact or high levels of radiant heat flux.

Building No	Building Name
01	Gate House
02	Storage Substation
03	Storage Building
04	Urea Unit 1
05	Urea Unit 2
06	Control Room
07	
08	Air Separation Unit
09	Ammonia Unit
10	
11	Water Treatment
12	Seawater Cooling Tower
13	Closed Cooling Water System
14	Power Generation Unit
15	Entrance Gate
16	
17	
18	Laboratory
19	Maintenance
20	Administration
21	Warehouse
22	Chemical Storage

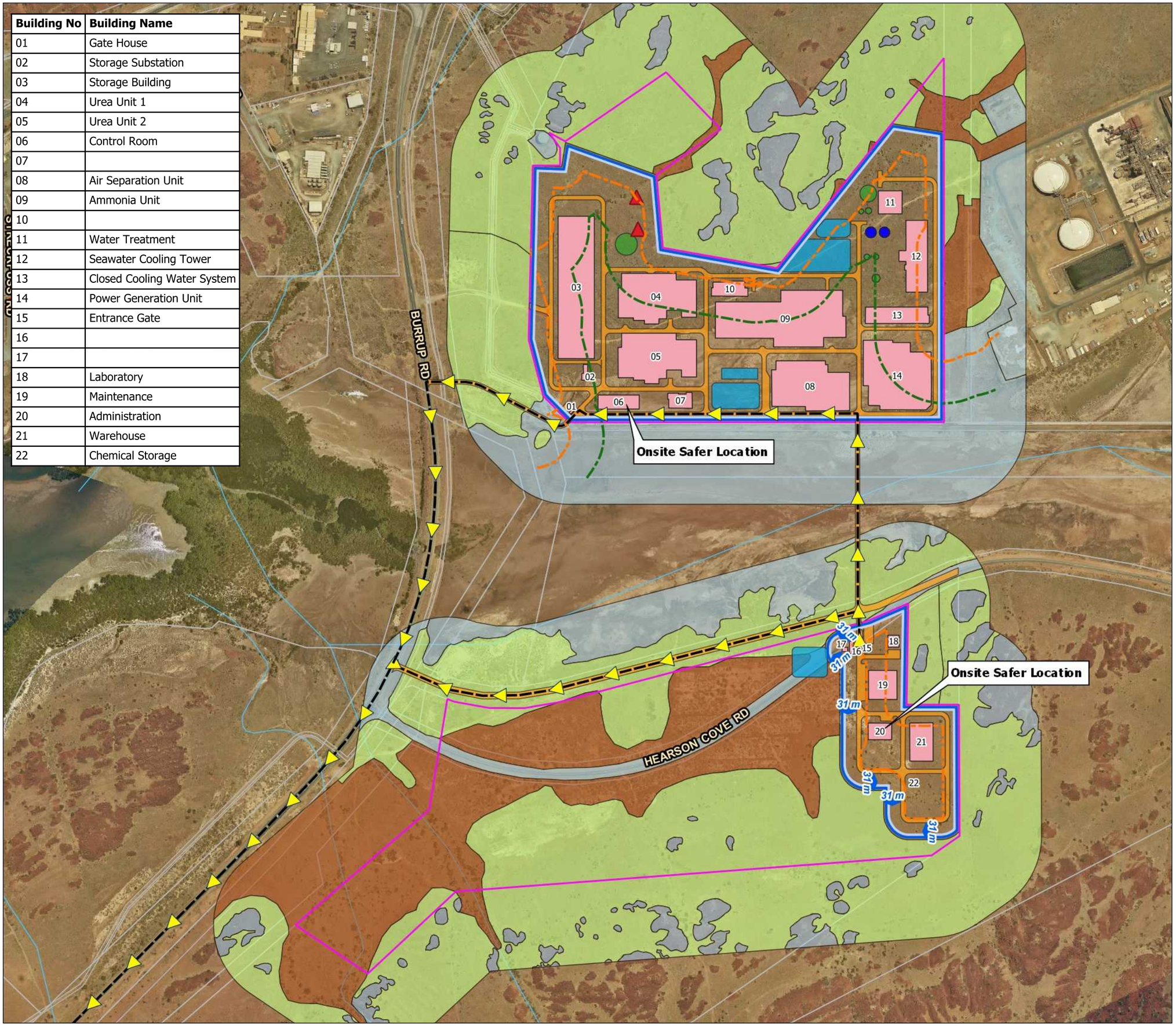


Figure 5.1

Perdaman Urea Plant
Bushfire Lot Management Map

Lot 3016 on Plan 42282
Lots 556 & 557 on Plan 406755
Burrup Road & Hearson Cove Road
BURRUP
CITY OF KARRATHA

------ LEGEND ------

- Access-Egress Route
- Fire Water Tank
- Structures
- Flare Stack
- Tanks
- Driveways
- Ponds
- Asset Protection Zone
- APZ Distance (m)
- Subject Site
- 100m BAL Buffer
- Cadastre
- 10kW/m2 Buffer
- 2kW Buffer Site C only

Classified Vegetation

- Class D - Scrub
- Class G - Grassland
- Exclusion 2.2.3.2

0 50 100 150 200 250 300 350

Metres

------ LOCALITY ------

AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Merctaor Units: Metre
Map by: Ian Macleod 13-02-2022
SCALE (A3): 1 : 6500

BUSHFIRE PRONE PLANNING

6 RESPONSIBILITIES FOR IMPLEMENTATION AND MANAGEMENT OF THE BUSHFIRE PROTECTION MEASURES

Table 6.1: BMP Implementation responsibilities prior to occupancy or building.

