

3 February 2023

Shire of Serpentine Jarrahdale
6 Paterson Street
Mundijong WA 6123

cc. email to Andrew Trosic, copy to Vesna Baskovic, Nino Scidone, Ashwin Nair

Dear Andrew,

**WESTERN AUSTRALIAN PLANNING COMMISSION DEVELOPMENT APPLICATION
- LOT 201 (NO. 169) DOLEY ROAD, BYFORD**

Iredale Pedersen Hook Architects, acting on behalf of the landowners (Department of Fire and Emergency Services) submits this development application (**Attachment 1 Application Forms for Planning Approval**, including – MRS Form 1 Application for Planning Approval, and Shire of Serpentine Jarrahdale Application for Development Approval) for the proposed construction of a new Career Fire and Rescue Services Fire Station on Lot 201 (no. 169) Doley Road, Byford (CT 2532/605) (the site).

The works are identified as public works and therefore the application requires determination by the Western Australian Planning Commission (WAPC). It would be appreciated if the Shire of Serpentine-Jarrahdale (the Shire) forwards the application to the WAPC within the 7-day timeframe prescribed by Clause 29(1) of the MRS.

It is understood that no fees are payable as a public works project

Site description and ownership

The site is located within the Shire of Serpentine and Jarrahdale and is bounded by Yandra Street to the north, Orton Road to the south, and Doley Road to the west. The site currently has a residential building and associated outbuildings.

A copy of the current Certificate of Title is provided (**Attachment 2 – Certificate of Title**)

Planning Context

The site is currently zoned Urban under the Metropolitan Region Scheme. It is zoned Urban Development under the Shire's Town Planning Scheme No. 2 (within Development Area 3). The Urban Development zone requires Structure Plans to be completed prior to commencement of any development.

The site can accommodate current and future personnel, fleet and equipment in a strategically positioned location, that will enhance service delivery to the South-East Metropolitan region, complementing surrounding peri-urban regions and the developments around the new METRONET rail infrastructure in Byford.

It is understood from our earlier consultation, in addition to DFES consultation that the Shire supports the proposed location of the Fire Station.

This development is entirely compliant with the applicable development requirements under the Shire's Planning Scheme Text and associated Local Planning Policies, with no proposed variations to the local scheme and policies etc.

Description of Proposed Works

The proposed works includes the demolition of existing structures, site works and the construction of the new fire station (**Drawing Attachments – Development Application Plans**). The specific scope of the works subject to this application include:

The proposed works are to be in 2-stages being, forward works and main works.

The proposed forward works are for the proposed fire station, and are including-

- (1) the demolition of all of the existing residential buildings, out-buildings, site features, site services and landscaping etc. as noted on the drawings, specification and reports as noted;
- (2) the pest management etc. as noted;
- (3) civil works for bulk earthworks; and
- (4) preparation and make-good works for the site sewer extension to the site, adjacent to Yandra Street (by the utility provider).

The proposed main works are for the proposed fire station, and are including the building, covered areas and services, incorporating-

- (1) 6-dormitories and amenity spaces suitable for approx. 12-persons at a time, with 4-shifts of 6-fire-fighters to be assigned to the station (up to a maximum of 32-persons);
- (2) 2-appliance bays to house the fire trucks;
- (3) working spaces for emergency responses;
- (4) storage for plant and equipment;
- (5) training spaces such as the training tower and lay-down for fire-fighter training etc. The training exercises are outlined in the Acoustic Report and can be limited to day time only. The proposed training tower is located away from the residential zone along Yandra Street, with overlooking only into the front yards of those houses;
- (6) carparking for 12-staff, 2-visitors and 1-for drycleaning delivery including-
 - a. covered carparking for staff at the rear of the site, with proposed crossover at Doley Road;
 - b. visitor and dry-cleaning delivery bays, also including an accessible bay at the front of the building, with a proposed crossover at Orton Road;
 - c. appliance movements are expected to be up to 12-per day;
 - d. visitors are expected to be up to 2-per day;
 - e. As per the Traffic Impact Statement, "The traffic generated by the development is estimated to be 40 vehicles daily with peak hour of 12 movements" – which can be adequately catered for. and
- (7) boundary walls, fencing and landscaping works etc., noting-
 - a. Proposed boundary walls area adjacent to the training areas at the rear of the site, adjacent to Doley Road, and also adjacent to the external amenity area, adjacent to Orton Road;
 - b. Proposed boundary fencing (Perforated Aluminium Pattern) adjacent to the training areas at the rear of the site, adjacent to Doley Road – for limited visibility;
 - c. Proposed boundary fencing (Proprietary Garrison Fencing) adjacent to landscaped areas at the east of the site;
 - d. Existing boundary fencing (Colorbond Fencing) at the rear of the site, adjacent to Yandra Street; and
 - e. Proposed boundary fencing (Colorbond Fencing) at east of the site.

The proposed building is single storey with additional development height provided to accommodate the parking and servicing of the fire trucks. It will have an 18.47m setback to the western lots boundary and will be setback approximately 9m from the southern boundary. Access to the development will predominantly occur from Doley Road via a hardstand driveway. Access from the development for the fire truck will occur onto Orton Road via a second hardstand driveway. Infrequent access to the development will occur from Orton Road, for up to 2-visitors per day and drycleaning service vehicles.

Summary of operations

The proposed development will be a secure site that as an emergency service operates 24 hours a day, 7 days a week and is only accessible by authorised personnel.

The design of the proposed fire station is considered to deter any anti-social behaviour.

The benefit of having this service available to local residents is considered to outweigh any negative impacts associated with activity outside of ordinary business hours.

The amount of traffic generated is not considered to be significant when considering the higher order nature of Orton Road, particularly when its development is complete. In this regard the proposed traffic accessing the development will be a very minor percentage and will not negatively impact the existing residential amenity.

Site considerations

- (1) Traffic – A Traffic Impact Statement was undertaken by Porter Engineering to support this proposal (**Attachment 13**). As outlined within this report this development has adequately considered the transport aspects of the development application:
 - a. Provision of 14 parking bays will satisfy the expected parking demand; and
 - b. traffic generated by the development is estimated to be 40 vehicles daily with peak hour of 12 movements. This additional traffic generated can be adequately catered for on the surrounding road network in context with these roads existing hierarchy function and spare capacity.
- (2) Bushfire Management – As the subject site is within a Bushfire Prone Area, the Bushfire Attack Level Assessment (**Attachment 3**) and Bushfire Management Plan (**Attachment 8**) was undertaken and has been prepared by Bushfire Prone Planning to support the proposed development. The applicable BAL assessment determined that the proposed development would be subject to a BAL rating of 12.5.
- (3) Storage and Management of Waste - A Waste Management Plan has been prepared by Syrinx to support this proposal (**Attachment 18**). As the proposed development will include various types of waste, both liquid and solid, a number of different management measures will be implemented as part of the proposed development. In light of the proposed measures, it is considered that waste generated at the subject site will be appropriately managed. These measures include:
 - i. Domestic liquid waste will be discharged into the gravity fed urban sewerage infrastructure;
 - ii. Industrial liquid waste will be treated on site and separated through passive and mechanical engineering measures. Specialist waste contractors will remove separated industrial waste from the site with the compliant by-product discharged into the sewerage system.
 - iii. Domestic solid waste will be disposed of via Council collection in the provided bins or via a commercial waste contractor if collection isn't available.
 - iv. Industrial solid waste will all be managed by specialist waste contractors licenced to collect and dispose of the applicable waste.
- (4) Environmental Considerations
 - a. Vegetation and Fauna – An Environmental Management Plan has been prepared by Syrinx to support this proposal (**Appendix 12**). With a Flora and Fauna Survey prepared by Aurora (**Attachment 15**). No occurrences of intact native vegetation communities were observed at the Site in the recent flora survey. And, Due to lack of vegetation cover, the fauna assemblage of the site is limited. Quenda (also known as the Southern Brown Bandicoot (*Isoodon obesulus fusciventer*), a Priority 4 listed species, were sighted during the Site inspection in September 2022. Significant existing vegetation and existing soils and topography are proposed to be retained to contribute to providing a sense of place and meeting sustainability objectives, particularly when considering stormwater management. The remnant Threatened *Corymbia calophylla* - *Kingia australis* woodlands species along the southern boundary are of particular importance for retention, and the site will be developed for expansion of the dwindling Guildford Complex vegetation community.

- b. Stormwater/ Rainwater Retention – As per the Environment Management Plan as above, and the Stormwater Drainage Plan (**Attachment 14**).
 - i. The site soils in their current state are not suitable for stormwater disposal via conventional soak wells.
 - ii. For the carpark and laydown areas (at the rear of the site, excluding the Covered Servicing Area and Training Pad), proposed drainage of the upper sand layer via subsoil drains will be provided to mitigate soil shrink: swell movement. In addition, proposed vegetated biofilters will be provided for biological stormwater treatment. No swale will be provided (minimising mosquitos .
 - iii. At the Covered Servicing Area and Training Pad, spills will be controlled with no material entering into the stormwater drains.
 - iv. The proposed rainwater tank will collect the rainwater off roofs, for reuse for irrigation.
- c. Acoustic – An Acoustic Report has been prepared by Gabriels Hearne Farrell to support this proposal (**Attachment 16**). This Acoustic Report has addressed each of the project specific acoustic design issues relevant to the Development Application stage. Based on the acoustic modelling predicted noise levels, it is evident that that are times at which a large portion of training activities are expected to exceed the Assigned Noise Levels. It is our understanding that the majority of training exercises can be limited to daytime only, therefore the level of non-compliance may only be relevant to the daytime criteria. Even with this in mind it is predicted that all activities will exceed the regulations for at least one receiver position, depending upon the location of the noise source. Based on these results it is our understanding that the client will be seeking an exemption from meeting the Regulations under Part 1, Section 6 of the Environmental Protection Act 1986: “Power of Minister or Authority to exempt”. Due to the outdoor nature and necessity of the training activities for the Fire Station to safely and correctly operate, this ministerial exemption will be required and that DFES will provide the supporting noise management plan (at the post-occupation stage, and once this Report is approved), limiting the frequency and timing of certain activities so as to reduce the likelihood of complaints from neighbours. It is expected that this would provide a direct line of contact available between the duty manager and any adjacent neighbour such that any concerns can be addressed immediately.

Consultation

Further to our discussion with the Shire of Serpentine Jarrahdale, 11 November 2022 and various email correspondence - Dynamic Planning and Developments Pty Ltd (DPD) held a meeting on 31 August 2022 with the Department of Planning, Lands and Heritage to discuss the Career Fire Station and the public works approval process. This meeting was to build upon the previous advice provided by the Shire and determine the Departments willingness for the proposal as a potential determining authority. A summary of discussion points from the meeting is as follows:

1. The DPLH officers confirmed that the access to Orton Road for emergency vehicles is not considered to be a major issue, subject to an internal review by the Departments Traffic Team justifying the arrangement under ‘Lights and Siren’ conditions.
2. A key component of the MRS assessment will be determining the extent of the amenity impacts on the surrounding residential development. As such the standard documentation referenced by the Shire in their meeting will be required to demonstrate no adverse amenity impacts are proposed.

Sewer - Application has been made to the Authority for the proposed sewer gravity main extension as part of the forward works stage. A 150mm diameter sewer extension approx. 9.1m in length is to connect to an existing 150mm diameter sewer. To serve this lot only.

Water - The Water Corporation does not envisage any major implications with supplying Potable cold water boundary connections to meet the sites peak demands. It is intended to obtain a new 50mm potable cold water boundary from the 100mm Water Corporation main located in Yandra Road. The 50mm meter, backflow prevention device, by-pass and pressure limiting valve will be housed in an approved enclosure located on Yandra Road.

Power - Ongoing consultation and liaison with Western Power and Shire of Serpentine Jarrahdale is being undertaken. A low voltage supply will be provided by Western Power to serve the fire station. Western Power will be requested to provide the connection via a District Substation recommended to be established on the Doley Road lot boundary. The substation to be in accordance with DSM-3-04 (350-1000kVA District Substation), see appendix for requirements. An application has been submitted to Western Power for the proposed new connection for confirmation of the above. ETC has preliminary requested 250amps/150kVA however further advice from DFES regarding EV charging and requirement for an additional 250amps. Once Western Power starts the design process ETC will request for the power supply increase to 500amps.

There is an existing western power pillar at the Doley Street boundary that can remain and be utilised as the builders temporary power supply. This will be removed once the new substation is established and site is energised on permanent power. There is an existing street light pole on Doley Road that is clashing with the new driveway crossover. An application has been submitted to Western Power during the design for relocation of the existing light pole.

Planning Assessment

Dynamic Planning and Developments Pty Ltd (DPD) has carried out a detailed planning investigation pertaining to the proposed Career Fire and Rescue Services Fire Station at Lot 201 (No. 169) Doley Road, Byford. Our investigation concludes that the applicable statutory planning framework allows for development approval of the proposed Career Fire Station at the subject site. Key considerations that resulted from our investigation included:

1. The Local Planning Scheme is given due regard as part of the approval process. Being a public works application by a public authority, Section 6 of the Planning and Development Act 2005 specifies that the development would be exempt from requiring planning approval under the Shire's Local Planning Scheme. However, in exercising this exemption, to comply with the following: To have regard to the purpose and intent of the local planning scheme; To have regard to the principles of proper and orderly planning and amenity of the area; and To consult with the local government when a proposal is being formulated for any public work, or the taking of land for a public work.
2. Emergency vehicle access to Orton Road is possible subject to a Traffic Impact Assessment justifying the arrangement under 'Lights and Siren' conditions, despite being a higher order road and future 'Other Regional Road'.
3. The requirement to provide a developer contribution as part of the approval implementation and a public art contribution to a cost of 1% of the development cost.
4. The proposed development cedes land, to a width of 6m along Orton Road to facilitate the required road widening and upgrade works proposed for Orton Road.
5. The development will maintain a 6x6m visual truncation at Yandra Street.
6. The clearing of vegetation is limited as above, in spite of large scale clearing that has already occurred on surrounding sites. To support the clearing, a flora and fauna assessment as part of the development application process is provided (**Attachment 15**).

7. Ultimately, the site is suitable for its intended development and there are no constraints to suggest approval would not be granted.

Assessment against the MRS

Clause 30 of the MRS requires the decision maker (WAPC) to have regard to the following factors when determining a Development Application:

- *The purpose for which the land is zoned or reserved under the Scheme*
As above, The site is zoned Urban under the MRS and Urban Development under the Shire's Town Planning Scheme. The proposed works are considered to be consistent with the zone under the MRS.
- *The orderly and proper planning of the locality*
The proposed development complies with the strategic and statutory planning intent for the site as the site is identified in the relevant planning instruments.
- *The preservation of amenities of the locality*
Given the existing use of the surrounding locality, and the nature and scale of the proposed works, the proposal is considered to have a negligible impact on the amenity of the surrounding locality.

We look forward to your favourable consideration and recommendation of this proposal to enable the Department of Fire & Emergency Services to progress the delivery of new fire station for the Byford community.

If any further information is required, please do not hesitate to contact the undersigned.

Regards,

Tania Perrella
Senior Architect, Iredale Pedersen Architects (Applicant), 08 9322 9750
24 February 2023

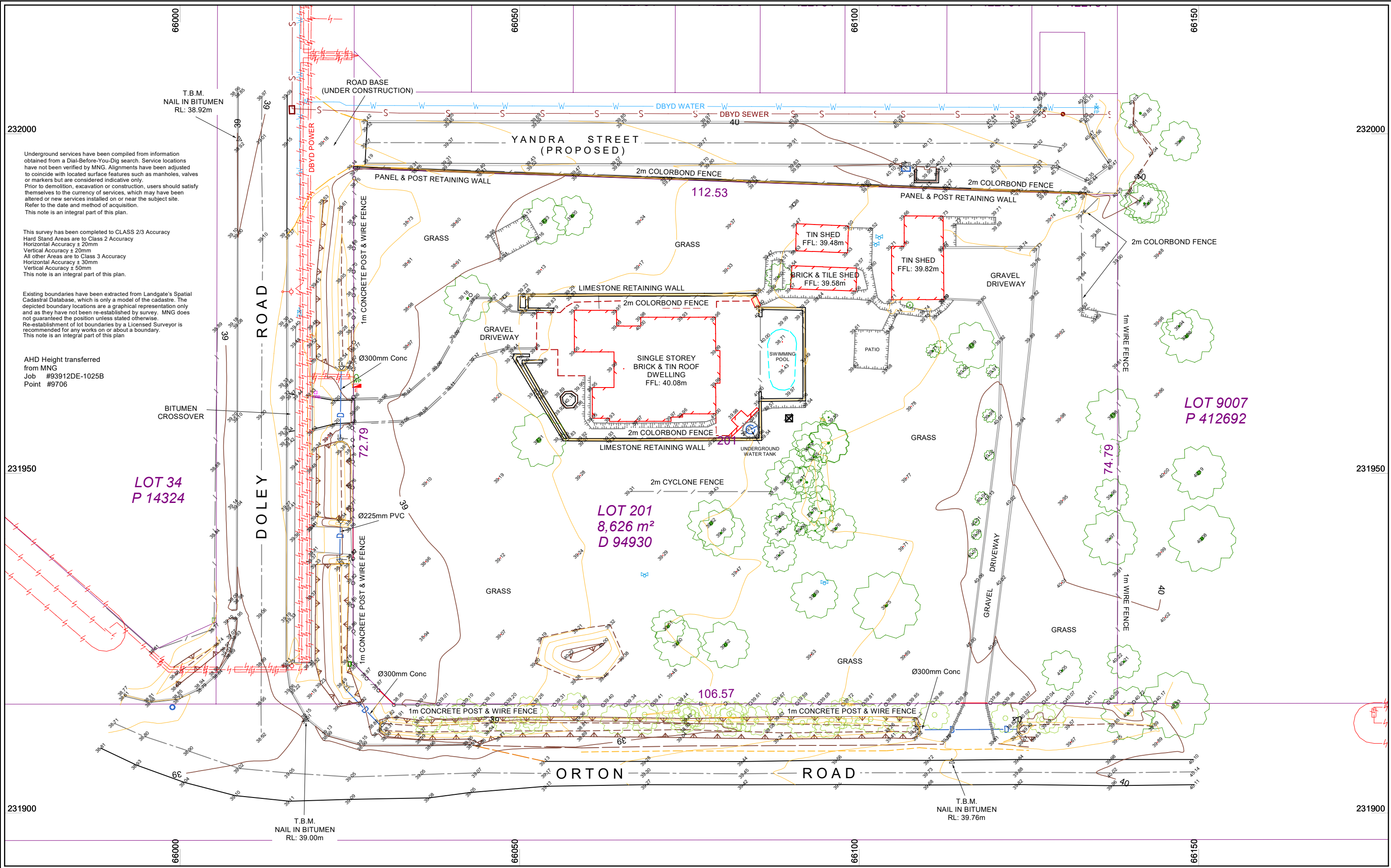
Enclosed Information as per Table 1 The Shire Application for Development Approval-

- (1) Attachment 1 - Application Forms for Planning Approval, including – MRS Form 1 Application for Planning Approval
- (2) Attachment 2 - Copy of the Certificate of Title
- (3) Attachment 3 - Bushfire Attack Level Assessment: Noted as BAL-12.5 for this development that is not determined as vulnerable or high-risk.
- (4) Attachment 4 - Existing Site Plan as per the Feature Survey Plan (1:500 A3): Noting existing residential buildings, out-buildings, site features etc. proposed to be demolished in the forward works stage. At a suitable scale for A3 drawing size.
- (5) Drawing attachments 5 - A1.11 DA - Proposed Site Plan (1:200 A1): At a suitable scale for A1 drawing size.
 - a. A1.12 Demolition Drawing (1:200 A1) Noting vegetation to be removed
- (6) Drawing attachment 6- A1.16 DA - Proposed Floor Plan (1:100 A1)
- (7) Drawing attachments 7 - A0.09, A0.10, A3.01, A3.02 Proposed Site and Building Elevations (1:100 A1): Noting-
 - a. Signage Strategy –
 1. Proposed building signage-
 - a. Station name on the Appliance Bays Front Elevation (Individual letters, 400mm height, 25mm thick, colour engine red),

- b. Building Entry sign on the external wall adjacent to the front entry (Steel plate fixed to wall with logo and “Cardup Fire & Rescue Services”, with letters 270mm height)
 - c. Site Entry sign adjacent to the crossover and path on Orton Road - Illuminated sign 900x900mm on post (“Fire Station Emergency 000”)
 - d. All as per the DFES Style Guide attached (**Attachment 10**) as below.
- 2. Proposed integrated public art at external wall adjacent to Doley Road.
 - 3. Proposed integrated signage on boundary/feature walls, i.e. numbers depicting the postcode, DFES call numbers using brick colours etc.
- b. A0.06 External Finishes Schedule

Additional enclosed information, as per Table 1 The Shire Application for Development Approval:

- (8) Attachment 8 - Bushfire Management Plan: No emergency evacuation plan is provided, for this development that is not determined as vulnerable or high-risk.
- (9) Attachment 9 - Underground Services Survey (1:300 A3) Noting existing services proposed to be demolished in the forward works stage.
 - a. Underground Services Survey Report as above
- (10) Attachment 10 - Signage strategy is noted above
- (11) Drawing attachment 11 - Landscaping Plan L.01
- (12) Attachment 12 - Environmental Management Plan, noting rainwater retention proposed from the roof of the building to the rainwater tank 200,000-Litres and with water-run off (excluding from working spaces) to bio-filters (139m²) and then deep drainage cell system (50m²).
- (13) Attachment 13 - Traffic Impact Statement for vehicle trips as above. The Traffic Management Plan will be provided by the contractors in the construction stages.
- (14) Drawing attachment 14 - Stormwater and Drainage Plan C3.01
- (15) Attachment 15 - Flora and Fauna Survey
- (16) Attachment 16 - Acoustic Report and Noise Management Plan
- (17) Dust Management Plan will be provided by the contractors in the construction stages.
- (18) Attachment 18 - Waste Management Plan



Underground services have been compiled from information obtained from a Dial-Before-You-Dig search. Service locations have not been verified by MNG. Alignments have been adjusted to coincide with located surface features such as manholes, valves or markers but are considered indicative only. Prior to demolition, excavation or construction, users should satisfy themselves to the currency of services, which may have been altered or new services installed on or near the subject site. Refer to the date and method of acquisition. This note is an integral part of this plan.

This survey has been completed to CLASS 2/3 Accuracy
 Hard Stand Areas are to Class 2 Accuracy
 Horizontal Accuracy ± 20mm
 Vertical Accuracy ± 20mm
 All other Areas are to Class 3 Accuracy
 Horizontal Accuracy ± 30mm
 Vertical Accuracy ± 50mm
 This note is an integral part of this plan.

Existing boundaries have been extracted from Landgate's Spatial Cadastral Database, which is only a model of the cadastre. The depicted boundary locations are a graphical representation only and as they have not been re-established by survey, MNG does not guarantee the position unless stated otherwise. Re-establishment of lot boundaries by a Licensed Surveyor is recommended for any works on or about a boundary. This note is an integral part of this plan.

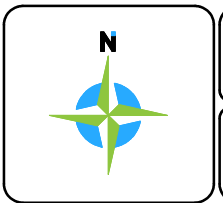
AHD Height transferred from MNG
 Job #93912DE-1025B
 Point #9706

Rev.	Description	Drawn	Date	Checked
B	Additional Trees & Water Taps Added	KDM	14/12/2022	MJ
A	Initial Issue	KDM	22/11/2022	MJ

SCALE 1:500 @ A3
 0 15 30
 ALL DISTANCES ARE IN METRES
 For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilize this data should satisfy themselves of this plan's currency by contacting the McMullen Nolan Group.

Surveyor:- KDM
 Survey Date:- 17/11/2022
 Precal/Cad:- 22/11/2022



The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

MCMULLEN NOLAN GROUP
 Level 1, 2 Sabre Crescent
 Jandakot, W.A. 6164
 PO Box 3526, Success
 W.A. 6954, Australia
 Offices in: Perth | Melbourne | Kimberley | South West WA

Tel: (08) 6436 1599
 Fax: (08) 6436 1500
 info@mngsurvey.com.au
 www.mngsurvey.com.au
 ABN 90 009 363 311

FEATURE & CONTOUR SURVEY
LOT 201 (#169) DOLEY ROAD
BYFORD WA 6122

CLIENT: **IREDALE PEDERSON HOOK ARCHITECTS**

Project Mgr: MATT JILLEY Datum: PG694 / AHD

105269 - DE - 001 - B
 Job Number Type Plan Number Revision

Ordinary Council Meeting - 15 May 2023

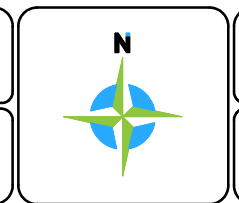
ROAD FEATURES	COMMUNICATION	SEWER	GROUND FEATURES	ROAD FEATURES	STRUCTURE	GROUND FEATURE	ELECTRICAL	SEWER
Traffic Junction Box	Telstra Pit	Sewer Vent	Natural Surface	Edge Of Bitumen	Bridge	Major Contour	Variable Message Sign	Sewer Pressure Main
Traffic Signals - 1 Aspect	Telstra Pillar	Sewer Line Marker	Aerial Survey Marker	Road Shoulder	Abutment	Minor Contour	Electrical Structure String	Sewer Pipe
Traffic Signals - 2 Aspect	Telstra Marker	Sewer Inspection Shaft	VEGETATION	Edge Of Unsealed Road	Columns	Bank Bottom	Overhead Powerlines - Null Height	Railway Platform
Traffic Signals - 3 Aspect	Telstra Pole	Sewer Inspection Opening	Tree Details - Canopy & Trunk	On Road	Piers	Bank Top	Overhead Powerlines - True Height	On Rail
Traffic Signals - 4 Aspect	Telephone Booth	Sewer Manhole	Tree 0.1m-0.3m Trunk Diameter	Centre Of Road	Underpass	Levee Top	High Tension Power Lines - Null Height	Rail Boom Gate
Pedestrian Signals	Emergency Phone	Rail Traffic Signals	Tree 0.3m-0.5m Trunk Diameter	Kerb Top	Ramp	Levee Bottom	High Tension Power Lines - True Height	Rail Underground Cable
Sign On One Pole	Antenna	Rail Traffic Control Box	Tree 0.5m-1.0m Trunk Diameter	Kerb Bottom	Steps/Stairs	Rock Outcrop	Unidentified Service Pit	Dual Gauge Rail
Sign Multiple Poles	Telstra Elevated Joint	Rail Telephone Box	Tree > 1.0m Trunk Diameter	Cattle Grid	Edge Of Concrete	Ridge Line	Telstra Cable	Narrow Gauge Rail
Overhead Sign	Cable Marker (Optus)	Rail Cable Pit	Bush	Centre Of Driveway	Bus Shelter	Borrow Pit	Amcom Cable	Cross Section - Rail
Traffic Controller Box	Telstra Tower	Rail Cable Marker	Die Back Area - Marker	Edge Of Driveway	Memorial	Earthworks Area	Water Pipe	Standard Gauge Rail
Finger Sign	Communication Manhole	Rail SLK Post	Nesting Tree	Pedestrian Ramp	Building / Structure	Ground Subsidence	Gas Line	Rail U/G Cable
Traffic Earth Pit	WATER	Manhole - Rail Cable	Grass Tree	Track	Awning	Rock Pitching	Drainage Pipe	MNG Precal/Re Established
Police Traffic Camera	Water Meter	STRUCTURE	SURVEY CONTROL	Parking Bay	Shed	VEGETATION	Telstra Cable	(SCDB) - State Cadastral Data Base
Guide Post	Water Stop Valve	Deck Level	Star Iron Picket	Line Markings 1m Line & 1m Gap	Verandah	Tree Line/Canopy	Water Pipe	Cadastral By Others
Km Marker	Hydrant (Ground Level)	Floor Level	Trig Point	Line Markings 1m Line & 3m Gap	Door Opening	Bush Line	Gas Line	Dam
Traffic Count	Hydrant (Pillar)	Column Centre	SSM	Line Markings 3m Line & 9m Gap	Window	Hedge	Drainage Pipe	Edge Of Drain
ELECTRICAL	Water Bore	Clothes Hoist	Bench Mark	Lane Marking (9m*3m GAP)	Roof Gutter Line	Garden Bed	Drainage Culvert	Floodway
Earth Pit	Stand Pipe	Air Conditioner	Photo Point	Lane Markings - Audible	Roof Ridge Line	Lawn Area	Floodway	Swimming Pool
Electrical Pillar	Reticulation Sprinkler	Marker Unk/Undefined	Cadastral Peg/Post	Shared Pathway - Guide Line 900mm*300mm GAP	Top Of Wall	Vineyard	Drain	Tank Perimeter
Electrical Dome	Reticulation Control Valve	Undefined Manhole	Reference Peg	Footpath/Shared Path - Give Way 200mm*200mm GAP	Brick Wall	Orchard	Edge Of Drain	Mine Shaft
Light Pole - Directional	Well	Control Of Access Sign	Alignment Control	Giveaway/Hold/Turn Lines 600mm*600mm GAP	Concrete Wall	Nursery	Sump	Mine Workings
Power Pole	Water Main Marker	Count Station	Spring Head Nail	Double Barrier Line	Livestock Grid	Market Garden	Waters Edge	Koppa Logging Fence
Transformer Single Pole	Water Tap	Advertising Sign	Spike	Overtaking Lane Left	Arrow Straight	Recreational Area	Swamp	Fence/Gate
Stay Pole	Flushing Point	Windmill	TBM	Overtaking Lane Right	Arrow Straight/Left	Trunk Circumference Circle	Dam	Wall
Steel Wire Anchor	Air Valve	Stock Trough	Peg Placed / Found	Single Solid Line	Arrow Straight/Right	Tree-line Face Of Trunks	Edge Of Creek/Water	Top Of Barrier / Wall etc
High Mast Lighting	Pelzometer	Litter Bin	Painted Lettering On Seal	Arrow Left	Arrow Left		Centre Of Channel	Retaining Wall
Electrical Cable Marker	Hydrant Booster Box	Mail Box	Guardrail - W Beam	Arrow Right	Arrow Right		Wet Area	Boundary Line
MRWA Cable Marker	Gas Marker	Parking Meter	Guardrail - Thrie	Arrow 3 Ways	Arrow Right & Left		Flood Level Line	Footpath
MRWA Electrical Cable Box	Gas Valve	Ticket Machine	Barrier Concrete	Arrow Right & Left	Arrow U-Turn		Waterways Cross Section	Gas Cylinder/Tank
Electrical Cable Pit/Box	Gas Test Valve	Borehole	Barrier Steel Rope	Arrow U-Turn	Arrow Merge			Brick Paving
MRWA Distribution Board	LPG Tank	Flag Pole	Barrier - Single Rail	Arrow Merge	Painted Bicycle Traffic Signal Detector			Bike Rack
High Tension Power Pole	Gas Test Pit	Bollard	Barrier - Double Rail	Painted Bicycle Traffic Signal Detector				Bench Seating
Electrical Supply Pole	Gas Manhole	Fuel Bowser	Barrier - Triple Rail					Handrail
Ground Floodlight	DRAINAGE	Underground Filler	Bridge Barrier - (All Types)					
MRWA Electrical Manhole	Invert Level	Diesel Tank	Bridge Expansion Joints					
Meter Box	Overt Level	Oil Main Marker	Bridge - Outside Of Deck					
Power Meter Box	Flood Level	Security Post	Soffit String					
Electrical Transformer	Water Line	Tank						
MRWA Light Pole	Flood Level Indicator							
MRWA Multiple Light Pole	Storm Water Grate							
	Drainage Gully							
	Drainage Manhole							
	Drainage Headwall							

Rev.	Description	Drawn	Date	Checked
H	U/G Services Amended	SAH	30/10/2020	TKI

SCALE 1:1000 @ A3
0 10 20 30 40 50
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilize this data should satisfy themselves of this plan currency by contacting the McMullen Nolan Group.

Surveyor:- MNG
Survey Date:- 30/06/2020
Precal/Cad:- 30/06/2020



The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Perth | Melbourne | Kimberley | South West WA

Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

McMULLEN NOLAN GROUP
FEATURE SURVEY - GENERAL LEGEND

CLIENT: N/A

Project Mng: MNG Group Datum: LOCAL

95465 - DOC-012 - H

Job Number: 95465 Type: Plan Number: 012 Revision: H

Ordinary Council Meeting - 15 May 2023

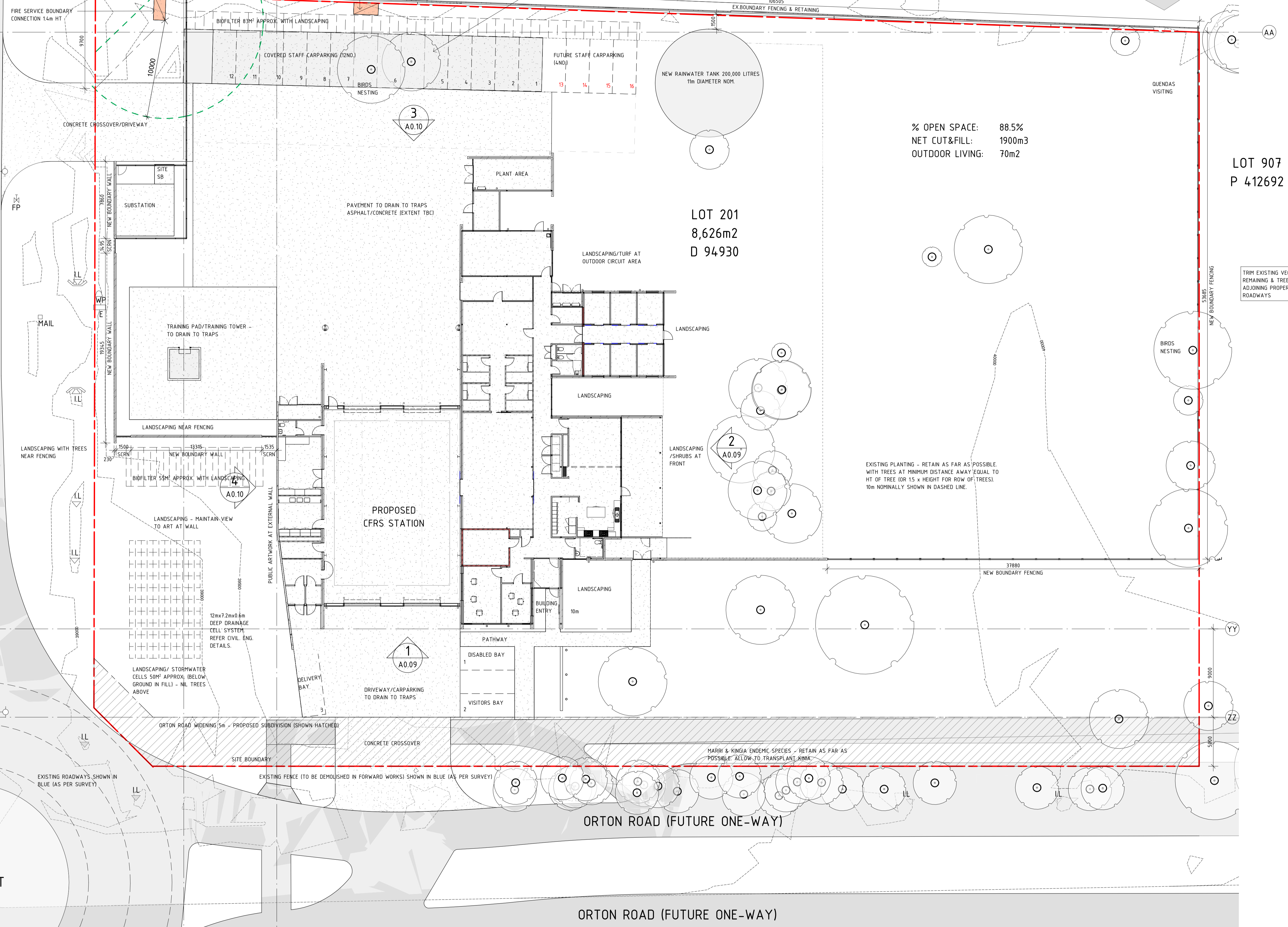
NOT FOR CONSTRUCTION

VISUAL TRUNCATION ONLY, 6m x 6m AT CORNER SHOWN IN GREEN DASHED LINE - EXTENT OF EX. FENCE TO BE DEMOLISHED

SEWER SERVICE (GRAVITY) MODIFY BOUNDARY FENCE AS REQUIRED.

2ND. EXISTING TREES RL39.2 NOM. - RETAIN AS FAR AS POSSIBLE. WITH TREES AT MINIMUM DISTANCE AWAY EQUAL TO HT OF TREE (OR 1.5 x HEIGHT FOR ROW OF TREES). 10m NOMINALLY SHOWN IN DASHED LINE.

YANDRA STREET



% OPEN SPACE: 88.5%
 NET CUT&FILL: 1900m³
 OUTDOOR LIVING: 70m²

LOT 907
 P 412692

LOT 201
 8,626m²
 D 94930

LOT 34
 P 14324

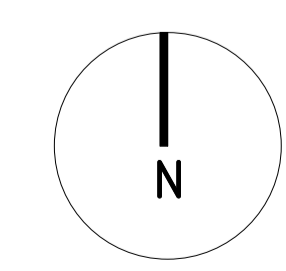
DOLEY ROAD

ORTON ROAD (FUTURE ONE-WAY)

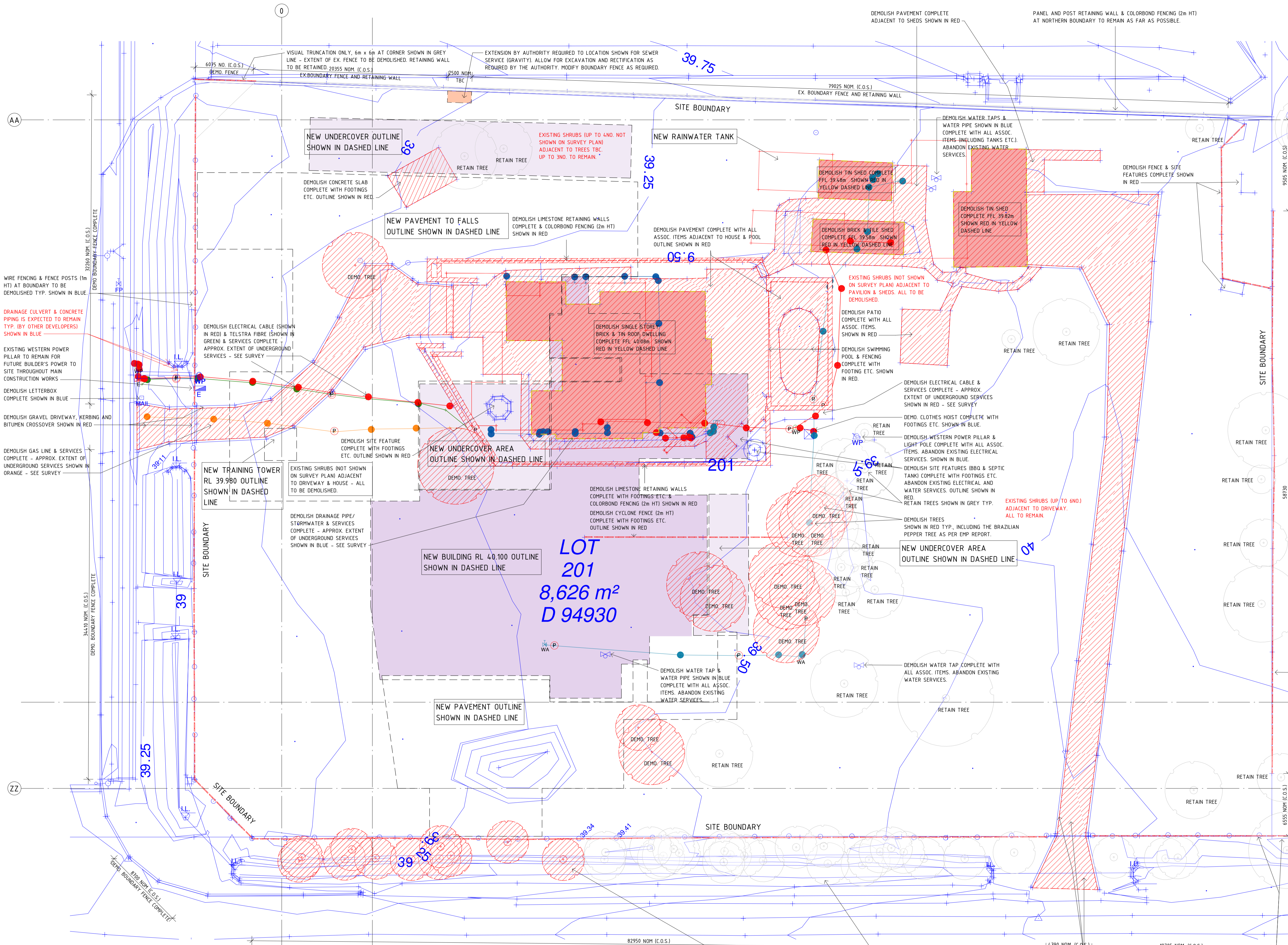
ORTON ROAD (FUTURE ONE-WAY)

1 SITE PLAN
 A0.09 1 : 200

iredale pedersen hook architects
 Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
 PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
 www.iredalepedersenhook.com email@iredalepedersenhook.com



CARDUP CFRS FIRE STATION		DRAWING No.	
LOT 201, 169 DOLEY ROAD, BYFORD WA 6122		A1.11DA	
PROPOSED SITE PLAN (DA)		SCALE	DATE
		1 : 200 @A1 50% REDUCTION @ A3	29/03/23



DEMOLITION LEGEND

- Existing survey item to be retained/demolished as noted
- Existing building to be demolished
- Proposed building outline
- Proposed undercover area
- Proposed pavement outline
- Existing item to be demolished as noted

PROVIDE TEMPORARY GATES OFF DOLEY ROAD AND FENCE (1.8m HT) TO SOUTHERN, EASTERN & WESTERN BOUNDARIES THROUGHOUT WORKS (WITH EXISTING NORTHERN FENCING TO REMAIN)

EXTENT OF TREES & SHRUBS FOR DEMOLITION (WITH 13NO. TREES SHOWN IN RED & NO. OF SHRUBS NOT SHOWN/ TO REMAIN AS FAR AS POSSIBLE EXCEPT AS NOTED). EXISTING SITE TREES SHOWN IN GREY TO BE RETAINED AND PROTECTED. EXCAVATION WORKS WITHIN THE TREE PROTECTION ZONE SHALL BE CARRIED OUT WITH MACHINERY FITTED WITH A FLAT EDGE BUCKET AND A SPOTTER EMPLOYED TO MONITOR EXISTING TREE ROOTS. DIGGING IN CLOSE PROXIMITY TO THE TREE SHALL BE CARRIED OUT BY HAND. TRIPPING AND TRANSPLANT OF EXISTING TREES & SHRUBS WILL BE PART OF MAIN CONSTRUCTION WORKS.