Landowner (Developer) - Prior to Occupancy or Building	
No.	Implementation Actions
1	The local government may condition a development application approval with a requirement for the landowner/proponent to register a notification onto the certificate of title and deposited plan. This will be done pursuant to Section 70A *Transfer of Land Act 1893* as amended ('Factors affecting use and enjoyment of land, notification on title'). This is to give notice of the bushfire hazard and any restrictions and/or protective measures required to be maintained at the owner's cost. This condition ensures that: 1. Landowners/proponents are aware their lot is in a designated bushfire prone area and of their obligations to apply the stated bushfire risk management measures; and 2. Potential purchasers are alerted to the Bushfire Management Plan so that future landowners/proponents can continue to apply the bushfire risk management measures that have been established in the Plan.
2	Prior to sale and post planning approval, the entity responsible for having the BMP prepared should ensure that anyone listed as having responsibility under the Plan has endorsed it and is provided with a copy for their information and informed that it contains their responsibilities. This includes the landowners/proponents (including future landowners where the Plan was prepared as part of a subdivision approval), local government and any other authorities or referral agencies ('Guidelines' s4.6.3).
3	Establish the Asset Protection Zones (APZs) within the proposed development sites as shown on Figures 3.4, 3.6 and 3.8. Establish the APZs to the standards established by the Guidelines (refer to Appendix 1) or as varied by the local government through their Firebreak Notice (refer to Appendix 5). This is the responsibility of the developer.
4	Prior to occupation of the development sites, each individual lot is to be compliant with the City of Karratha Fire Break Notice issued under s33 of the Bushfires Act 1954 (See Appendix 5). This may include specifications for asset protection zones that differ from the Guideline's APZ Standards, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with. Refer to Appendix 1 and Appendix 5.
5	Prior to occupancy, install the private driveways to the standards stated in the BMP.
6	Prior to any building work, inform the builder of the existence of this Bushfire Management Plan and the responsibilities it contains, regarding the required construction standards. This will be: • The standard corresponding to the determined BAL, as per the bushfire provisions of the Building Code of Australia (BCA); and/or • A higher standard because the BMP establishes that the construction standard is to correspond to a higher BAL as an additional bushfire protection measure. See Section 5.5 of this Bushfire Management Plan.
7	There is an outstanding obligation, created by this Bushfire Management Plan, for a Risk Management Plan to be developed and approved for the 'high risk' land use (refer to Section 1.2).

Table 6.2: Ongoing management responsibilities for the Landowner/Occupier.

Landowner/Occupier - Ongoing	
No.	Ongoing Management Actions
1	Maintain the Asset Protection Zones (APZs) within the proposed development sites as shown on Figures 3.4, 3.6 and 3.8. Maintain the APZs to the standards established by the Guidelines (refer to Appendix 1) or as varied by the local government through their Firebreak Notice (refer to Appendix 5). This is the responsibility of the developer.
2	Comply with the City of Karratha Fire Break Notice issued under s33 of the Bush Fires Act 1954. This may include specifications for asset protection zones that differ from the Guideline's APZ Standards, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with. Refer to Appendix 1 and Appendix 5.
3	Maintain vehicular access routes within the lot to the required surface condition and clearances as stated in the BMP.
4	Maintain the emergency water supply tank and its associated fittings and vehicular access in good working condition.
5	Ensure that any builders (of future structures on the lot) are aware of the existence of this Bushfire Management Plan and the responsibilities it contains regarding the application of construction standards corresponding to a determined BAL.
6	Ensure all future buildings the landowner has responsibility for, are designed and constructed in full compliance with: 1. the requirements of the WA Building Act 2011 and the bushfire provisions of the Building Code of Australia (BCA); and 2. with any identified additional requirements established by this BMP or the local government.
7	To implement and maintain, the additional bushfire protection measures contained in Section 5.5 of this Bushfire Management Plan, in addition to the measures that are established by the acceptable solutions.
8	The Risk Management Plan containing bushfire risk management measures for flammable onsite hazards and operations with the potential to ignite a bushfire, must be reviewed each year and relevant information updated. All required measures must continue to be complied with.

Table 6.3: Ongoing management responsibilities for the Local Government.

Local Government - Ongoing	
No.	Ongoing Management Actions
1	Monitor landowner compliance with the Bushfire Management Plan and the annual Fire Break Notice.

A1.1 Requirements Established by the Guidelines – Standards for Asset Protection Zones

(Source: Guidelines for Planning in Bushfire Prone Areas - WAPC 2021 v1.4 Appendix 4, Element 2, Schedule 1 and Explanatory Notes)

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

E2 Managing an Asset Protection Zone (APZ) to a low threat state

An APZ is a low fuel area maintained around a habitable building to increase the likelihood that it will survive a bushfire, by providing a defendable space and reducing the potential for direct flame contact, radiant heat exposure and ember attack.

Vegetation management within an APZ should provide defendable space and be maintained to a low threat state, in perpetuity, in accordance with the requirements outlined in Schedule 1.

The width of an APZ varies with slope and vegetation type, however it should only be as wide as needed to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL-29), or 10kW/m² where a building is identified for use as an on-site shelter. An APZ is generally not required where a building or development site achieves 29kW/m² (BAL-29) or lower in its pre-development state (prior to any vegetation clearing or modification).

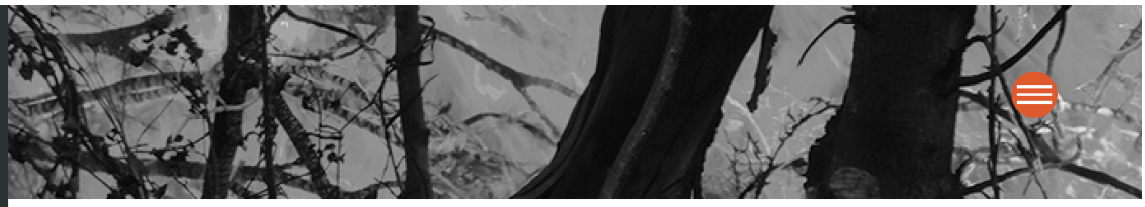
An APZ should include an area of defendable space immediately adjoining a building, that is kept free from combustible items and obstructions, within which firefighting operations can be undertaken to defend the structure. Where a lot contains a building envelope, it may not be necessary for the entire building envelope to achieve 29kW/m² (BAL-29) as this may result in significant unnecessary clearing. It is recommended that the BMP identifies that a sufficient APZ can be accommodated within the building envelope, with the development site and associated APZ to be determined at the development approval stage.