STRIP TOP SOIL (200mm DEPTH MAX) INCLUDING VEGETATION & ROOTS, BOULDERS ETC. (600mm DEPTH) REMOVE FROM SITE. EXCAVATE TO NEW LEVELS. VERIFY REMOVAL SAND/FILL/BOULDERS FROM SITE. SEE CIVIL.

THE CONTRACTOR SHALL LIAISE WITH WESTERN POWER, TELSTRA & RELEVANT AUTHORITIES FOR DISCONNECTION OF SERVICES TO THE SITE PRIOR TO COMMENCING DEMOLITION WORKS. ALL EXISTING ELECTRICAL SERVICES ARE TO BECOME REDUNDANT & BE REMOVED FROM SITE.

Hydraulics Scope Of Work
Carry out all sanitary plumbing, hot, cold, gas, stormwater & stormwater soakwells, property sewerage cut & seals in order to complete the demolition work to the satisfaction of the Superintendent Representatives and the relevant authorities having jurisdiction. Allow to investigate to locate all existing hydraulic services within the works area. All existing hydraulic services are to become redundant & be removed from site.

Property Sewer
Allow to cut, seal & make redundant all property sewer drains connected to septic tank & leach drains.

Demolish, remove rubble, backfill and compact all existing redundant property sewer drains and associated apparatuses to facilitate a clean site for new building.

Septic Tanks & Leach Drains
Allow to arrange and pay for a pump out and de-sludge of redundant septic tanks & leach drains by a licensed sullage haulage contractor.

Disinfect with hydrated lime or Chlorine in accordance with WA Health Department requirements. Demolish, remove rubble, backfill with clean sand and compact area where removal of septic tanks & leach drains has occurred.

All septic tank & leach drain remnant to be removed from excavations & site.

Water Service
Allow to cut & seal potable water main from existing potable water meter. Make application, arrange to pay all fees to Water Corporation to disconnect redundant potable water meter.

LP Gas and Natural Gas Service
Allow to cut & seal all LP gas from LPG bottle. Remove all existing redundant gas pipework from site.

Stormwater
Allow to demolish, remove rubble, backfill with clean sand & compact all redundant soakwells as required.

DEMOLISH & ABANDON EXISTING RETICULATION COMPLETE WITH CONTROLS, ELEC. & WATER SERVICES COMPLETE (NOT SHOWN ON SURVEY PLAN).

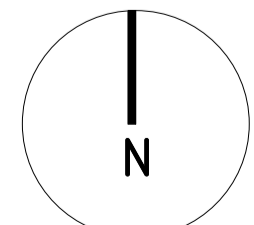
EXTENT OF SALVAGE ITEMS TBC DURING CONSTRUCTION - MINIMUM EXTENT DESIRED FOR SALVAGE IS INCLUDING GRAVEL PATHWAY SURFACE, SAND, TIMBER LOGS, ROCKS/BOULDERS, PLANTING ETC. NO CLEARING TO OCCUR UNTIL TREES DESIGNATED FOR RETENTION AND LANDSCAPE ITEMS FOR SALVAGE HAVE BEEN CONFIRMED BY THE SUPERINTENDENT'S REPRESENTATIVE. ALL TREES TO BE RETAINED SHALL BE FENCED OFF FOR THE DURATION OF THE WORKS.

DEMOLISH WIRE FENCING (1m HT) AT EASTERN BOUNDARY SHOWN IN RED.

1 DEMOLITION PLAN
A0.09 1:200

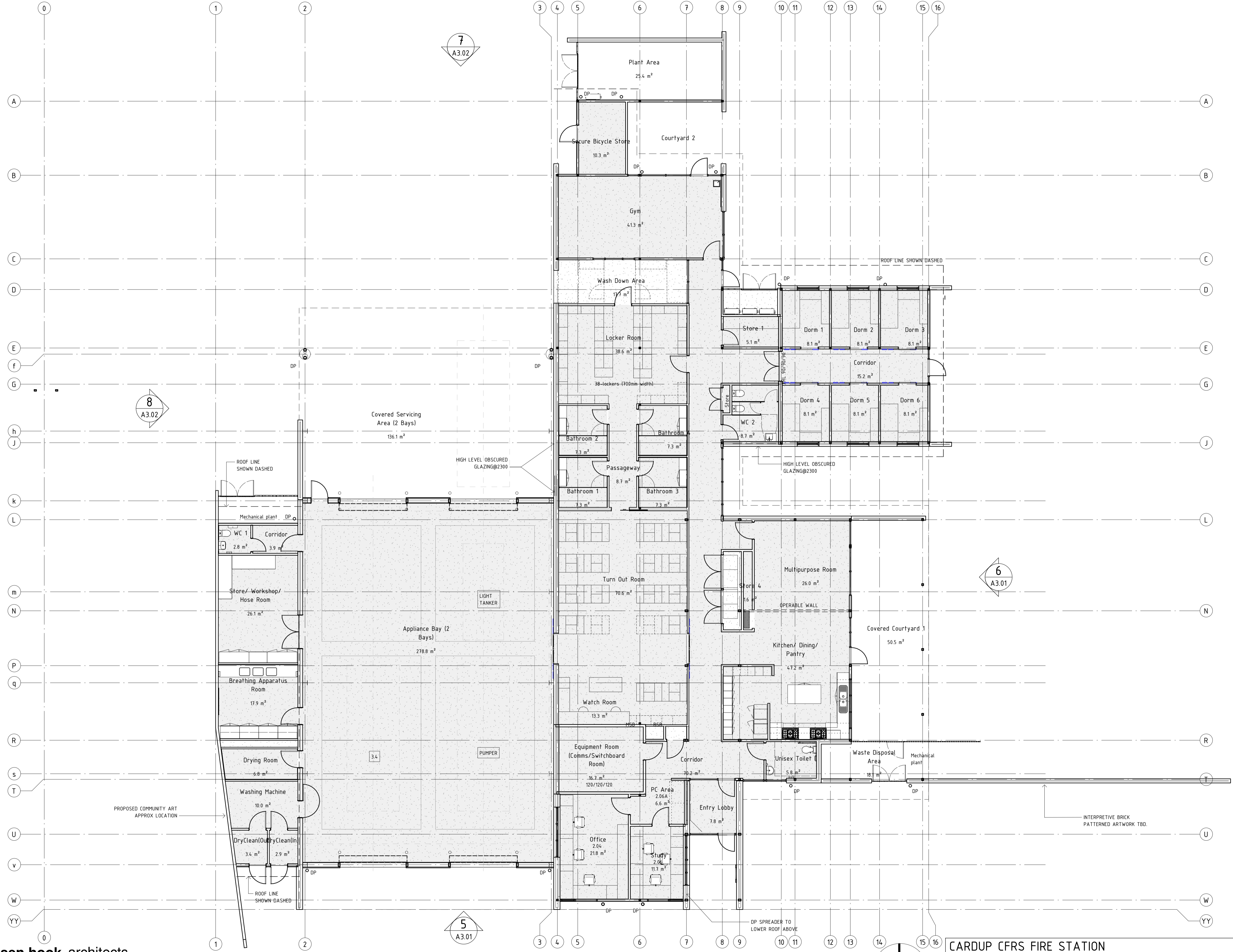
iredale pedersen hook architects
Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
www.iredalepedersenhook.com email@iredalepedersenhook.com

MARRI & KINGIA ENDEMIC SPECIES ALONG ORTON ROAD TYP. RETAIN MARRI AS FAR AS POSSIBLE. ALLOW TO TRANSPLANT KINGIA TO EASTERN END OF THE SITE (FINAL LOCATIONS TO BE ADVISED TO MAIN CONTRACTOR FOR PLANTING DURING THE MAIN WORKS). MARRI TREES SHOWN IN RED TO BE DEMOLISHED FOR VISIBILITY WHEN DRIVING ONTO ORTON ROAD (DEMOLITION BY OTHER DEVELOPERS WITH EXTENT TBC IF POSSIBLE DURING CONSTRUCTION, WITH WORKS LIKELY TO BE UNDERTAKEN AFTER DEMOLITION WORKS ARE COMPLETE).



CARDUP CFRS FIRE STATION		DRAWING No.
LOT 201, 169 DOLEY ROAD, BYFORD WA 6122		A1.12
PROPOSED DEMOLITION PLAN		
SCALE	DATE	
As indicated @A1 50% REDUCTION @ A3	29/03/23	

NOT FOR CONSTRUCTION



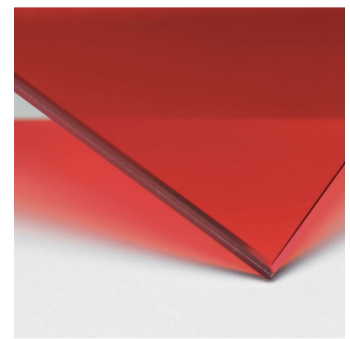
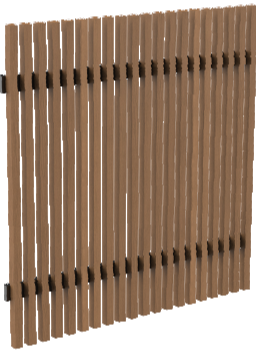




iredale pedersen hook architects
 Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
 PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
 www.iredalepedersenhook.com email@iredalepedersenhook.com

CARDUP CFRS FIRE STATION		DRAWING No.	
LOT 201, 169 DOLEY ROAD, BYFORD WA 6122		A1.16DA	
PROPOSED GENERAL ARRANGEMENT PLAN (DA)		SCALE	DATE
		1 : 100 @A1	29/03/23
		50% REDUCTION @ A3	

EXTERIOR FINISHES SCHEDULE

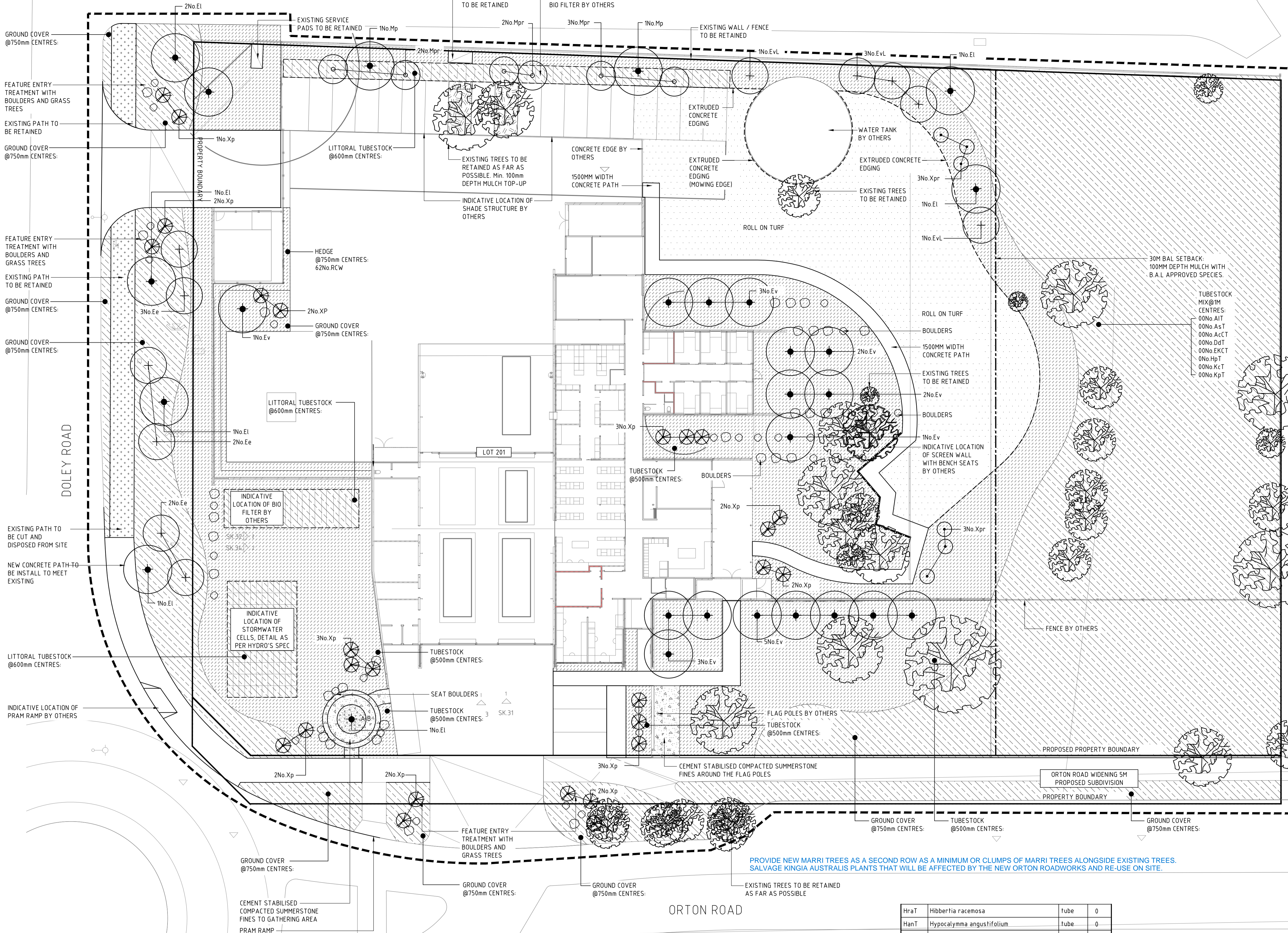
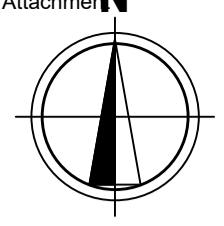
PRODUCT	MATERIAL	APPLICATION	IMAGE
	In-Situ Concrete Light Grey	2400mm Height Blade Walls Refer to dwg's	
	In-Situ Concrete Red Ochre Oxide	Feature Wall (East Elevation) Refer to dwg's	
Austral Bricks "Le Grand"	Face Brick	2400mm Height Blade Walls Refer to dwg's	
Austral Bricks "Kingston"	Face Brick	900mm Under Dorm Windows. Refer to dwg's	
Austral Bricks "Jackson"	Face Brick	2400mm Height Blade Walls Refer to dwg's	
Matrix Fibre Cement Wall Cladding	Fibre Cement Grey	1) 300mm cladding strip @2400mm AFFL 2) Wall cladding @2700mm AFFL 3) Soffit Lining Expressed joints typically Refer to dwg's	
	Reclaimed Jarrah Boards Timber Penetrating Stain	2400mm Height Feature Wall Cladding (South and West Elevations - Front Entry and Courtyard) Refer to dwg's	

PRODUCT	MATERIAL	APPLICATION	IMAGE
	Reclaimed Jarrah Boards Weathered to suit roofing colour	Feature Soffit Lining (South Elevation - Front Entry Refer to dwg's	
Lysaght Spandek	Roll formed steel	Roof and upper wall cladding Refer to dwg's	
	Red Tinted Glass	Feature Glazing (South Elevation - Front Entry)	
	Timber Batten Screening	Screening (Bin Store and West Elevation - Mechanical Plant) Spacings for ventilation	
	Steel Column Charcoal Powdercoated	Bin Store Screening Dining Under Cover Appliance Bay Columns	
Colorbond Prominence	Profiled Extruded Steel	Dormetary East Wall	

iredale pedersen hook architects

Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
www.iredalepedersenhook.com email@iredalepedersenhook.com

CARDUP CFRS FIRE STATION			DRAWING No.
LOT 201, 169 DOLEY ROAD, BYFORD WA 6122			A0.06
EXTERIOR FINISHES SCHEDULE	SCALE 1 : 1 50% REDUCTION @ A3	DATE 29/03/23	



LEGEND

- EXTENT OF LANDSCAPE WORKS IN THIS CONTRACT
- LOT BOUNDARY
- BAL SETBACK
- EXISTING PATH TO BE RETAINED
- EXISTING TREES TO BE RETAINED & PROTECTED
- 200 LITRE TREES (inc. STAKING)
- 100 LITRE TREES (inc. STAKING)
- 45 LITRE TREES (inc. STAKING)
- GRASS TREES (NURSERY STABILISED)
- GRASS TREES TRANSPLANTED FROM ORTON ROAD VERGE
- ROOT CONTROL BARRIERS
- IRRIGATED SHRUB / TUBESTOCK PLANTING (75mm DEPTH MULCH)
- NON-IRRIGATED TUBESTOCK PLANTING (WINTER PLANTING JUN-AUG) (75mm DEPTH MULCH)
- MULCH ONLY SURFACE (100mm DEPTH)
- ROLL ON TURF
- CEMENT STABILISED COMPACTED SUMMERSTONE FINES, REFER 4/L02
- EXTRUDED CONCRETE EDGE, REFER 5/L02
- LATERITE BOULDERS SIZE TO VARY (300-1000mm DIAMETER), REFER 6/L02

- GENERAL NOTES:**
- THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL OTHER COMPONENTS OF THE CONTRACT PACKAGE. IN THE EVENT OF CONFLICTS OR CLASHES THE CONTRACTOR MUST NOTIFY THE SUPERINTENDENT.
 - REFER TO ARCHITECTURAL DRAWINGS FOR LEVELS & SETOUT OF PAVING SURROUNDING BUILDINGS.
 - REFER TO CIVIL ENGINEERS AND/OR ARCHITECTURAL DRAWINGS FOR LEVELS & SETOUT OF RETAINING WALLS, SERVICES, DRAINAGE INFRASTRUCTURE AND STRUCTURES.
 - EXISTING TREES TO BE TRIMMED, CUT BACK OR REMOVED AS REQUIRED TO MEET THE STANDARDS FOR ASSET PROTECTION ZONES AS HIGHLIGHTED IN THE BUSHFIRE MANAGEMENT PLAN.
 - ALL TREES WITHIN 1M OF KERB / FOOTPATH / HARD SURFACE TO BE INSTALLED WITH ROOT BARRIERS AS SPECIFIED.
 - ALL SCALES ARE AS NOTED TO SUIT A1 PAPER SIZE.
 - FOR ASSOCIATED IRRIGATION DESIGN, REFER TO IRRIGATION DOCUMENTATION AND SPECIFICATION.
 - RETAIN OR CAP EXISTING RETICULATION WHERE POSSIBLE ALONG ALL STREETS CAPES.
 - IRRIGATED PLANTING TO BE SERVICED BY A FULL AUTOMATIC SYSTEM SUPPLIED BY A RAINWATER TANK WITH SUPPLEMENTARY MAINS WATER CONNECTION.