An APZ should be contained within the boundaries of the lot on which the building is situated, except in instances where it is demonstrated that the vegetation on the adjoining land is managed in a low threat state, as per cl. 2.2.3.2 of AS 3959, such as a road, managed park, rocky outcrop or a water body.

The siting of a habitable building and associated APZ should aim to minimise the clearing of vegetation. The BMP should demonstrate that the proposed APZ has minimised the unnecessary loss of vegetation or potential for conflict with landscape or environmental objectives; and complies with environmental approvals/exemptions (where necessary). A re-design or reduction in lot yield may be necessary to minimise the removal and modification of remnant vegetation.

It is recommended that development be located on flat areas or slopes less than 20 degrees (especially where classified vegetation is located downslope to a building) and away from ridge tops, crests or narrow gullies, as bushfire can spread rapidly in these areas. Circumstances where these locations may be suitable for development to occur include where the land is already cleared, and 29kW/m² (BAL-29) or lower can be achieved for the whole development site without the use of an APZ. To ensure soil stability within an APZ, vegetation removal on slopes exceeding 18 degrees is discouraged.

Figure 17: Topography considerations for building locations



ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

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Fine fuel load should be maintained to less than two tonnes per hectare, however this is often a subjective assessment. Reducing fuel load levels does not necessarily require the removal of existing vegetation. A combination of methods can be utilised to reduce fuel load such as raking, weed removal, pruning, mulching and/or the removal of plant material.

A simple method to estimate fuel load is to roughly equate one tonne of fuel load per hectare as 100 grams per square metre. For example, two tonnes per hectare of leaf litter is roughly 200 grams of leaf litter per square metre and eight tonnes per hectare is roughly 800 grams. Eucalyptus leaf litter is approximately 100 grams per handful, so two handfuls of litter per square metre will roughly equate to two tonnes per hectare. Different types of fine fuel, like mulch or pine needles may be more or less than a handful, however the 100 grams per square metre rule of thumb can still be used.

The landowner or proponent is responsible for maintaining an APZ in accordance with Schedule 1 - Standards for Asset Protection Zones. Ongoing maintenance of an APZ is usually enforced through the local government firebreak notice issued under section 33 of the *Bushfires Act 1954*, and/or through a condition of a development approval, which requires the implementation of measures identified within a BMP.

A copy of the firebreak notice and Schedule 1 should be included in a BMP specifically as a how-to guide for the landowner, and to demonstrate to decision-makers that the measures outlined in the BMP to achieve the appropriate BAL rating through provision and ongoing management of an APZ, can be implemented.

Regardless of whether an Asset Protection Zone exists in accordance with the acceptable solutions and is appropriately maintained, it should be noted that fire fighters are not obliged to protect an asset if they think the separation distance between the dwelling and vegetation is unsafe.

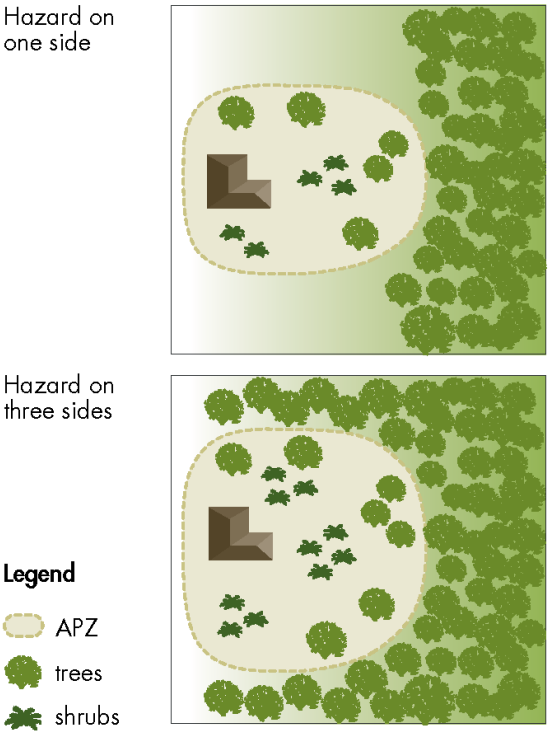
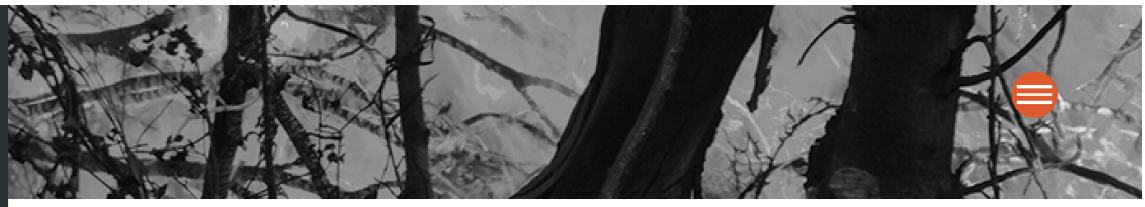


Figure 18: Design of Asset Protection Zone

Refer to Schedule 1: Standards for Asset Protection Zones



ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

E2 Landscaping and design of an asset protection zone

Landscaping, design, and maintenance of an APZ in a bushfire prone area can significantly improve the bushfire resilience of a building. An APZ should not be seen as an area entirely cleared of vegetation, but as a strategically designed space that gives holistic consideration to how existing or proposed vegetation or non-combustible features interact with, or affect the building's bushfire resilience.

A well designed APZ provides a greater level of vegetation management within the first few metres of a building with, for example, less vegetation or inclusion of non-combustible materials. The vegetation within the remainder of an APZ can increase further away from the building with carefully considered plant selection and landscaping techniques.