C	REVISED AS PER ARCHITECT'S AMENDMENT	KW	070223	JH
B	ISSUED FOR APPROVAL	KW	240123	JH
A	ISSUED FOR INFORMATION	KW	191222	JH
No	AMENDMENT	DWN	DATE	CHKD

EPCAD

EPCAD Pty Ltd
28-30 Mayfair Street
West Perth Western Australia 6005

PO Box 1233 West Perth WA 6872
epcad@epcad.com.au
Tel 08 9481410 Fax 08 94816903

PLANT SCHEDULE

TREES (IRRIGATED)	SIZE	QTY
Ee Eucalyptus erythrocorys	100L	0
Ei Eucalyptus leucoxyton 'Euky Dwarf'	200L	0
Ete Eucalyptus leucoxyton 'Euky Dwarf'	100L	0
Ev Eucalyptus victrix 'Little Ghost Gum'	200L	0
Mp Melaleuca preissiana	200L	0
Mpr Melaleuca preissiana	45L	0
Xp Xanthorrhoea preissii	MATURE TRANSPLANT	0

SHRUBS (IRRIGATED)

RCW	Rhaphiolepis indica 'Cosmic White'	200mm	750mm	0
TUBESTOCK MIX (NON-IRRIGATED) (@500mm, 750mm & 1000mm CENTRES OR REFER CALLOUT)				
AIT	Acacia lasiocarpa 'Prostrate Variety'	tube	0	
AsT	Acacia saligna 'Prostrate Variety'	tube	0	
AcCT	Adenanthos cuneatus 'Coral Carpet'	tube	0	
BaT	Banksia ashbyi 'dwarf'	tube	0	
BbT	Banksia blechnifolia	tube	0	
CaST	Chrysocephalum apiculatum 'Silver Sunburst'	tube	0	

DICT

Dampiera linearis 'Cobalt Mound'	tube	0
DdT Dampiera diversifolia	tube	0
EKCT Eremophila 'Kalbarri Carpet'	tube	0
EnT Eremophila nivea x drummondii	tube	0
HpT Hemidra pungens	tube	0
HsT Hibbertia scandens	tube	0
KcT Kennedia coccinea	tube	0
KpT Kennedia prostrata	tube	0
LLCT Lomandra 'Little Con'	tube	0
OaT Olearia axillaris 'Mini'	tube	0
PaT Patersonia occidentalis	tube	0

ApuT

Acacia pulchella	tube	0
Anigozanthos viridis	tube	0
BniT Banksia nivea	tube	0
BsqT Beaufortia squarrosa	tube	0
CacT Conostylis aculeata	tube	0
DdeT Daviesia decurrens	tube	0
EpaT Eremaea pauciflora	tube	0
GmaT Gompholobium marginatum	tube	0
GbiT Grevillea bipinnatifida	tube	0
HsuT Hakea sulcata	tube	0
HhyT Hibbertia hypericoides	tube	0

LITTORAL TUBESTOCK MIX (NON-IRRIGATED) (@600mm CENTRES OR REFER CALLOUT)

Bar	Baumea articulata	tube	0
Bpr	Baumea preissii	tube	0
Cap	Carex appressa	tube	0
Fno	Ficinia nodosa	tube	0
Jkr	Juncus kraussii	tube	0
Jpa	Juncus pallidus	tube	0
Llo	Lepidosperma longitudinale	tube	0

PLANT NOTE:

BaT & EnT are to be planted 15m back from roads, footpaths & buildings within shrub mix.

In the event of a size or species being unavailable at time of ordering, the contractor shall seek an alternative substitute and present these to the superintendent for approval.

Min. 600mm mulch strip set back from back of kerb.

Root control barriers to all irrigated trees.

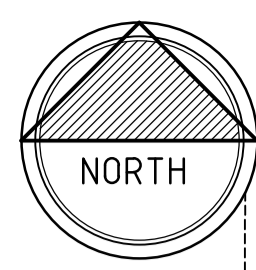
Government of Western Australia
Department of Finance
Building Management and Works

LANDSCAPE

Cardup Career Fire Station
DEPARTMENT OF FIRE AND EMERGENCY SERVICES
169 Dooley Road, Byford 6122
LANDSCAPE PLAN

DRAWN	KW	DESIGNED	KW	REDUCTION
CHECKED	JH	PRINCIPAL		0 2 4m
APPROVED	JH	DATE	December 2022	DRAWING No. L01 C
DF PROJ No.	00000	DF FILE No.	2022/00000	

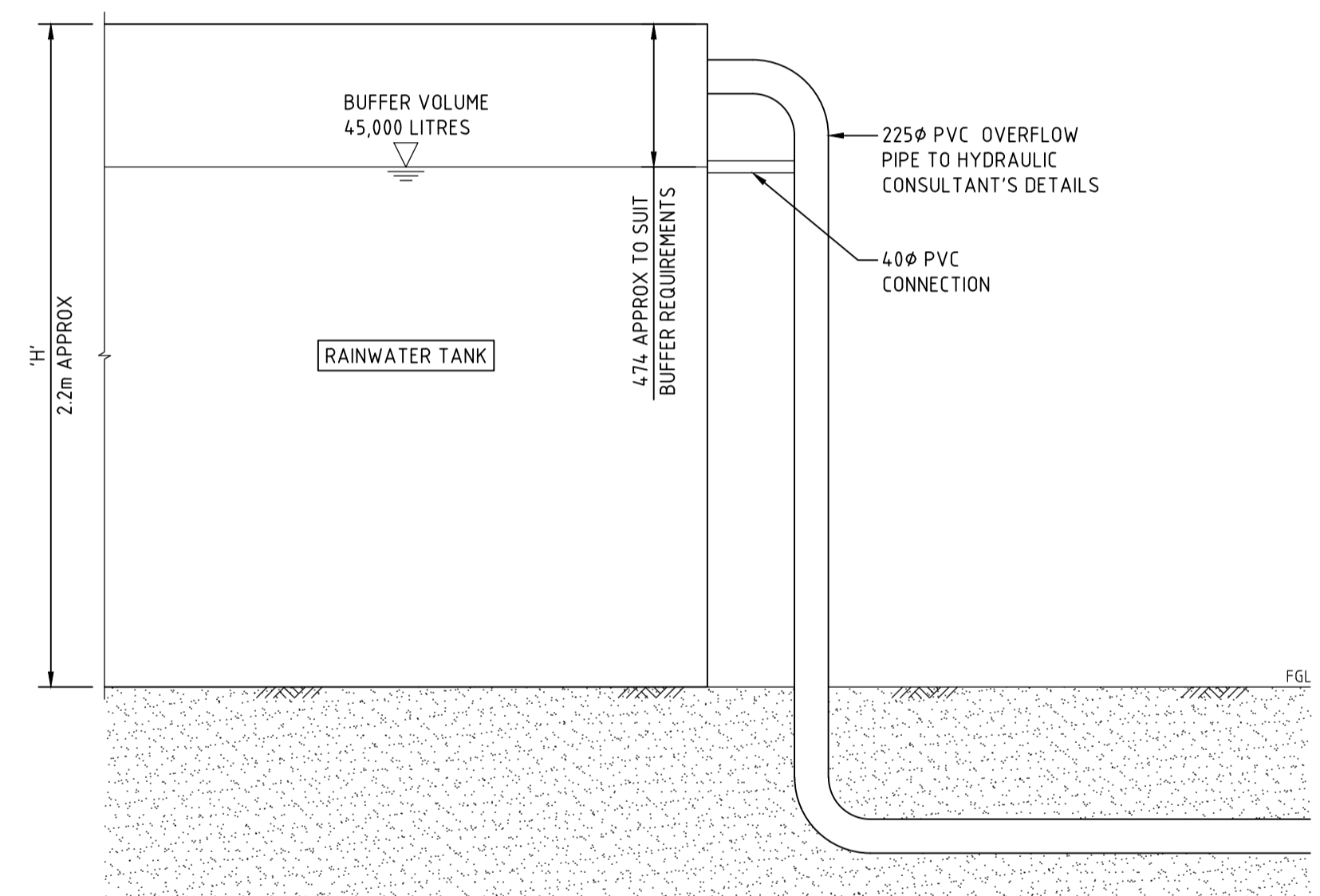
THIS IS A CADD DRAWING DO NOT AMEND MANUALLY
Ordinary Council Meeting - 15 May 2023
OKA PROJECT NO. LFSL016



STORMWATER DRAINAGE DESIGN SUMMARY

BUILDING	AREA	REQUIRED STORAGE
CFRS STATION	134.8m ² APPROX.	4.2m ³ APPROX.
CARPARKING	1237m ² APPROX.	4.6m ³ APPROX.
MIN. ON SITE STORAGE REQUIRED		88m ³ APPROX.
ON SITE STORAGE PROVIDED		
BELOW GROUND STORAGE CELL		50m ³ APPROX.
ABOVE GROUND STORAGE BUFFER		45m ³ APPROX.
TOTAL		95m³ APPROX.

- LEGEND**
- DENOTES NEW BUILDING WORKS
 - DENOTES NEW 40mm AC14 ASPHALT ON 250mm COMPACTED GRAVEL BASE COURSE
 - DENOTES 150mm THICK REINFORCED CONCRETE CROSSOVER.
 - DENOTES PAVING TO ARCHITECTS SPECIFICATIONS
 - DENOTES NEW 100mm THICK REINFORCED CONCRETE PAVING. REFER C2.02 FOR DETAILS.
 - FFL 4.0.10 DENOTES FINISHED FLOOR LEVEL
 - FPL 4.0.05 DENOTES FINISHED PAVING LEVEL
 - FGL 4.0.00 DENOTES FINISHED GROUND LEVEL
 - 225 PVC 1:125 DENOTES Ø225 PVC STORMWATER PIPE AT 1:150 GRADE
 - Ø1800 x 1200 DEEP PRECAST CONC. GULLY PIT WITH TRAFFICABLE LID AND Ø650 GULLY GRATE RAISED 160mm ON PRECAST CONCRETE RING FOOTING.
 - +1.40.05 DENOTES FINISHED PAVING or FINISHED SURFACE LEVEL
 - 600 DENOTES 600 x 600 ACCESS SHAFT
 - 39 DENOTES EXISTING GROUND CONTOUR
 - SMK DENOTES 250mm WIDE SEMI-MOUNTABLE KERB
 - MK DENOTES 310mm WIDE MOUNTABLE KERB
 - 139 CHS 5.4 DENOTES 139 CHS 5.4 CONCRETE FILLED BOLLARD. REFER C2.01 FOR DETAIL
 - DRAIN DENOTES CHANNEL DRAIN
 - FP DENOTES FLUSHING POINT



TYPICAL RAINWATER TANK NEW CONNECTION DETAIL 120

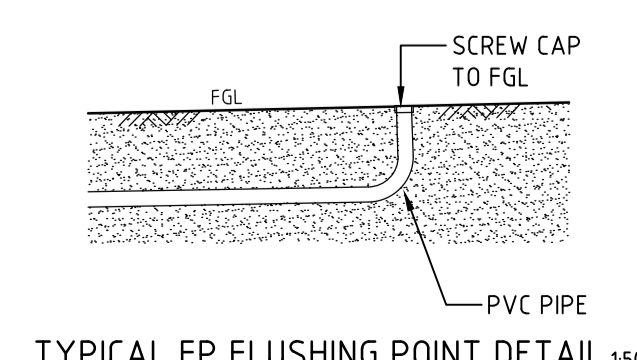
NO.	AMENDMENT	DATE	INIT.
B	ISSUED FOR DEVELOPMENT APPROVAL	28.02.23	J.V.
A	ISSUED FOR SCHEMATIC DESIGN REVIEW	13.01.23	J.V.

DOCUMENTATION

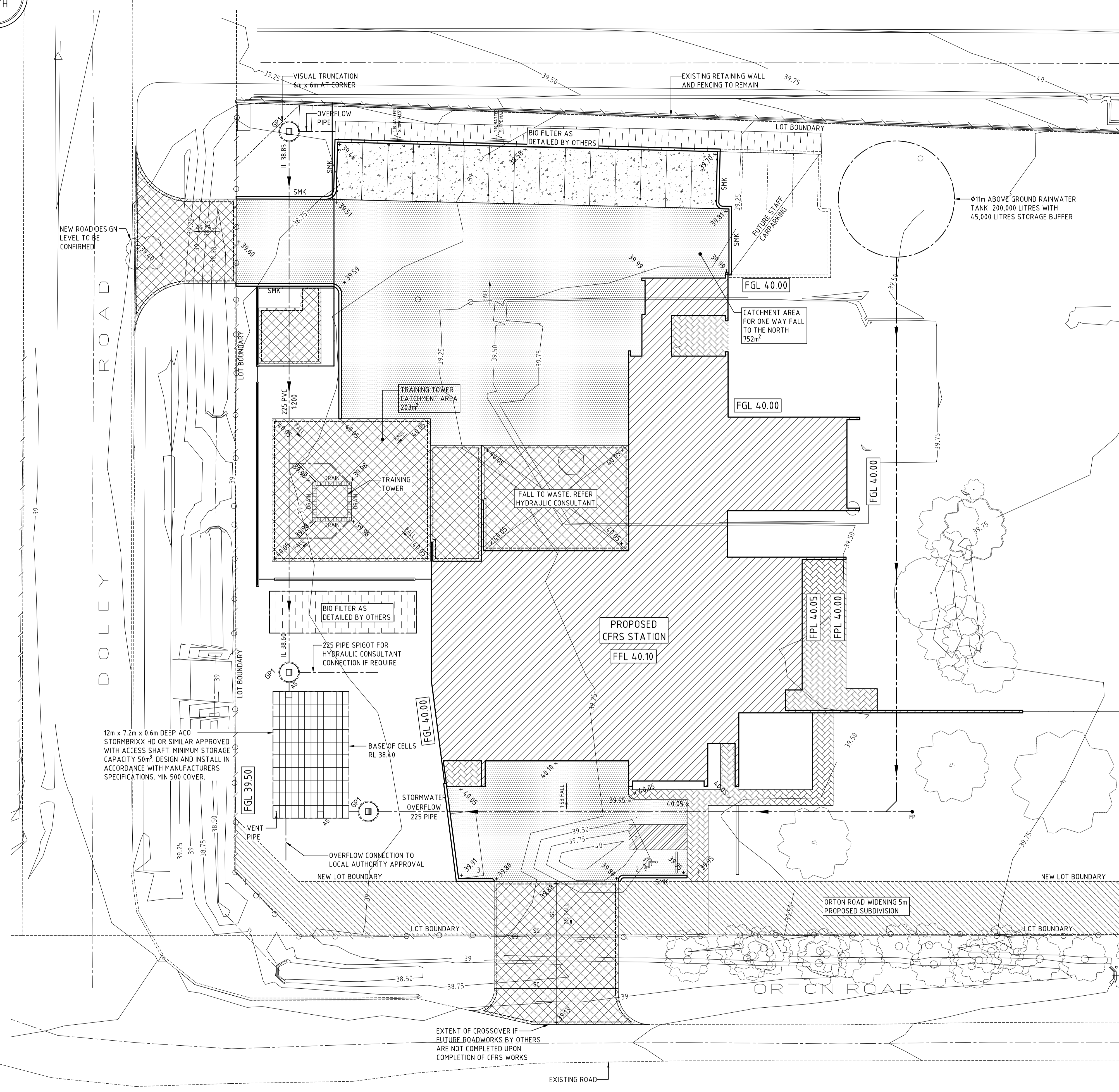


CIVIL
CARDUP CFRS STATION
 LOT 169 DOLEY ROAD
 BYFORD
 STORMWATER DRAINAGE LAYOUT PLAN

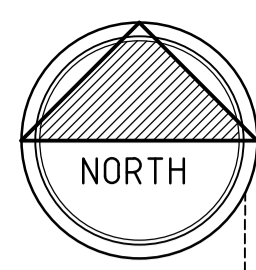
DRAWN	J.V.	DESIGNED	P.T.	REDUCTION
CHECKED	-	PRINCIPAL		0 25
APPROVED	-			
SCALE	1:200 AT A1	DATE	DEC 2022	DRAWING No.
DF PROJ No.		DF FILE No.		C3.01



TYPICAL FP FLUSHING POINT DETAIL 150

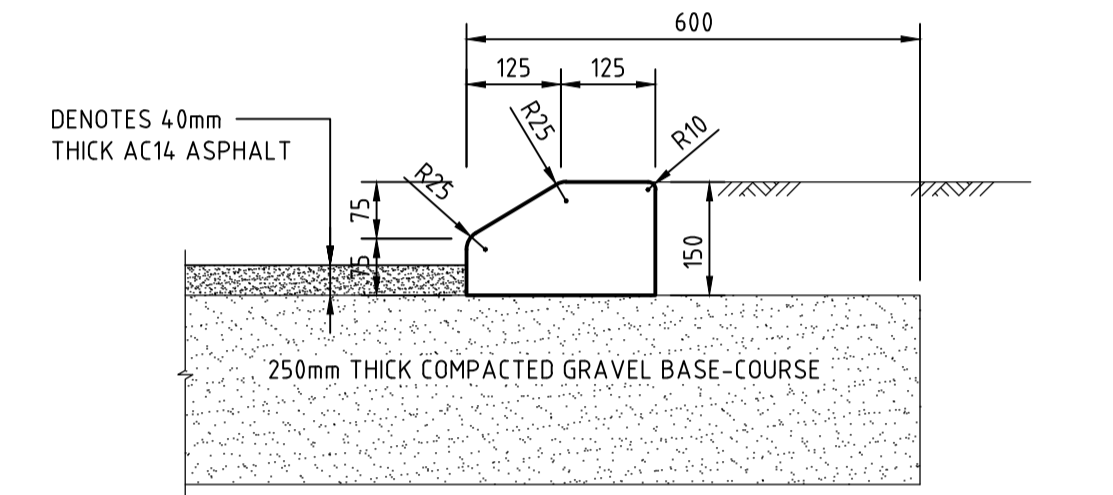
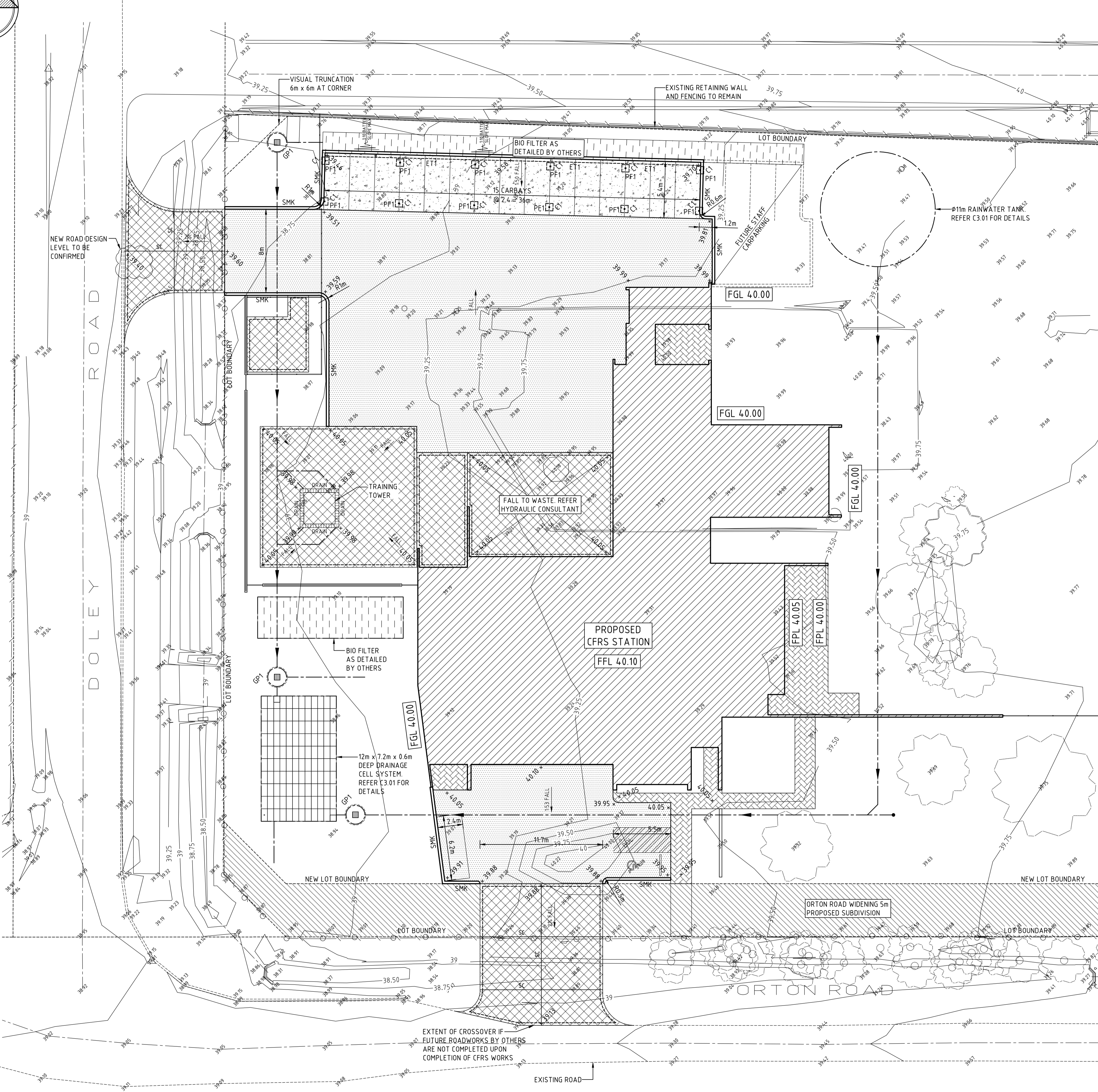


STORMWATER DRAINAGE LAYOUT PLAN 1200

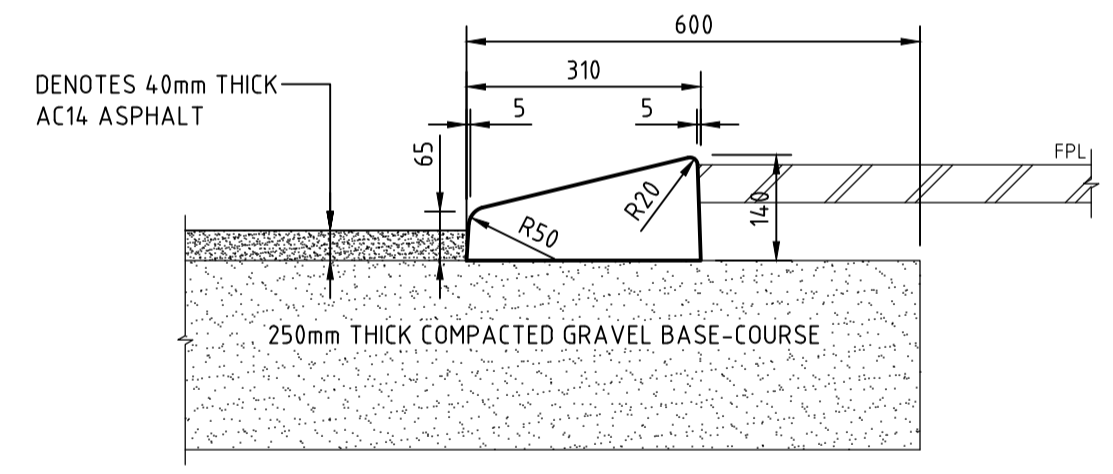


Check all dimensions on site before commencing work to figured dimensions, do not scale drawing, report any discrepancies to the Architect for decision before proceeding to work.

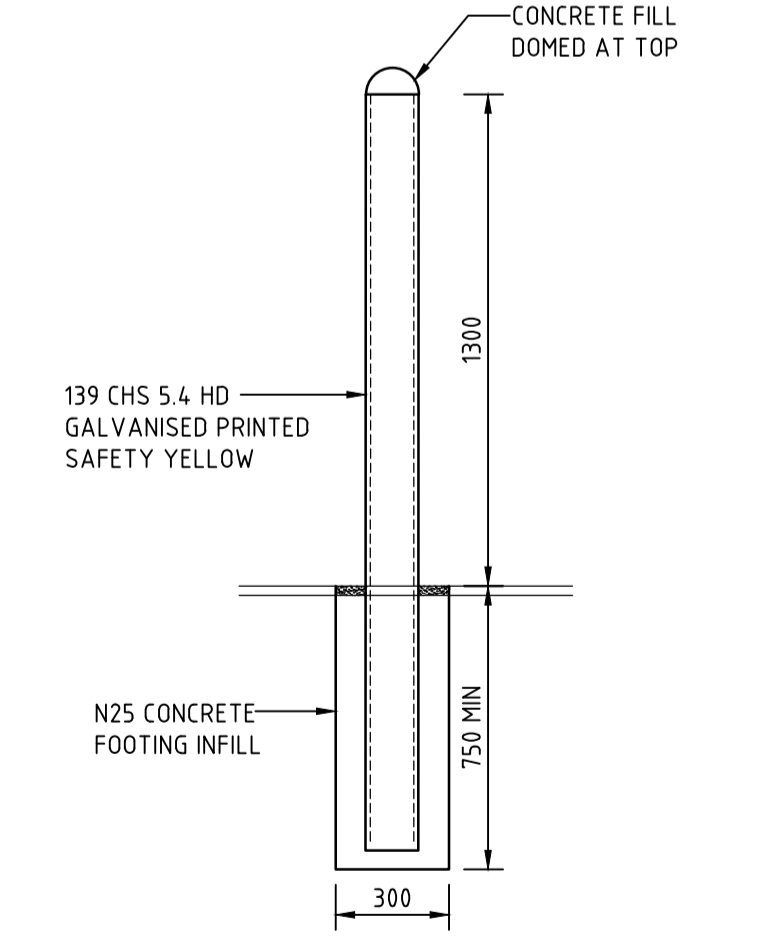
- LEGEND**
- DENOTES NEW BUILDING WORKS
 - DENOTES NEW 40mm AC14 ASPHALT ON 250mm COMPACTED GRAVEL BASE COURSE
 - DENOTES 150mm THICK REINFORCED CONCRETE CROSSOVER.
 - DENOTES PAVING TO ARCHITECTS SPECIFICATIONS
 - DENOTES NEW 100mm THICK REINFORCED CONCRETE PAVING. REFER C2.02 FOR DETAILS.
 - FFL 4.110** DENOTES FINISHED FLOOR LEVEL
 - FPL 4.0.05** DENOTES FINISHED PAVING LEVEL
 - FGL 4.0.00** DENOTES FINISHED GROUND LEVEL
 - DENOTES STORMWATER PIPE. REFER C3.01 FOR DETAILS
 - $\phi 1800 \times 1200$ DEEP PRECAST CONC. GULLY PIT WITH TRAFFICABLE LID AND $\phi 650$ GULLY GRATE RAISED 160mm ON PRECAST CONCRETE RING FOOTING.
 - DENOTES FINISHED PAVING or FINISHED SURFACE LEVEL
 - DENOTES EXISTING GROUND/PAVING LEVEL
 - DENOTES EXISTING GROUND CONTOUR
 - DENOTES 250mm WIDE SEMI-MOUNTABLE KERB
 - DENOTES 310mm WIDE MOUNTABLE KERB
 - DENOTES 139 CHS 5.4 CONCRETE FILLED BOLLARD. REFER C2.01 FOR DETAIL
 - DENOTES CHANNEL DRAIN



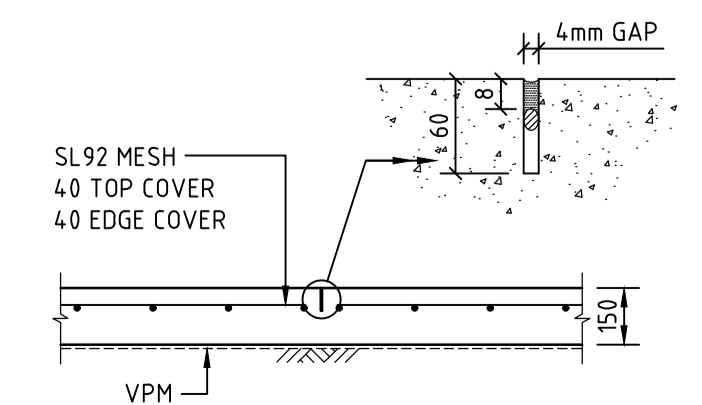
TYPICAL SEMI-MOUNTABLE KERB (SMK) DETAIL 110
 PROVIDE CONTRACTION JOINTS AT 2.5m MAX CRS.
 PROVIDE EXPANSION JOINTS AT 7.5m MAX CRS.
 CONCRETE GRADE TO BE N25



TYPICAL MOUNTABLE KERB (MK) DETAIL 110
 PROVIDE CONTRACTION JOINTS AT 2.5m MAX CRS.
 PROVIDE EXPANSION JOINTS AT 7.5m MAX CRS.
 CONCRETE GRADE TO BE N25



TYPICAL BOLLARD DETAIL 120



SAW-CUT JOINT DETAIL (SC) 120

NO.	AMENDMENT	DATE	INIT.
B	ISSUED FOR DEVELOPMENT APPROVAL	28.02.23	J.V.
A	ISSUED FOR SCHEMATIC DESIGN REVIEW	13.01.23	J.V.

DOCUMENTATION

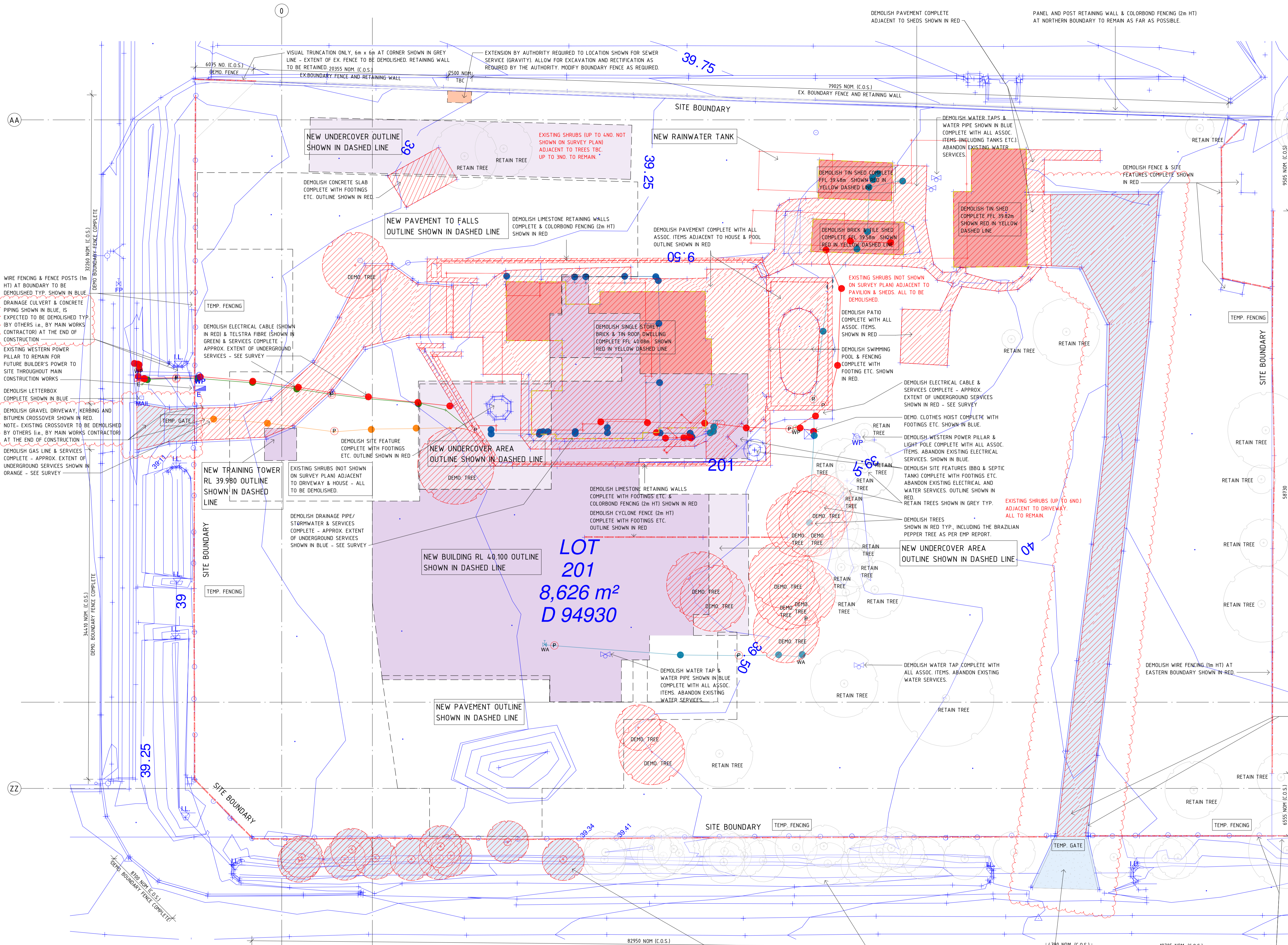


CIVIL CARDUP CFRS STATION LOT 169 DOLEY ROAD BYFORD SITeworks AND CARPARK LAYOUT PLAN AND DETAILS

DRAWN	A.A.	DESIGNED	P.T.	REDUCTION
CHECKED	-	PRINCIPAL	-	0 25
APPROVED	-	-	-	-
SCALE	1:200 AT A1	DATE	DEC 2022	DRAWING No.
DF PROJ No.	-	DF FILE No.	-	C2.01

SITeworks AND CARPARK LAYOUT PLAN

• SC - DENOTES SAW-CUT JOINT. REFER THIS SHEET FOR DETAIL.



DEMOLITION LEGEND

- Existing survey item to be retained/demolished as noted
- Existing building to be demolished
- Proposed building outline
- Proposed undercover area
- Proposed pavement outline
- Existing item to be demolished, as noted
- Existing item to be demolished by others as noted

PROVIDE TEMPORARY GATES OFF DOLEY ROAD & ORTON ROAD AND TEMPORARY FENCE (1.8m HT) TO SOUTHERN, EASTERN & WESTERN SITE BOUNDARIES THROUGHOUT WORKS (WITH EX. NORTHERN FENCING TO REMAIN). EXISTING GATE AT THE ORTON ROAD CROSSOVER MAY BE RETAINED IN LIEU OF THE NEW TEMPORARY GATE THROUGHOUT THE WORKS.

EXTENT OF TREES & SHRUBS FOR DEMOLITION (WITH 130m TREES SHOWN IN RED & NO. OF SHRUBS NOT SHOWN) TO REMAIN AS FAR AS POSSIBLE EXCEPT AS NOTED). EXISTING SITE TREES SHOWN IN GREY TO BE RETAINED AND PROTECTED. EXCAVATION WORKS WITHIN THE TREE PROTECTION ZONE SHALL BE CARRIED OUT WITH MACHINERY FITTED WITH A FLAT EDGE BUCKET AND A SPOTTER EMPLOYED TO MONITOR EXISTING TREE ROOTS. DIGGING IN CLOSE PROXIMITY TO THE TREE SHALL BE CARRIED OUT BY HAND. TRIMMING AND TRANSPLANT OF EXISTING TREES & SHRUBS WILL BE PART OF MAIN CONSTRUCTION WORKS). STRIP TOP SOIL (200mm DEPTH MAX.) INCLUDING VEGETATION & ROOTS, BOULDERS ETC. (600mm DEPTH) REMOVE FROM SITE. EXCAVATE TO NEW LEVELS. VERIFY REMOVAL SAND/FILL/BOULDERS FROM SITE. SEE CIVIL.

THE CONTRACTOR SHALL LIAISE WITH WESTERN POWER, TELSTRA & RELEVANT AUTHORITIES FOR DISCONNECTION OF SERVICES TO THE SITE PRIOR TO COMMENCING DEMOLITION WORKS. ALL EXISTING ELECTRICAL SERVICES ARE TO BECOME REDUNDANT & BE REMOVED FROM SITE.

Hydraulics Scope Of Work
Carry out all sanitary plumbing, hot, cold, gas, stormwater & stormwater soakwells, property sewerage cut & seats in order to complete the demolition work to the satisfaction of the Superintendent Representatives and the relevant authorities having jurisdiction. Allow to investigate to locate all existing hydraulic services within the works area. All existing hydraulic services are to become redundant & be removed from site.

Property Sewer
Allow to cut, seal & make redundant all property sewer drains connected to septic tank & leach drains. Demolish, remove rubble, backfill and compact all existing redundant property sewer drains and associated apparatuses to facilitate a clean site for new building.

Septic Tanks & Leach Drains
Allow to arrange and pay for a pump out and de-sludge of redundant septic tanks & leach drains by a licensed siltage haulage contractor. Disinfect with hydrated lime or Chlorine in accordance with WA Health Department requirements. Demolish, remove rubble, backfill with clean sand and compact area where removal of septic tanks & leach drains has occurred.

Water Service
Allow to cut & seal potable water main from existing potable water meter. Make application, arrange to pay all fees to Water Corporation to disconnect redundant potable water meter.

LP Gas and Natural Gas Service
Allow to cut & seal all LP gas from LPG bottle. Remove all existing redundant gas pipework from site.

Stormwater
Allow to demolish, remove rubble, backfill with clean sand & compact all redundant soakwells as required. DEMOLISH & ABANDON EXISTING RETICULATION COMPLETE WITH CONTROLS, ELEC. & WATER SERVICES COMPLETE (NOT SHOWN ON SURVEY PLAN).

EXTENT OF SALVAGE ITEMS TBC DURING CONSTRUCTION - MINIMUM EXTENT DESIRED FOR SALVAGE IS INCLUDING GRAVEL PATHWAY SURFACE, SAND, TIMBER LOGS, ROCKS/BOULDERS, PLANTING ETC. NO CLEARING TO OCCUR UNTIL TREES DESIGNATED FOR RETENTION AND LANDSCAPE ITEMS FOR SALVAGE HAVE BEEN CONFIRMED BY THE SUPERINTENDENT'S REPRESENTATIVE. ALL TREES TO BE RETAINED SHALL BE FENCED OFF FOR THE DURATION OF THE WORKS.

NOTES - WORKS BY OTHERS:
1. DOLEY ROAD
A. EX. CROSSOVER TO BE DEMOLISHED BY OTHERS (i.e., BY THE MAIN WORKS CONTRACTOR) AT THE END OF THE MAIN WORKS CONSTRUCTION.
B. DRAINAGE CULVERT & CONCRETE PIPING SHOWN IN BLUE, IS EXPECTED TO BE DEMOLISHED TYP. (BY OTHERS i.e., BY THE MAIN WORKS CONTRACTOR) AT THE END OF MAIN WORKS CONSTRUCTION.

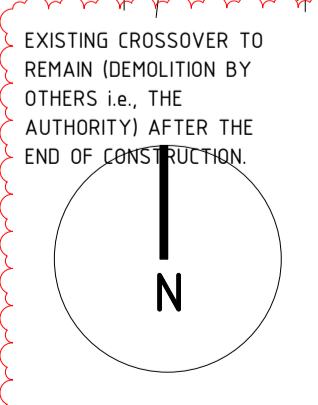
2. ORTON ROAD
A. EX. BITUMEN DRIVEWAY AND KERBING TO REMAIN EX. GATE IN LIEU OF TEMPORARY GATE MAY BE CONSIDERED DEMOLITION BY OTHERS (i.e., THE MAIN WORKS CONTRACTOR) AT THE END OF CONSTRUCTION.
B. EX. CROSSOVER TO REMAIN (DEMOLITION BY THE AUTHORITY) AFTER THE END OF MAIN WORKS CONSTRUCTION.

EXISTING BITUMEN DRIVEWAY AND KERBING TO REMAIN FOR LAYDOWN AND ACCESS THROUGHOUT THE MAIN WORKS. DEMOLITION BY OTHERS (i.e., THE MAIN WORKS CONTRACTOR) AT THE END OF CONSTRUCTION. EXISTING GATE MAY BE RETAINED IN LIEU OF THE NEW TEMPORARY GATE THROUGHOUT THE MAIN WORKS.

1 DEMOLITION PLAN
A0.09 1:200

iredale pedersen hook architects
Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
www.iredalepedersenhook.com email@iredalepedersenhook.com

MARRI & KINGIA ENDEMIC SPECIES ALONG ORTON ROAD TYP. RETAIN MARRI AS FAR AS POSSIBLE. ALLOW TO TRANSPLANT KINGIA TO EASTERN END OF THE SITE (FINAL LOCATIONS TO BE ADVISED TO MAIN CONTRACTOR FOR PLANTING DURING THE MAIN WORKS). MARRI TREES SHOWN IN RED TO BE DEMOLISHED FOR VISIBILITY WHEN DRIVING ONTO ORTON ROAD (DEMOLITION BY OTHER DEVELOPERS WITH EXTENT TBC IF POSSIBLE DURING CONSTRUCTION, WITH WORKS LIKELY TO BE UNDERTAKEN AFTER DEMOLITION WORKS ARE COMPLETE).