Strategic landscaping measures can be applied, such as replacing weeds with low flammability vegetation (refer to E2 Plant Flammability) to create horizontal and vertical separations between the retained vegetation. The accumulation of fine fuel load from different plants is an important consideration for ongoing maintenance in accordance with Schedule 1. For example, when planting ground covers under deciduous trees within an APZ, the total fine fuel load prescribed in Schedule 1 will include any dead plant material from ground covers and leaf litter from the trees.

Plant density and final structure and form of mature vegetation should be considered in the initial landscaping stages. For example, clumps of sapling shrubs planted at a density without consideration of future growth, may increase the bushfire risk as a clump will quickly grow to exceed 5m^2. It should be noted that in some cases, a single shrub in a mature state may be so dense as to fill a 5m^2 clump alone.

The location of plants within an APZ is a key design technique. Separation of garden beds with areas of low fuel or non-combustible material, will break up fuel continuity and reduce the likelihood of a bushfire running through an APZ and subjecting a dwelling to radiant heat or direct flame contact. It is important to note, where mature trees are separated from a building by six metres, but the canopy has grown to extend or overhang a building, maintenance and pruning to remove the overhanging branches should be undertaken without the entirety of the tree being removed.

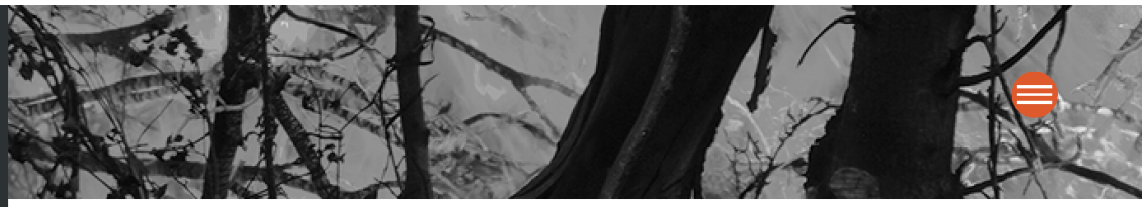
Mulches used within the APZ should be non-combustible. The use of stone, gravel, rock and crushed mineral earth is encouraged. Wood mulch >6mm in thickness may be used, however it is recommended that it is used in garden beds or areas where the moisture level is higher by regular irrigation. These materials could be sourced from non-toxic construction and demolition waste giving the added benefit of reducing the environmental impact of any 'hard landscaping' actions.

Combustible objects, plants, garden supplies such as mulches, fences made from combustible material, should be avoided within 10 metres of a building. Vines or climbing plants on pergolas, posts or beams, should be located away from vulnerable parts of the building, such as windows and doors. Non-flammable features can be used to provide hazard separation from classified vegetation, such as tennis courts, pools, lawns and driveways or paths that use inorganic mulches (gravel or crushed rock). Consider locating firewood stacks away from trees and habitable buildings.

Incorporation of landscaping features, such as masonry feature walls can provide habitable buildings with barriers to wind, radiant heat and embers. These features can include noise walls or wind breaks. Use of Appendix F of AS 3959 for bushfire resistant timber selection within areas of 29kW/m^2 (BAL-29) or below, or the use of non-combustible fencing materials such as iron, brick, limestone, metal post and wire is encouraged.

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

- ensuring gutters are free from vegetation;
- installing gutter guards or plugs;
- regular cleaning of underfloor spaces, or enclosing them to prevent gaps;
- trimming and removing dead plants or leaf litter;
- pruning climbing vegetation (such as vines) on a trellis, to ensure it does not connect to a building, particularly near windows and doors;
- removing vegetation in close proximity to a water tank to ensure it is not touching the sides of a tank; and/or
- following the requirements of the relevant local government section 33 fire break notice, which may include additional provisions such as locating wood piles more than 10 metres from a building.



ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

Preparation of a property prior to the bushfire season and/or in anticipation of a bushfire is beneficial even if your plan is to evacuate. As embers can travel up to several kilometres from a bushfire and fall into small spaces and crevices or land against the external walls of a building, best practice recommends that objects within the APZ are moved away from the building prior to any bushfire event. Objects may include, but are not limited to:

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

E2 Plant flammability

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

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

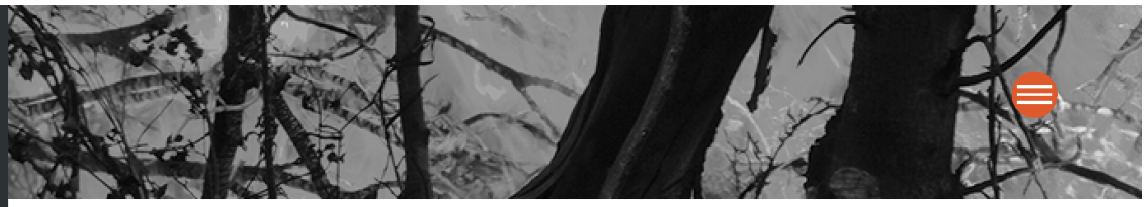
- Fire resistant – plant species that survive being burnt and will regrow after a bushfire and therefore may be highly flammable and inappropriate for a garden in areas of high bushfire risk.
- Fire retardant – plants that may not burn readily or may slow the passage of a bushfire.
- Fire wise – plants that have been identified and selected based on their flammability properties and linked to maintenance advice and planting location within a garden.

Although not a requirement of these Guidelines, local governments may develop their own list of fire wise or fire-retardant plant species that suit the environmental characteristics of an area. When developing a recommended plant species list, local governments should consult with ecologists, land care officers or environmental authorities to ensure the plants do not present a risk to endangered ecological communities, threatened, or endangered species or their habitat.

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

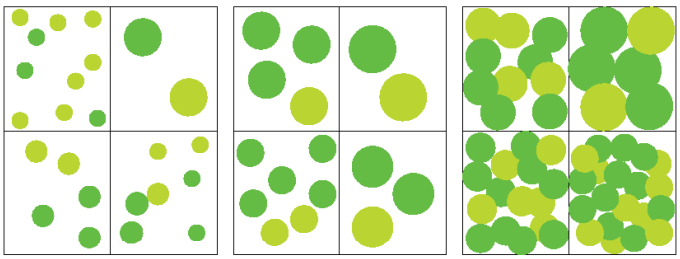
- grow in a predicted structure, shape and height;
- are open and loose branching with leaves that are thinly spread;
- have a coarse texture and low surface-area-to-volume ratio;
- will not drop large amounts of leaves or limbs, that require regular maintenance;
- have wide, flat, and thick or succulent leaves;
- trees that have bark attached tightly to their trunk or have smooth bark;
- have low amounts of oils, waxes, and resins (which will often have a strong scent when crushed);
- do not produce or hold large amounts of fine dead material in their crowns; and/or
- will not become a weed in the area.

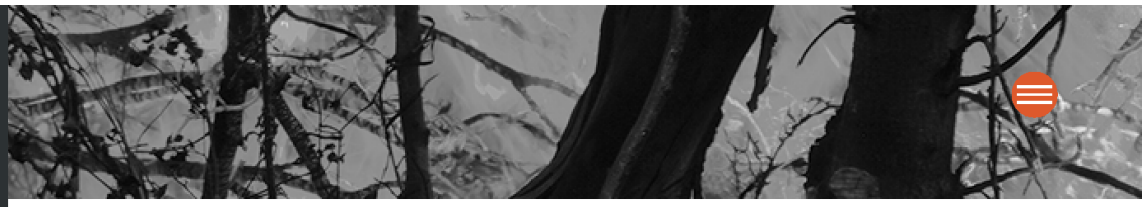
Refer to the WAPC Bushfire and Vegetation Fact Sheet for further information on clearing and vegetation management and APZ landscaping, design and plant selection reference material.



ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Fences within the APZ	• Should be constructed from non-combustible materials (for example, iron, brick, limestone, metal post and wire, or bushfire-resisting timber referenced in Appendix F of AS 3959).
Fine fuel load (Combustible, dead vegetation matter <6 millimetres in thickness)	• Should be managed and removed on a regular basis to maintain a low threat state. • Should be maintained at <2 tonnes per hectare (on average). • Mulches should be non-combustible such as stone, gravel or crushed mineral earth or wood mulch >6 millimetres in thickness.
Trees* (>6 metres in height)	• Trunks at maturity should be a minimum distance of six metres from all elevations of the building. • Branches at maturity should not touch or overhang a building or powerline. • Lower branches and loose bark should be removed to a height of two metres above the ground and/or surface vegetation. • Canopy cover within the APZ should be <15 per cent of the total APZ area. • Tree canopies at maturity should be at least five metres apart to avoid forming a continuous canopy. Stands of existing mature trees with interlocking canopies may be treated as an individual canopy provided that the total canopy cover within the APZ will not exceed 15 per cent and are not connected to the tree canopy outside the APZ. **Figure 19**: Tree canopy cover – ranging from 15 to 70 per cent at maturity  15% 30% 70%
Shrub* and scrub* (0.5 metres to six metres in height). Shrub and scrub >6 metres in height are to be treated as trees.	• Should not be located under trees or within three metres of buildings. • Should not be planted in clumps >5 square metres in area. • Clumps should be separated from each other and any exposed window or door by at least 10 metres.
Ground covers* (<0.5 metres in height. Ground covers >0.5 metres in height are to be treated as shrubs)	• Can be planted under trees but must be maintained to remove dead plant material, as prescribed in 'Fine fuel load' above. • Can be located within two metres of a structure, but three metres from windows or doors if >100 millimetres in height.



ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Grass	• Grass should be maintained at a height of 100 millimetres or less, at all times. • Wherever possible, perennial grasses should be used and well-hydrated with regular application of wetting agents and efficient irrigation.
Defendable space	• Within three metres of each wall or supporting post of a habitable building, the area is kept free from vegetation, but can include ground covers, grass and non-combustible mulches as prescribed above.
LP Gas Cylinders	• Should be located on the side of a building furthest from the likely direction of a bushfire or on the side of a building where surrounding classified vegetation is upslope, at least one metre from vulnerable parts of a building. • The pressure relief valve should point away from the house. • No flammable material within six metres from the front of the valve. • Must sit on a firm, level and non-combustible base and be secured to a solid structure.

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

A1.2 Requirements Established by the Local Government – the Firebreak Notice

The local government's current Firebreak Notice is available on their website, at their offices and is distributed as ratepayer's information. It must be complied with.

These requirements are established by the local government's Firebreak Notice created under s33 of the Bushfires Act 1954 and issued annually (potentially with revisions). The Firebreak Notice may include additional components directed at managing fuel loads, accessibility and general property management with respect to limiting potential bushfire impact.

If Asset Protection Zone (APZ) specifications are defined in the Firebreak Notice, these may differ from the Standards established by the Guideline's, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with.

The APZ dimensions to be physically established and maintained, will be based on which of the following establishes the larger APZ dimension:

- The dimensions corresponding to the determined BAL of a building (refer to Section 3.2 explanation of the 'planning' versus 'building' requirements and 'indicative' versus 'determined' BAL(s)); or
- The APZ dimensions established by the local government's Firebreak Notice.

A1.3 Requirements Recommended by DFES – Property Protection Checklists

Further guidance regarding ongoing/lasting property protection (from potential bushfire impact) is presented in the publication 'DFES – Fire Chat – Your Bushfire Protection Toolkit'. It is available from the Department of Fire and Emergency Services (DFES) website.

A1.4 Requirements Established by AS 3959:2018 – 'Minimal Fuel Condition'

This information is provided for reference purposes. This knowledge will assist the landowner to comply with Management Requirement No. 3 set out in the Guidance Panel at the start of this Appendix. It identifies what is required for an area of land to be excluded from classification as a potential bushfire threat.