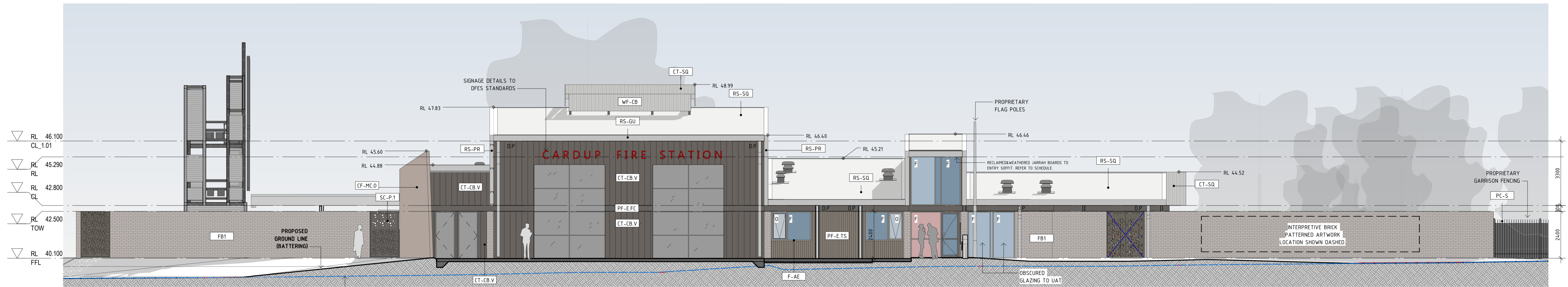
CARDUP CFRS FIRE STATION
LOT 201, 169 DOLEY ROAD, BYFORD WA 6122

DEMOLITION PLAN

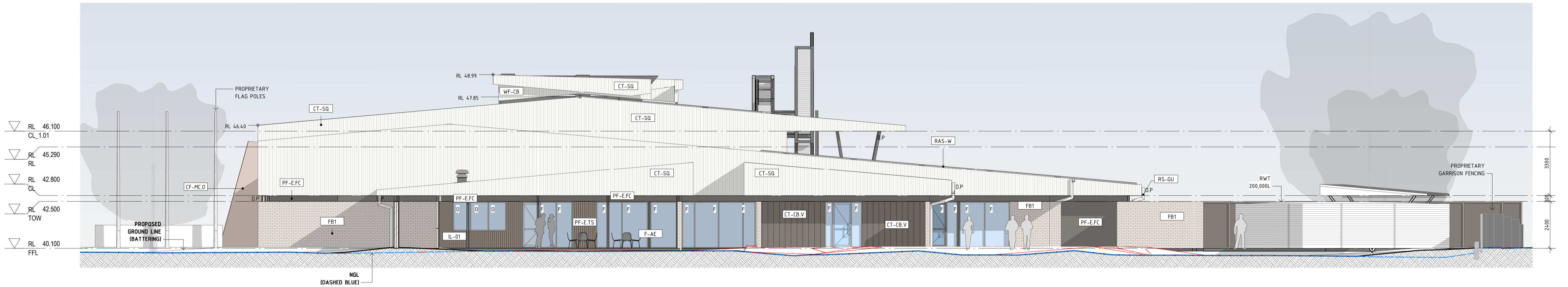
DRAWING No. **A1.12**

SCALE: As indicated @A1
DATE: 11/04/23

NOT FOR CONSTRUCTION



1 South/Orton Road Site Elevation
A0.11 1 : 100

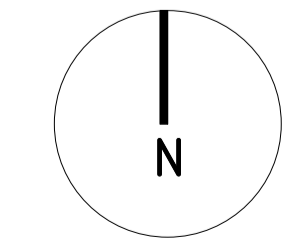


2 East Site Elevation
A0.11 1 : 100

A0.09, A.010, A3.01, A3.02 FINISHES LEGEND

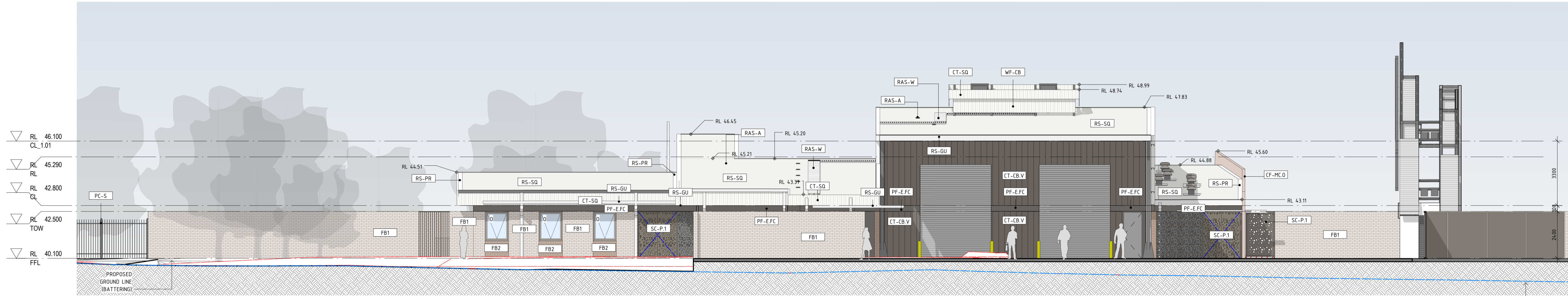
CODE	DESCRIPTION
COL	STRUCTURAL COLUMN - PAINT FINISH.
CT-CB.V	CLADDING - COLORBOND PROMINENCE SHEET METAL - VERTICAL (COLORBOND GULLY).
CT-SQ	CLADDING - COLORBOND SPANDEK PROFILE SHEET METAL - VERTICAL (COLORBOND SURFMIST).
F-AE	FRAMING SUITE - ANODISED ALUMINIUM - EXTERNAL - QUICKSAND.
PF-EFC	PAINT FINISH - EXTERIOR - FIBRE CEMENT SHEETING (MONUMENT / WOODLAND GREY).
PF-E.TS	PAINT FINISH - EXTERIOR - TIMBER PENETRATING STAIN (NATURAL COLOUR).
RAS-A	ROOF ACCESS SYSTEMS - ANCHORAGE POINT.
RAS-W	ROOF ACCESS SYSTEMS - WALKWAY PLATFORM.
RS-GU	ROOFING - PREFINISHED STEEL GUTTER - OPEN ENDED (COLORBOND SURFMIST).
RS-PR	ROOFING - PREFINISHED STEEL PRESSINGS & FLASHINGS (COLORBOND SURFMIST).
RS-SQ	ROOFING - PREFINISHED STEEL SQUARE CORRUGATED SHEETING (COLORBOND SURFMIST).
SC-P.1	SCREEN - PERFORATED ALUMINIUM PATTERN 1.
WF-CB	WALL FINISH - COLORBOND SHEETING.

iredale pedersen hook architects
 Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
 PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
 www.iredalepedersenhook.com email@iredalepedersenhook.com

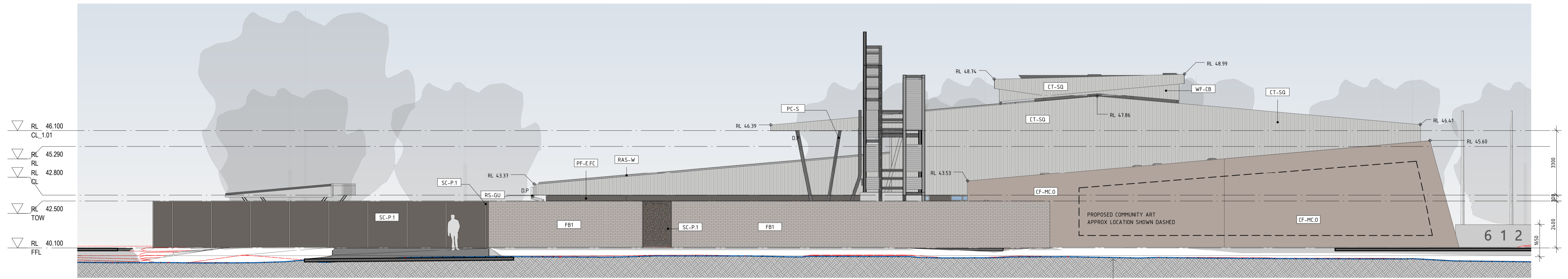


CARDUP CFRS FIRE STATION		DRAWING No.	
LOT 201, 169 DOLEY ROAD, BYFORD WA 6122		A0.09	
PROPOSED SITE ELEVATIONS	SCALE 1 : 100 @A1 50% REDUCTION @ A3	DATE 11/04/23	

NOT FOR CONSTRUCTION



3 North Site Elevation
A0.11 1 : 100

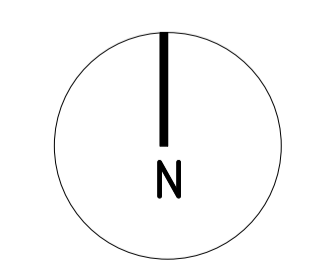


4 West/Doley Road Site Elevation
A0.11 1 : 100

A0.09,A.010,A3.01,A3.02 FINISHES LEGEND

CODE	DESCRIPTION
COL	STRUCTURAL COLUMN - PAINT FINISH.
CT-CB.V	CLADDING - COLORBOND PROMINENCE SHEET METAL - VERTICAL (COLORBOND GULLY).
CT-SQ	CLADDING - COLORBOND SPANDEK PROFILE SHEET METAL - VERTICAL (COLORBOND SURFMIST).
F-AE	FRAMING SUITE - ANODISED ALUMINIUM - EXTERNAL - QUICKSAND.
PF-EFC	PAINT FINISH - EXTERIOR - FIBRE CEMENT SHEETING (MONUMENT / WOODLAND GREY).
PF-ETS	PAINT FINISH - EXTERIOR - TIMBER PENETRATING STAIN (NATURAL COLOUR).
RAS-A	ROOF ACCESS SYSTEMS - ANCHORAGE POINT.
RAS-W	ROOF ACCESS SYSTEMS - WALKWAY PLATFORM.
RS-GU	ROOFING - PREFINISHED STEEL GUTTER - OPEN ENDED (COLORBOND SURFMIST).
RS-PR	ROOFING - PREFINISHED STEEL PRESSINGS & FLASHINGS (COLORBOND SURFMIST).
RS-SQ	ROOFING - PREFINISHED STEEL SQUARE CORRUGATED SHEETING (COLORBOND SURFMIST).
SC-P.1	SCREEN - PERFORATED ALUMINIUM PATTERN 1.
WF-CB	WALL FINISH - COLORBOND SHEETING.

iredale pedersen hook architects
 Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
 PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
 www.iredalepedersenhook.com email@iredalepedersenhook.com



CARDUP CFRS FIRE STATION		DRAWING No.	
LOT 201, 169 DOLEY ROAD, BYFORD WA 6122		A0.10	
PROPOSED SITE ELEVATIONS		SCALE 1 : 100 @A1 50% REDUCTION @ A3	DATE tbc



CARDUP FIRE STATION

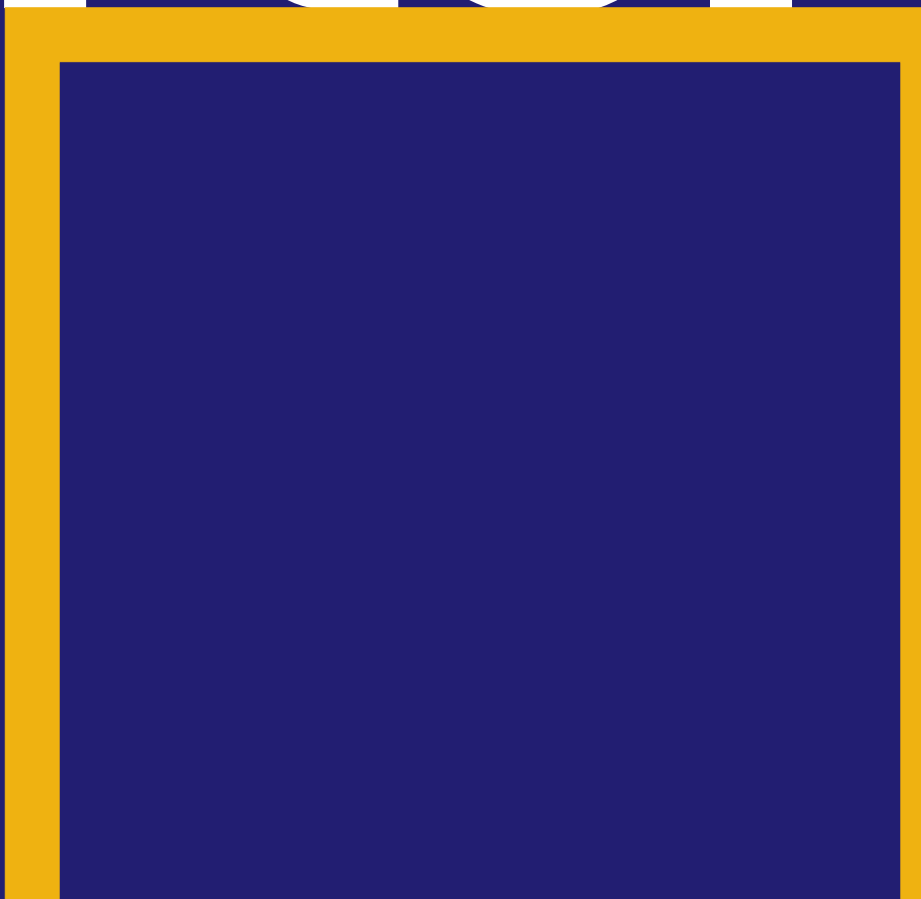


TRAFFIC IMPACT STATEMENT

DFES CAREER FIRE & RESCUE STATION

LOT 201, 169 DOLEY ROAD, BYFORD

Porter



REPORT PREPARED FOR
IREDALE PEDERSON HOOK ARCHITECTS

Prepared by	Porter Consulting Engineers
Postal address	PO Box 1036 Canning Bridge WA 6153
Phone	(08) 9315 9955
Email	office@portereng.com.au
Job number	22-09-109
Date	2 February 2023
Our reference	R09.23
Checked	

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Author	Issued to	Revision type
Rev A	2/02/2023	EW	Iredale Pederson Hook	1 st Issue

CONTENTS

1.0	INTRODUCTION.....	1
1.1	Background.....	1
1.2	Scope of Assessment.....	2
2.0	DEVELOPMENT PROPOSAL.....	3
2.1	Proposed Land Uses.....	3
2.2	Context to the Surrounds.....	3
3.0	EXISTING SITUATION.....	5
3.1	Road Hierarchy and Road Infrastructure.....	5
3.2	Existing Traffic Volumes.....	8
3.3	Crash History.....	8
3.4	RAV Network.....	9
4.0	VEHICLE ACCESS AND PARKING.....	10
4.1	Vehicle Access.....	10
4.2	Sight Distance.....	10
4.3	Service Deliveries.....	13
4.4	Parking.....	13
5.0	TRAFFIC ASSESSMENT.....	14
5.1	Trip Generation.....	14
5.2	Trip Distribution and Assignment.....	15
5.3	Impact on Adjacent Road Network.....	15
6.0	OTHER ISSUES.....	16
6.1	Pedestrian and Cyclist Facilities.....	16
6.2	Public Transport.....	16
7.0	SUMMARY AND CONCLUSION.....	18

Appendix – Development Concept Plan

1.0 INTRODUCTION

1.1 Background

Porter Consulting Engineers has been commissioned to prepare a Traffic Impact Statement (TIS) to inform the development application for a DFES Career Fire and Rescue Station to be located at Lot 201, No.169 Doley Road, Byford in the Shire of Serpentine Jarrahdale.

The site is located approximately 34kms to the southeast of the Perth CBD. Key distributor roads within close proximity include Tonkin Highway, Thomas Road, South Western Highway, Hopkinson Road, Abernethy Road and Orton Road.

The site location is shown in a regional context in **Figure 1.1** and in the local context in **Figure 1.2**.

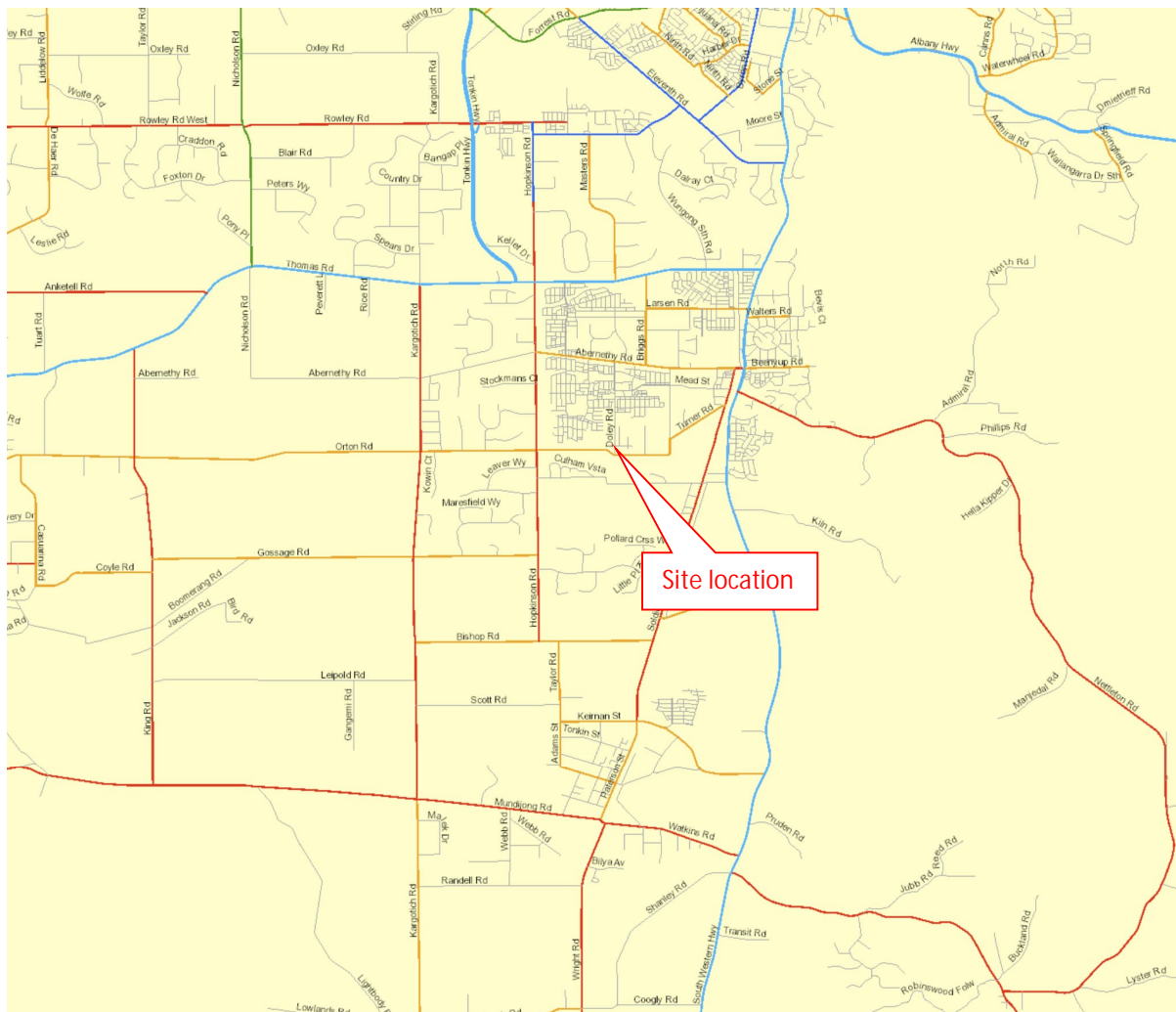


Figure 1.1: Site Location – Regional Context (MRWA Road Hierarchy Map)



Figure 1.2: Site Location – Local Context (*Metromap 21/12/2022*)

1.2 Scope of Assessment

The intent of this report is to provide the approving authority with sufficient transport information to confirm that the proponent has adequately considered the transport aspects of the development application.

2.0 DEVELOPMENT PROPOSAL

2.1 Proposed Land Use

The proposed development will accommodate a Department of Fire and Emergency Services Career Fire and Rescue Station. The site will comprise of the following:

- Single Storey building = 644.5 m²
- Appliance Bay = 2,718 m²
- Covered Servicing Area = 149.7 m²
- Outdoor Staff Areas = 69.9 m²

The Site will operate seven days a week 24 hours a day over two shifts of 10 hours and 14 hours with the shift changeovers occurring at 8am and 6pm.

The indicative staffing requirements are as follows:

- Fire and Rescue Services Staff = 6 per shift

Appendix A contains a copy of the proposed development plan for the development application.

2.2 Context to the Surrounds

The Site is currently zoned **industrial** as is the surrounding land. The proposed development is considered generally in context with surrounding land uses.