"Australian Standard - AS 3959:2018 Section 2.2.3.2: Exclusions - Low threat vegetation and non-vegetated areas:

The Bushfire Attack Level shall be classified BAL-LOW where the vegetation is one or a combination of the following:

a) Vegetation of any type that is more than 100m from the site.

b) Single areas of vegetation less than 1ha in area and not within 100m of other areas of vegetation being classified vegetation.

c) Multiple area of vegetation less than 0.25ha in area and not within 20m of the site or each other or other areas of vegetation being classified vegetation.

d) Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or each other, or other areas of vegetation being classified vegetation.

e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.

f) *Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a* ***minimal fuel condition,*** *(means insufficient fuel available to significantly increase the severity of a bushfire attack – for example, recognisable as short cropped grass to a nominal height of 100mm), mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks (single row of trees)."*

Each local government may have their own standard technical requirements for emergency vehicular access, and they may vary from those stated in the Guidelines.

When required, these are stated in Section 5.1 of this bushfire management plan.

Requirements Established by the Guidelines – The Acceptable Solutions

(Source: Guidelines for Planning in Bushfire Prone Areas WAPC 2021 v1.4, Appendix 4)

EXPLANATORY NOTES

E3.6 Private driveways

In areas serviced by reticulated water, where the road speed limit is not greater than 70 km/h, and where the distance from the public road to the further part of the habitable building is no greater than 70 metres, emergency service vehicles typically operate from the street frontage.

In the event the habitable building cannot be reached by hose reel from the public road, then emergency service vehicles will need to gain access within the property. Emergency service vehicles will also need to gain access within the property, where access to reticulated water (fire hydrants) is not possible. In these situations, the driveway and battle-axe (if applicable) will need to be wide enough for access for an emergency service vehicle and a vehicle to evacuate.

Turnaround areas should be available for both conventional two-wheel drive vehicles of residents and Type 3.4 fire appliances. Turn-around areas should be located within 30 metres of habitable buildings. Circular and loop driveway design may also be considered. Note that the design requirements for a turn-around area for a private driveway or battle-axe differ to a cul-de-sac.

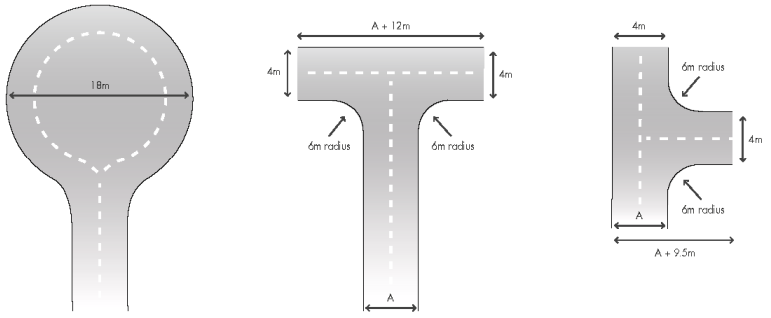


Figure 28: Design requirements for a turn-around area for a private driveway or battle-axe

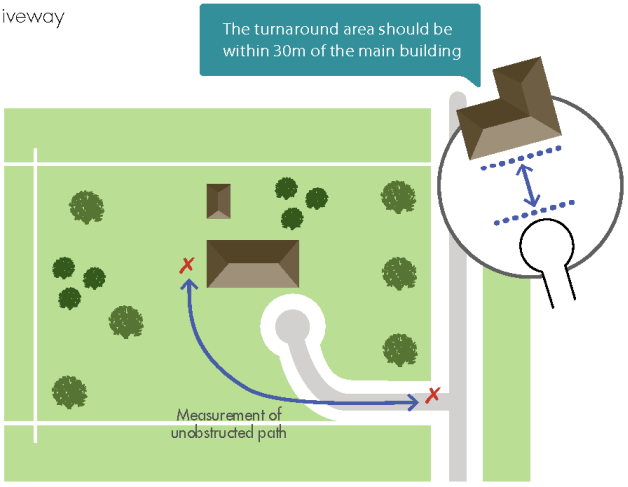


Figure 29: Design requirements for a private driveway where required under A3.6

Table 6: Vehicular access technical requirements

TECHNICAL REQUIREMENTS	1 Public roads	2 Emergency access way[1]	3 Fire service access route[1]	4 Battle-axe and private driveways[2]
Minimum trafficable surface (metres)	In accordance with A3.1	6	6	4
Minimum horizontal clearance (metres)	N/A	6	6	6
Minimum vertical clearance (metres)	4.5			
Minimum weight capacity (tonnes)	15			
Maximum grade unsealed road[3]	As outlined in the IPWEA Subdivision Guidelines	1:10 (10%)		
Maximum grade sealed road[3]		1:7 (14.3%)		
Maximum average grade sealed road		1:10 (10%)		
Minimum inner radius of road curves (metres)		8.5		

Notes:

[1] To have crossfalls between 3 and 6%.

[2] Where driveways and battle-axe legs are not required to comply with the widths in A3.5 or A3.6, they are to comply with the Residential Design Codes and Development Control Policy 2.2 Residential Subdivision.

[3] Dips must have no more than a 1 in 8 (12.5% -7.1 degree) entry and exit angle.

DETERMINING 2 KW/M² SEPARATION DISTANCES

Vegetation Areas 1 and 8

Calculated February 8, 2022, 12:39 pm (BALc v.4.9)

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	110	Rate of spread	28.51 km/h
Vegetation classification	Grassland	Flame length	9.699999999999999 m
Understorey fuel load	4.5 t/ha	Flame angle	85 °
Total fuel load	4.5 t/ha	Panel height	9.66 m
Vegetation height	n/a	Elevation of receiver	4.83 m
Effective slope	10 °	Fire intensity	66,286 kW/m
Site slope	0 °	Transmissivity	0.731
Distance to vegetation	105 m	Viewfactor	0.0245
Flame width	100 m	Radiant heat flux	2 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated February 8, 2022, 12:42 pm (BALc v.4.9)

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	5.88 km/h
Vegetation classification	Scrub	Flame length	13.62 m
Understorey fuel load	25 t/ha	Flame angle	84 °
Total fuel load	25 t/ha	Panel height	13.55 m
Vegetation height	3 m	Elevation of receiver	6.77 m
Effective slope	5 °	Fire intensity	75,987 kW/m
Site slope	0 °	Transmissivity	0.718
Distance to vegetation	126 m	Viewfactor	0.0248
Flame width	100 m	Radiant heat flux	1.99 kW/m²
Windspeed	45 km/h	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

Rate of Spread - Catchpole et al. 1998

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated February 8, 2022, 12:38 pm (BALc v.4.9)

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	110	Rate of spread	20.19 km/h
Vegetation classification	Grassland	Flame length	8.16 m
Understorey fuel load	4.5 t/ha	Flame angle	86 °
Total fuel load	4.5 t/ha	Panel height	8.140000000000001 m
Vegetation height	n/a	Elevation of receiver	4.07 m
Effective slope	5 °	Fire intensity	46,945 kW/m
Site slope	0 °	Transmissivity	0.736
Distance to vegetation	96 m	Viewfactor	0.0241
Flame width	100 m	Radiant heat flux	1.98 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated February 8, 2022, 12:36 pm (BALc v.4.9)

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	110	Rate of spread	14.3 km/h
Vegetation classification	Grassland	Flame length	6.87 m
Understorey fuel load	4.5 t/ha	Flame angle	86 °
Total fuel load	4.5 t/ha	Panel height	6.85 m
Vegetation height	n/a	Elevation of receiver	3.42 m
Effective slope	0 °	Fire intensity	33,247 kW/m
Site slope	0 °	Transmissivity	0.742
Distance to vegetation	87 m	Viewfactor	0.024
Flame width	100 m	Radiant heat flux	1.99 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

DETERMINING 10 KW/M² SEPARATION DISTANCES

Vegetation Areas 1 and 8

FPA AUSTRALIA | FLAMESOL

Calculated February 8, 2022, 12:28 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	110	Rate of spread	28.51 km/h
Vegetation classification	Grassland	Flame length	9.699999999999999 m
Understorey fuel load	4.5 t/ha	Flame angle	65 °, 72 °, 77 °, 80 °, 81 ° & 85 °
Total fuel load	4.5 t/ha	Elevation of receiver	4.39 m, 4.61 m, 4.72 m, 4.77 m, 4.79 m & 4.83 m
Vegetation height	n/a	Fire intensity	66,286 kW/m
Effective slope	10 °	Transmissivity	0.871, 0.855, 0.833, 0.8100000000000001, 0.797 & 0.738
Site slope	0 °	Viewfactor	0.4098, 0.3022, 0.2037, 0.1379, 0.1118 & 0.0302
Flame width	100 m	Minimum distance to < 40 kW/m²	11.7 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	15.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	23.1 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	32.6 m
		Minimum distance to < 10 kW/m²	38.7 m

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Vegetation Areas 2 and 7

FPA AUSTRALIA | FLAMESOL

Calculated February 8, 2022, 12:29 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	80	Rate of spread	5.88 km/h
Vegetation classification	Scrub	Flame length	13.62 m
Understorey fuel load	25 t/ha	Flame angle	65 °, 70 °, 75 °, 78 °, 79 ° & 84 °
Total fuel load	25 t/ha	Elevation of receiver	6.17 m, 6.4 m, 6.58 m, 6.66 m, 6.68 m & 6.77 m
Vegetation height	m	Fire intensity	75,987 kW/m
Effective slope	5 °	Transmissivity	0.859, 0.841, 0.8159999999999999, 0.792, 0.781 & 0.727
Site slope	0 °	Viewfactor	0.4145, 0.3085, 0.2078, 0.1411, 0.1145 & 0.0307
Flame width	100 m	Minimum distance to < 40 kW/m²	16.2 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	21.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	30.8 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	42.2 m
		Minimum distance to < 10 kW/m²	49.3 m

Rate of Spread - Catchpole et al. 1998

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated February 8, 2022, 12:30 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	110	Rate of spread	20.19 km/h
Vegetation classification	Grassland	Flame length	8.16 m
Understorey fuel load	4.5 t/ha	Flame angle	66 °, 72 °, 77 °, 81 °, 82 ° & 85 °
Total fuel load	4.5 t/ha	Elevation of receiver	3.73 m, 3.88 m, 3.97 m, 4.03 m, 4.04 m & 4.06 m
Vegetation height	n/a	Fire intensity	46,945 kW/m
Effective slope	5 °	Transmissivity	0.876, 0.863, 0.841, 0.819, 0.806 & 0.744
Site slope	0 °	Viewfactor	0.4075, 0.3006, 0.201, 0.1361, 0.1106 & 0.03
Flame width	100 m	Minimum distance to < 40 kW/m²	9.9 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	13.4 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	19.9 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	28.4 m
		Minimum distance to < 10 kW/m²	33.9 m

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated February 8, 2022, 12:31 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	110	Rate of spread	14.3 km/h
Vegetation classification	Grassland	Flame length	6.87 m
Understorey fuel load	4.5 t/ha	Flame angle	66 °, 72 °, 78 °, 81 °, 82 ° & 86 °
Total fuel load	4.5 t/ha	Elevation of receiver	3.13 m, 3.26 m, 3.36 m, 3.39 m, 3.4 m & 3.42 m
Vegetation height	n/a	Fire intensity	33,247 kW/m
Effective slope	0 °	Transmissivity	0.881, 0.869, 0.85, 0.828, 0.8159999999999999 & 0.75
Site slope	0 °	Viewfactor	0.4037, 0.2976, 0.1994, 0.1344, 0.1096 & 0.0297
Flame width	100 m	Minimum distance to < 40 kW/m²	8.4 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	11.4 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	16.9 m
Flame temperature	1,200 K	Minimum distance to < 12.5 kW/m²	24.6 m
		Minimum distance to < 10 kW/m²	29.5 m

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

FIRE BREAK NOTICE

City of Karratha

Important: The works outlined below must be completed and maintained within **14 days** of this notice.