Figures 2.1 and 2.2 show the surrounding land use zoning as outlined by the Shire of Serpentine Jarrahdale Intramaps.



Figure 2.1: Surrounding Land Uses (Shire of Serpentine Jarrahdale Intramaps)



Figure 2.2: Lot 201 (169) Doley Road, Byford (Shire of Serpentine Jarrahdale Intramaps)

3.0 EXISTING SITUATION

3.1 Road Hierarchy and Road Infrastructure

Doley Road

Doley Road is defined as an Access Road under Main Roads WA's *Functional Road Hierarchy*. The role of an access road is "to provide access to abutting properties with safety aspects having priority over the vehicle movement function."

Doley Road fronting the Site is constructed to a two lane undivided single carriageway standard. The road is kerbed and comprises of an approximately 7m wide pavement. Doley Road is subject to the built up area speed limit of 50km/h.

Doley Road connects to the primary road network via

- the Give Way controlled T-junction intersection with Orton Road; and
- the single lane roundabout controlled T-junction intersection with Abernethy Road.

Orton Road and Abernethy Road are classified as Local Distributor roads under Main Roads WA's *Functional Road Hierarchy*.

Orton Road

This section of Orton Road is defined as a Local Distributor road under Main Roads WA's *Functional Road Hierarchy*. The role of a Local Distributor road is "to carry traffic within a cell and link District Distributors or Regional Distributors at the boundary to access roads. The route of Local Distributors should discourage through traffic so that the cell formed by the grid of District distributors only carries traffic belonging to, or serving the area."

Orton Road abutting the Site is constructed to a two lane undivided single carriageway standard. The road is mostly unkerbed and comprises of a rural standard profile varying from 3.0m to 7.4m in width of seal with unsealed shoulders varying from 0.5m to 2.5m in width. Orton Road is not speed zone signed and it is unclear to motorists if it is subject to the built up area speed limit of 50km/h or rural and subject to the maximum speed limit of 110km/h.

Orton Road connects to the primary road network via Hopkinson Road which is a Regional Distributor road.

The intersection of Orton Road with Hopkinson Road is a 4-way intersection controlled by Stop signs on the Orton Road approaches.

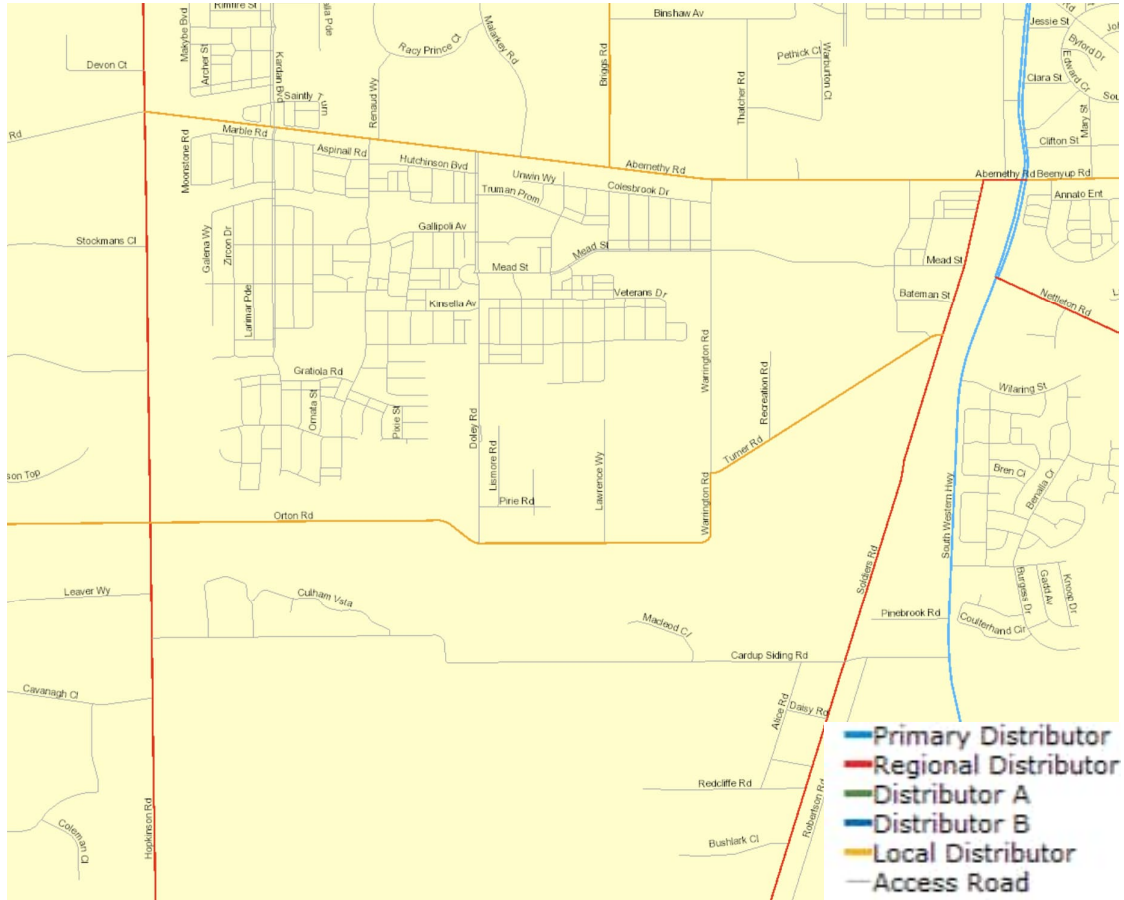


Figure 3.1: Road Hierarchy of Surrounding Road Network (Main Roads website)



Figure 3.2: Existing T-intersection at Doley Road/Orton Road

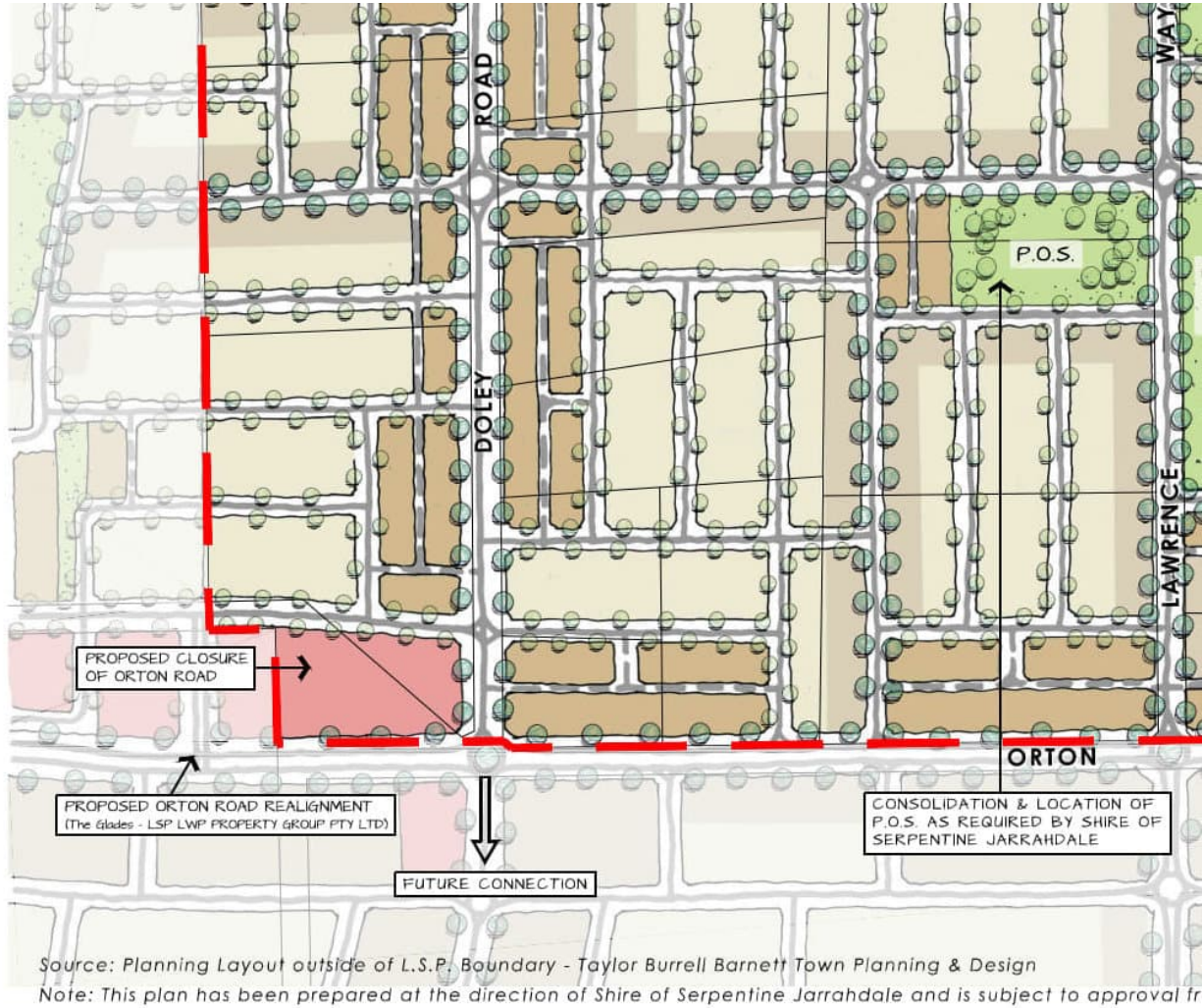


Figure 3.3: Proposed Future Orton Road Realignment Concept (KCTT)



Figure 3.4: Proposed Future Orton Road and 4-way Intersection with Doley Road (Stantec)

3.2 Existing Traffic Volumes

The most recently available traffic counts were sourced and are summarised in the following table.

Table 3.1: Existing Traffic Data

Location	Data Source	Date	AWT	% HV	AM Peak Volume	PM Peak Volume
Doley Road – 300m north of Orton Rd	KCTT	4/2015	164	n/a	16	14
Orton Road – east of Doley Rd	SoSJ	12/2020	365	16.7	25	33
Orton Road – west of Doley Rd	SoSJ	12/2020	829	12.5	58	78
Hopkinson Road – 300m south of Abernethy Rd	KCTT	4/2105	3,097	n/a	600	728

3.3 Crash History

A review of the recent crash history for the surrounding road in the vicinity to the site has been conducted for the five year period to the end of December 2021 from the Main Roads Western Australia Integrated Road Information System (IRIS) crash database. Eight (8) crashes have occurred at the locations shown in **Figure 3.5** within the blue outline.

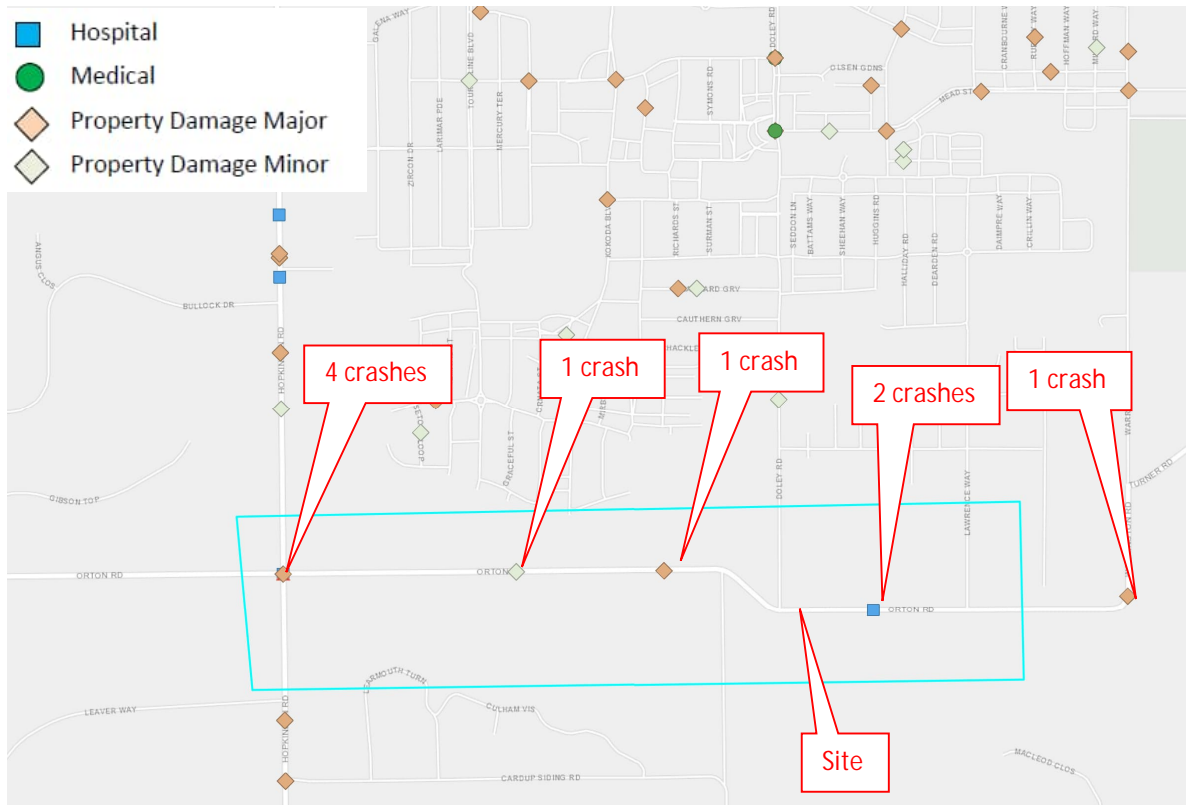


Figure 3.5: Crashes on the Surrounding Road Network

3.4 RAV Network

The Heavy Vehicles Restricted Access Vehicles (RAV) Network documented by Main Roads Western Australia was reviewed. No roads abutting and adjacent to the Site permit restricted access heavy vehicles.

The nearest RAV routes are limited to Thomas Road and South Western Highway where RAV4.3 vehicles are permitted, refer **Figure 3.6**. The proposed development area surrounding the Site typically operates with “As-of-right Vehicles” where the longest permitted vehicle is 19 metres i.e. semi-trailers and rigid trucks. Fire and Rescue vehicles are less than 19 metres and are permitted under the As-of-right vehicles conditions.

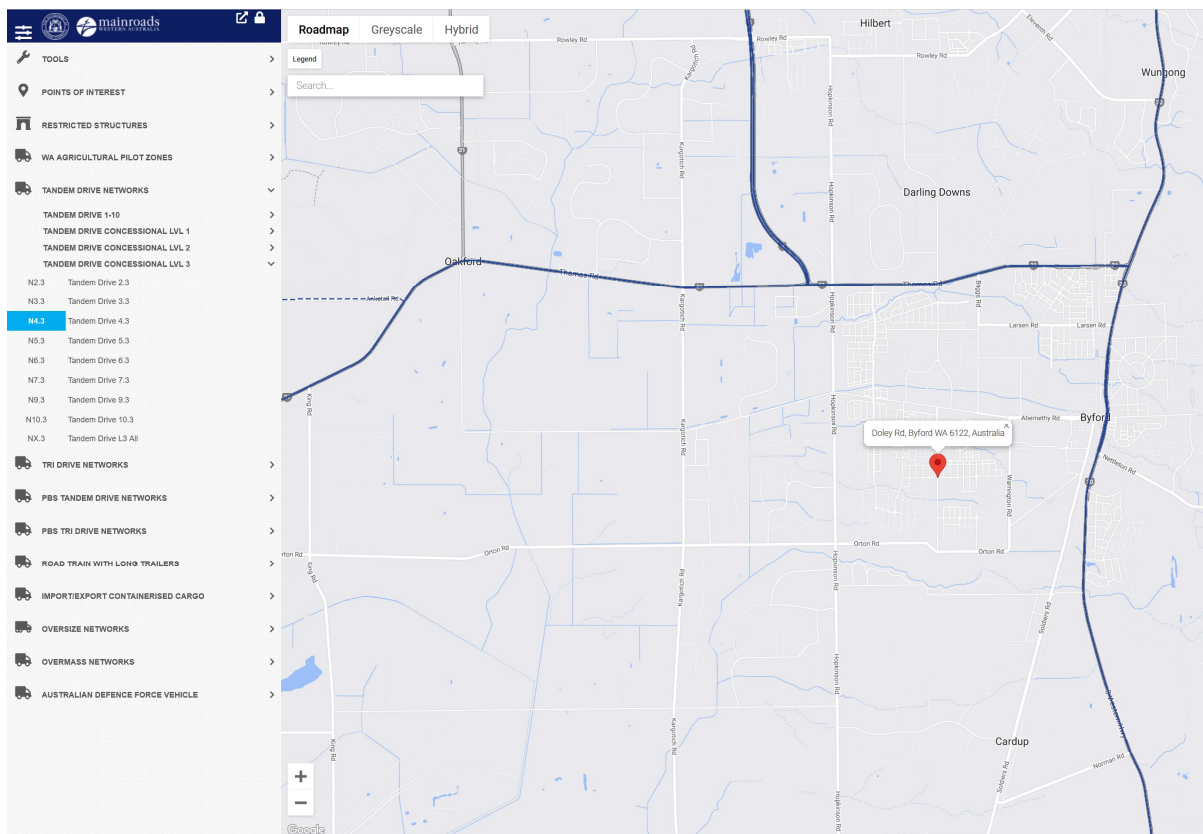


Figure 3.6: Existing RAV Network

4.0 VEHICLE ACCESS AND PARKING

4.1 Vehicle Access

Two driveways are proposed to service the development and they are:

- A two-way driveway on Doley Road for light vehicles to access the staff car parking area at the north side of the development and for returning Fire and Rescue Vehicles.
- A two-way driveway on Orton Road for Fire and Rescue vehicles to attend tasks and for occasional visitors to the site to park in the visitors and disabled bay.

Separation of time-sensitive vehicle traffic and other traffic is desirable as it provides improved traffic circulation and better levels of safety to the Site's users and fronting roads traffic.

To keep conflict between frontage road traffic and car park traffic to an acceptable minimum AS/NZS 2890.1 recommends that driveways be prohibited at intersections in accordance with Figure 3.1, i.e. being within 6m from the intersection TPs and opposite. The two driveways are compliant with AS2890.

Abutting the northern boundary of the Site is the recently constructed road named Yandra Street that is presently constructed up to the eastern boundary of the Site. In the future the Structure Plan shows Yandra Street extending to link with Encounter Road. The DFES CFRS station will not have any access on to Yandra Street and as such that street is unaffected by this development.

4.2 Sight Distance

The Australian Standard AS/NZS 2890.1:2004 makes recommendation on the sightlines for driveways. Doley Road is subject to the default built up area speed limit of 50km/h and it can reasonably be anticipated that Orton Road will in the future become clearer to motorists as being subject to a 50km/h speed limit. Based on a design speed of 10km/h higher than the posted speed the desirable sight distance is 83m with a minimum of 65m for 60km/h.

Google Streetview suggests that adequate sight lines will be available along Doley Road in both directions and Orton Road to the east as the carriageway alignment has relatively low gradients with clear sight lines as indicated in **Figures 4.1 to 4.3**. Orton Road looking to the west has a stagger in the road alignment immediately west of Doley Road and the verges are lined with trees. Sightlines at the Doley Road intersection looking west are therefore restricted, **Figure 4.4**. To improve road safety the Shire is proposing to install a single lane

roundabout at the Orton Road/Doley Road intersection and that is expected to improve safety for the intersection and as a consequence also improve safety for the Site exit to Orton Road.



Figure 4.1: Doley Road, looking north adjacent to the Site



Figure 4.2: Doley Road, looking south adjacent to the Site



Figure 4.3: Orton Road, looking east adjacent to the Site



Figure 4.4: Orton Road, looking west adjacent to the Site

4.3 Service Vehicles

Should there be need for occasional delivery vehicles they can readily be accommodated within the hardstand area located between the staff parking and covered servicing area and make their entry/exit via the Doley Street driveway.

A bin store is to be located toward the south-east corner of the building that will be used to contain typical Mobile Garbage Bins (MGB) supplied by the Shire of Serpentine Jarrahdale. Those bins can be wheeled out to the Orton Road verge for collection and empty by the Shire on their weekly bin day.

4.4 Parking

Parking requirements applied by Local Governments are generally defined through local planning schemes and local planning policies. Off-street parking is typically provided to accommodate peak parking demands and is usually based on a predicted 85th percentile usage or capacity (*RTA Guide to Traffic Generating Developments*).

The Shire of Serpentine Jarrahdale Local Planning Scheme No.2 outlines parking requirements for various land uses in Table V - Parking Requirements. There is no specific requirement listed for a Fire Station but it can be assumed that Industry: General can be applied. The parking requirements for Industry: General is described as follows:

- 1 space per employee or staff member.