NOTICE TO ALL OWNERS AND OCCUPIERS OF LAND WITHIN THE CITY OF KARRATHA

Pursuant to Section 33 of the *Bush Fires Act 1954 (WA)*, the City of Karratha gives you written notice to act as specified in this notice to land that you own and/or occupy and with respect to any matter which is upon the land that you own and/or occupy situated within the City of Karratha.

Persons who fail to comply with the requirements of this order may be issued with an infringement notice which carries a modified penalty of $250 and a maximum penalty of $25 000.

In accordance with the Act, Council may carry out the required works at the expense of the land owner or occupier regardless if issued with an infringement.

ALL LAND WITH A TOTAL AREA OF 2024m^2 OR MORE

FIRE-BREAKS

Provide firebreaks at least three (3) metres wide, immediately inside all external boundaries of the land and also immediately surrounding all buildings and haystacks situated on the land. Where several adjoining lots are held or used by the owner/occupier, the firebreaks may be provided inside and along the external boundaries of the group or lot.

DEAD FLAMMABLE MATERIAL

Maintain all dead flammable material below 8 tonne per hectare (see definition fuel load).

SLASHING

Dead grass, shrubs and plants shall be slashed, mowed, or trimmed down to a height no greater than 50mm across the entire property.

SPECIAL RURAL LAND

The owners of all small rural holdings zoned as Special Rural under Town Planning Schemes must maintain clear of all flammable materials a firebreak not less than three (3) meters wide immediately inside all external boundaries of the land.

FUEL AND/OR GAS DEPOTS

In respect of land owned and/or occupied by you on which is situated any container normally used to contain liquid or gas fuel, including the land on which any ramp or supports are constructed, you shall have the land clear of all flammable material.

RURAL AND TOWN SITE LAND (INCLUDES RESIDENTIAL, COMMERCIAL AND INDUSTRIAL) WITH A TOTAL AREA LESS THAN 2024m^2

DEAD FLAMMABLE MATERIAL

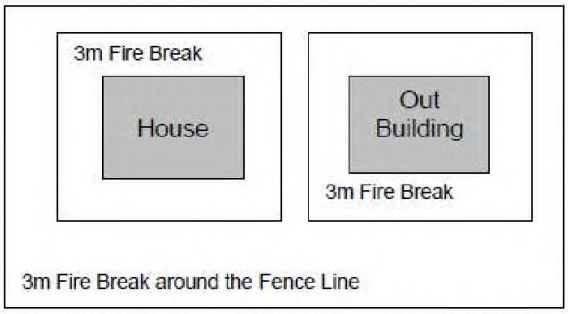
Remove all flammable material on the land except living standing trees, from the whole of the land.

SLASHING

Dead grass, shrubs and plants shall be slashed, mowed, or trimmed down to a height no greater than 50mm across the entire property.

CLEAN GUTTER DEBRIS

Ensure gutters, roofs and walls of buildings are free of flammable matter



VARIATION TO THE FIRE BREAK NOTICE

If you consider, for any reason, that it is impractical to meet the requirements as per this notice, you may apply in writing for a variation to the requirements of this notice.

ADDITIONAL WORKS

In addition to the requirements of this notice, regardless of land size, you may be required to carry out further fire prevention works on your land to reduce any hazards considered necessary by the duly Authorised Officer of the City of Karratha. If required, these requirements will be outlined in a 'work order' sent to the address of the owner and/or occupier.

DEFINITIONS

FIREBREAK
A strip of land cleared of all flammable material with the intention of minimising the spread or extension of a bushfire and provide safe access on your property for emergency vehicles and other firefighting operations.

- No less than 3 metres wide and 4 metres height clearance inside and along all boundaries (including boundaries adjacent to roads, rail and drain reserves and all public open space reserves).
- Must have a corner turning radius of up to 10 metres
- Must be a mineral earth break with a continuous trafficable surface for a 4WD vehicle, clear of any obstructions and must not terminate in a cul-de-sac (dead end)
- Maintained and living lawns are acceptable in conjunction with or in lieu of mineral earth fire breaks, provided that the same width and height requirements for a fire break are applied.

FUEL LOAD:
Any material such as wood, leaves and grass that is likely to be ignited and capable of burning.

- Leaf litter on the ground inclusive of leaves, twigs (up to 6mm diameter) and bark. A fuel load depth of 15mm from the top layer to the mineral earth beneath is indicative of approximately 8 tonne per hectare
- Mulch piles, stored firewood and burn piles contribute to fuel load and must be stored safely or removed from the property.

RESTRICTED BURNING PERIOD

You need a 'Permit to Burn' from the City of Karratha to carry out any burning at any time during the year
A PERMIT TO BURN ANYTHING IS REQUIRED ALL YEAR ROUND

WHAT DO I NEED A PERMIT FOR?
Permits are required all year round for.:
1. Burning rubbish,
2. Burning grass and vegetation.
3. Setting fire to bush or vegetation.

PROHIBITED BURNING
Burning off is totally prohibited and permits are not valid on days of Very High, Severe, Extreme or Catastrophic fire danger forecast.

HOW DO I OBTAIN A PERMIT?
A permit to burn must be applied for by contacting the City of Karratha. Your request will be assessed and if successful, all conditions laid down on the permit must be followed. Permits to Burn in residential areas are issued only where alternative means of removing fire hazards are not practical.

WHEN AND HOW TO BURN
If you have a permit, take all the proper precautions and reduce the risk of damage to, or loss of, your property or business. The safety of our community is at stake.

CAN I BURN GARDEN REFUSE?
Garden refuse may NOT be burnt in the City of Karratha as the public tip is free for residential rubbish.

MORE INFORMATION
If you require any further information, please call the City of Karratha Ranger Services team on (08) 9186 8555 or visit the City of Karratha Administration Building, Welcome Road, Karratha.