The Department of Fire and Emergency Services has advised that it proposes to staff the station in two shifts with 6 staff per shift. And, the advice received is that visitors to the site will be unlikely to exceed 1 or 2 per day.

The site proposes to provide a total of 12 staff parking bays and two visitor bays with one of those being a disabled bay. The parking demand is estimated to be as follows:

Staff = two shifts having 6 staff per shift. For up to 12 staff - 12 parking bays.

Visitors = anticipate 1 or 2 per day - 2 parking bays.

This equates to a total parking demand of 13 to 14 bays. The worst case scenario would occur when all shift staff overlap at the same time for the change of shift i.e. 6 staff in one shift and 6 staff in the second shift parking on site simultaneously creating a potential short term peak parking demand of 12 staff bays.

Based on this parking assessment of the advised operational conditions for the DFES CFRS station, the proposed provision of 12 staff parking bays and 2 visitor bays is sufficient to adequately cover the maximum likely peak short term parking demand.

During the detailed design process the carpark should be designed to meet the requirements of AS2890 in all aspects including provision for the universal access parking bay.

5.0 TRAFFIC ASSESSMENT

In order to assess the potential traffic impacts associated with the proposed development a traffic generation exercise was undertaken. This establishes the levels of traffic that could potentially be generated from the proposed development and enables the assessment of anticipated effects that the additional traffic could have on the adjacent road network.

5.1 Trip Generation

Traffic generation for sites is dependent on a number of key factors, one of which is employee density. The proposed development is considered to be a low density employment land use and there is a large portion of the site not dedicated to any use.

There are a number of resource documents used to determine the traffic generated by particular development land use types. These are the industry recognised documents used by Traffic Engineers Australia wide:

- Land Use Traffic Generating Guidelines, Director General of Transport, South Australia, 1986.
- Guide to Traffic Generating Developments, Roads and Traffic Authority, NSW, 2002.
- Trip Generation, Institute of Transportation Engineers, 7th Edition, 2003.

The Site will have 6 staff and expects up to 12 fire truck movements per day plus 1 or 2 visitors per day. The site operates 2 shifts and staff will change shifts at 8am in the morning and 6pm in the evening generating 24 trips per day. This equates to 24 staff trips, 4 visitor trips and adding this to the 12 expected fire truck trips this will generate 40 trips per day.

The previous occupancy of this site was a large semi-rural residential dwelling and the typical trip generation for a large lot single residential dwelling is 8 to 10 trips per day.

Taking the lesser trip rate of 8 trips per day for the previous residential use then the expected increase for the site will be 32 trips per day.

The Local Structure Plan for this area proposed residential cottages at R40 to R60 which requires an average lot area of 150sqm per dwelling for R60 and 220sqm per dwelling for R40. The area of this site is approximately 8,626 sqm which permits up to 57 dwellings at R60 and 39 at R40. Taking the lesser and assuming a densely urban trip generation rate of 6 trips/dwelling then the site could have generated at least $39 \times 6 = 234$ trips per day.

5.2 Trip Distribution and Assignment

All vehicle trips will enter and exit the Site via Doley Road and Orton Road with Doley Road carrying the majority of trips.

It is estimated that approximately 60% of trips (24 daily trips) to/from the Site will be via the Doley Road access and 40% of trips (16 Daily trips) will be via the Orton Road access.

It is anticipated the majority of staff trips will use Orton Road and Hopkinson Road. Fire and Rescue services may need to travel in any direction but it is anticipated that access to the major primary roads of Thomas Road and South Western Highway will be via Orton Road and Hopkinson Road.

5.3 Impact on Adjacent Road Network

Doley Road is classified a *Local Access road* and as such is typically expected to cater for up to 3,000 vehicles per day. The 3,000 vehicles per day is a prescribed maximum for the purposes of amenity and this is much less than the actual roadway capacity. The additional increase of traffic from this development over the previous land use of approximately 32 trips (40 - 8 trips) on a weekday is readily able to be accommodated on Doley Road in the context of its capacity.

Orton Road is classified a *Local Distributor* road that can carry up to 7,000 vehicles per day on a weekday. With only a small amount of the site generated traffic expected to use Orton Road, the additional increase of traffic from the development on a weekday can be accommodated on this Local Distributor road in the context of its road hierarchy and capacity.

The KCTT Transport Impact Assessment of Doley Road Precinct LSP dated 8 March 2017 includes modelling assessment of Doley Road and Orton Road under the full development of the Local Structure Plan area. Under the LSP this site is proposed for development as residential cottages under R40 to R60 and that is a much higher intensity of traffic generating development than the DFES CFRS can generate. Accordingly, the trip generation for this site has been sufficiently assessed by KCTT at a much higher level than will be actually generated by the CFRS.

6.0 OTHER ISSUES

6.1 Pedestrian and Cyclist Facilities

With reference to the Site there is an existing pedestrian path located along Doley Road from Orton Road to Abernethy Road and paths along both sides of Abernethy Road to the Byford Town Centre strip along South Western Highway.

Figure 6.1 outlines the main cycling path to/from the Site (blue line). As such there are opportunities for staff to walk and/or cycle to Site if this mode of transport is preferred.

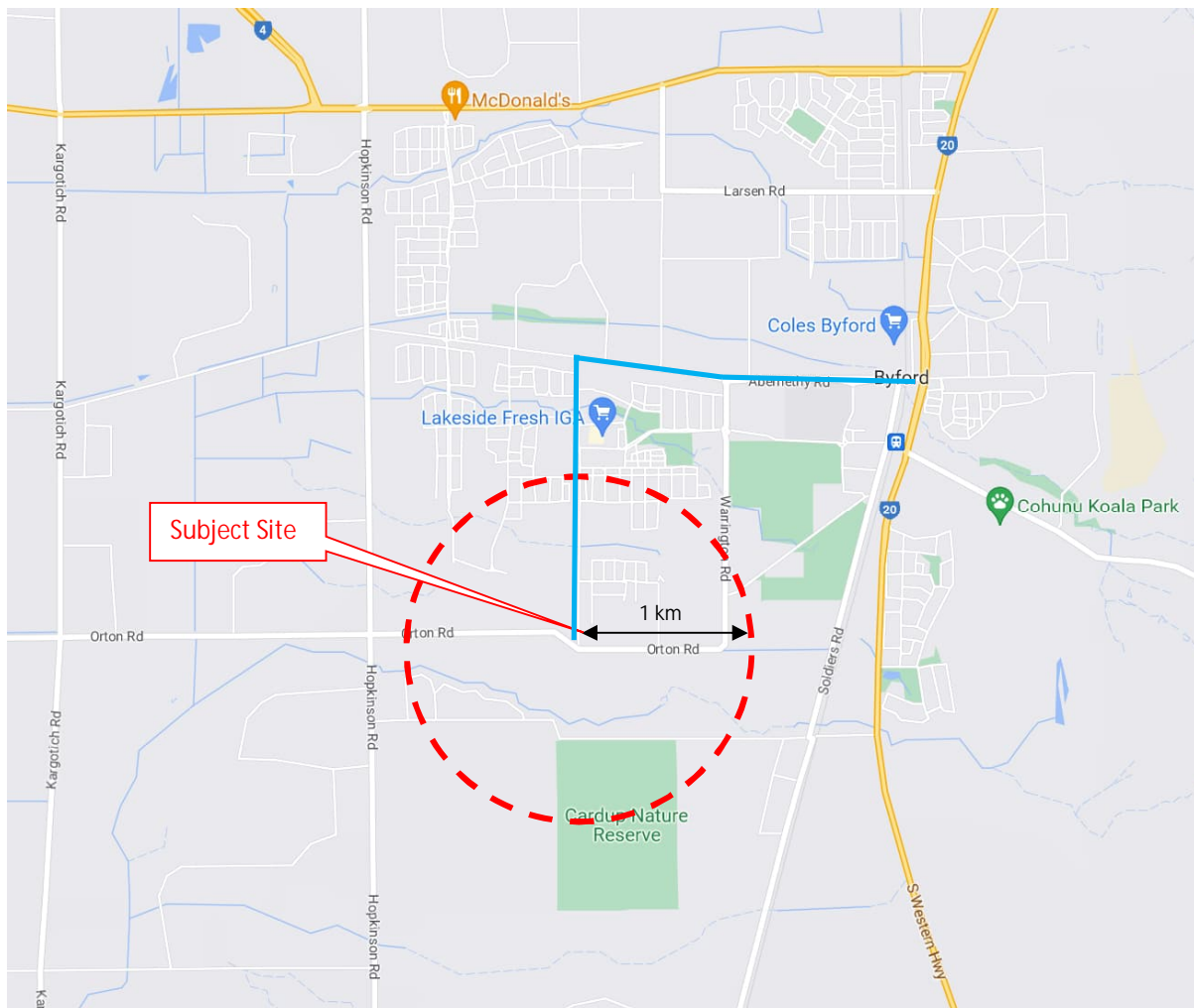


Figure 6.1: Existing Cycling Facilities Surrounding the Site (Google Map)

6.2 Public Transport

The site has limited access to public transport with the nearest bus stops located along Doley Road north of Mead Street at Stop ID 27622 and 27623 located approximately 1.2km from

the site. Bus Route 254 operates along Abernethy Road, Doley Road and Mead Street. **Figure 6.2** outlines the route.

There is some opportunity for staff to use public transport to travel to and from the proposed facility depending on their trip origin.

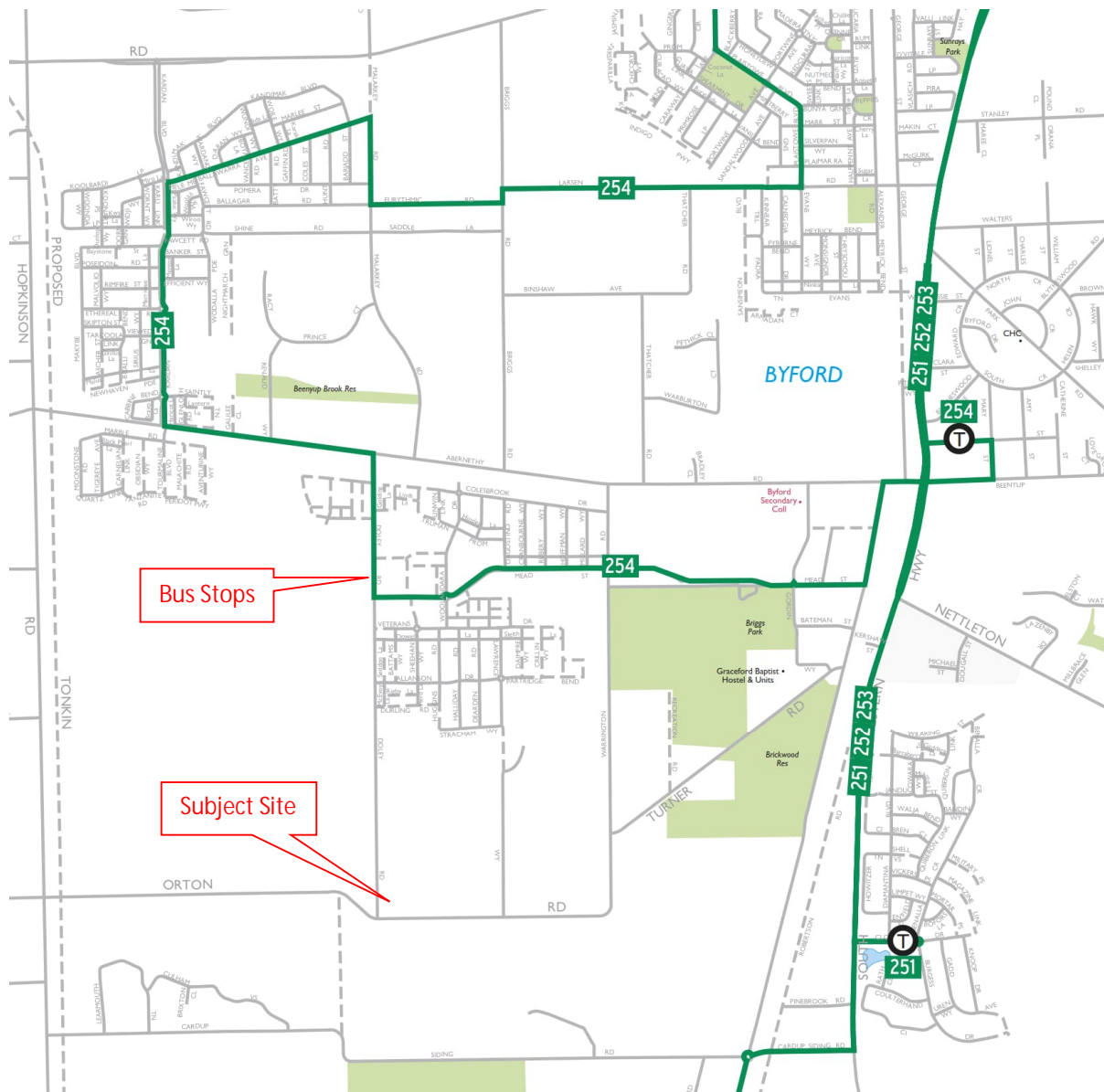


Figure 6.2: Public Transport Routes Surrounding the Site

7.0 SUMMARY AND CONCLUSION

Porter Consulting Engineers has been commissioned to prepare a Traffic Impact Statement (TIS) to inform the development application for the proposed department of Fire and Emergency Services Career Fire and Rescue Station to be located at Lot 201, No.169 Doley Road, Byford in the Shire of Serpentine Jarrahdale.

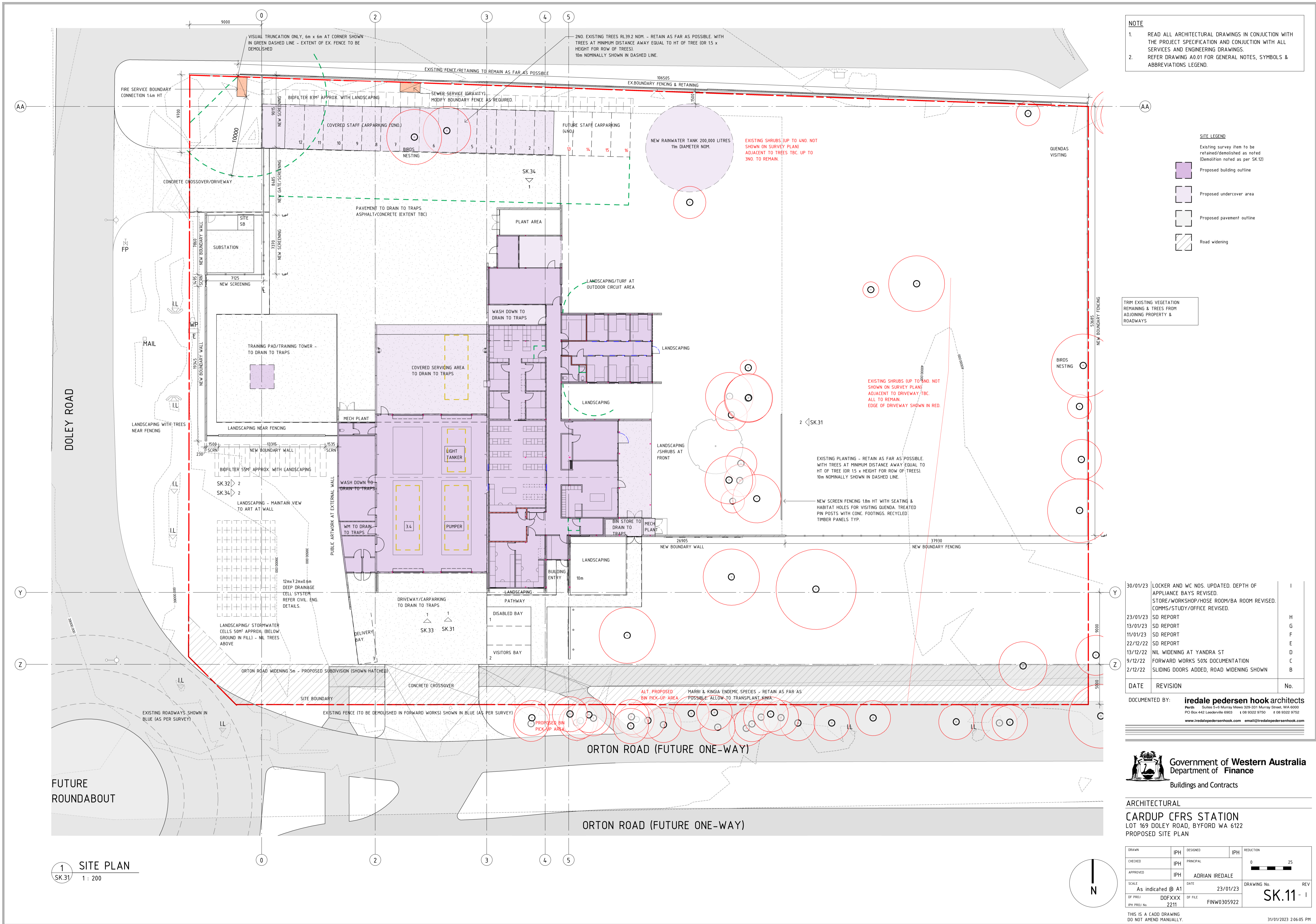
Based on Shire of Serpentine Jarrahdale Local Planning Scheme No.2 parking requirements a total of 12 bays should be provided. Based on the staffing and proposed operation of the Fire and Rescue Station the provision of 14 parking bays will satisfy the expected parking demand. The anticipated short term peak parking demand that could potentially occur with simultaneous shift changes of two groups of staff is up to 12 bays. The expectation is that the site will only receive 1 or 2 visitors per day and the provision of 1 visitor bay plus 1 disabled bay is considered sufficient.

The traffic generated by the development is estimated to be 40 vehicles daily with peak hour of 12 movements. This additional traffic generated can be adequately catered for on the surrounding road network in context with these roads existing hierarchy function and spare capacity. The KCTT Transport Impact Assessment for the Doley Road Precinct LSP dated 8 March 2017 modelled much higher trip generation for this site based on a higher intensity of development. Accordingly, the lesser trip generation under the proposed CFRS station will operate with much lower impact.

As outlined within this report the proponent has adequately considered the transport aspects of the development application.

APPENDIX

Development Concept Plan



NOTE

1. READ ALL ARCHITECTURAL DRAWINGS IN CONJUNCTION WITH THE PROJECT SPECIFICATION AND CONJUNCTION WITH ALL SERVICES AND ENGINEERING DRAWINGS.
2. REFER DRAWING A0.01 FOR GENERAL NOTES, SYMBOLS & ABBREVIATIONS LEGEND.

SITE LEGEND

- Existing survey item to be retained/demolished as noted (Demolition noted as per SK.12)
- Proposed building outline
- Proposed undercover area
- Proposed pavement outline
- Road widening

TRIM EXISTING VEGETATION REMAINING & TREES FROM ADJOINING PROPERTY & ROADWAYS

DATE	REVISION	No.
30/01/23	LOCKER AND WC NOS. UPDATED. DEPTH OF APPLIANCE BAYS REVISED. STORE/WORKSHOP/HOSE ROOM/BA ROOM REVISED. COMMS/STUDY/OFFICE REVISED.	I
23/01/23	SD REPORT	H
13/01/23	SD REPORT	G
11/01/23	SD REPORT	F
22/12/22	SD REPORT	E
13/12/22	NIL WIDENING AT YANDRA ST	D
9/12/22	FORWARD WORKS 50% DOCUMENTATION	C
2/12/22	SLIDING DOORS ADDED, ROAD WIDENING SHOWN	B

DOCUMENTED BY: **iredale pedersen hook architects**
 Perth | Suite 516 Murray Mews 328-331 Murray Street, WA 6000
 PO Box 442 Leederville 6003 | 08 9322 9750 | 08 9322 9752
 www.iredalepedersenhook.com | email@iredalepedersenhook.com



ARCHITECTURAL
CARDUP CFRS STATION
 LOT 169 DOLEY ROAD, BYFORD WA 6122
 PROPOSED SITE PLAN

DRAWN	IPH	DESIGNED	IPH	REDUCED	
CHECKED	IPH	PRINCIPAL		0	25
APPROVED	IPH	ADRIAN IREDALE			
SCALE	As indicated @ A1	DATE	23/01/23	DRAWING No.	SK.11 - I
DP PROJ	DDFXXX	DP FILE	FINW0305922		
DP PROJ No.	2211				

THIS IS A CADD DRAWING
 DO NOT AMEND MANUALLY.

31/01/2023 2:06:05 PM

1 SITE PLAN
 SK.31 1 : 200

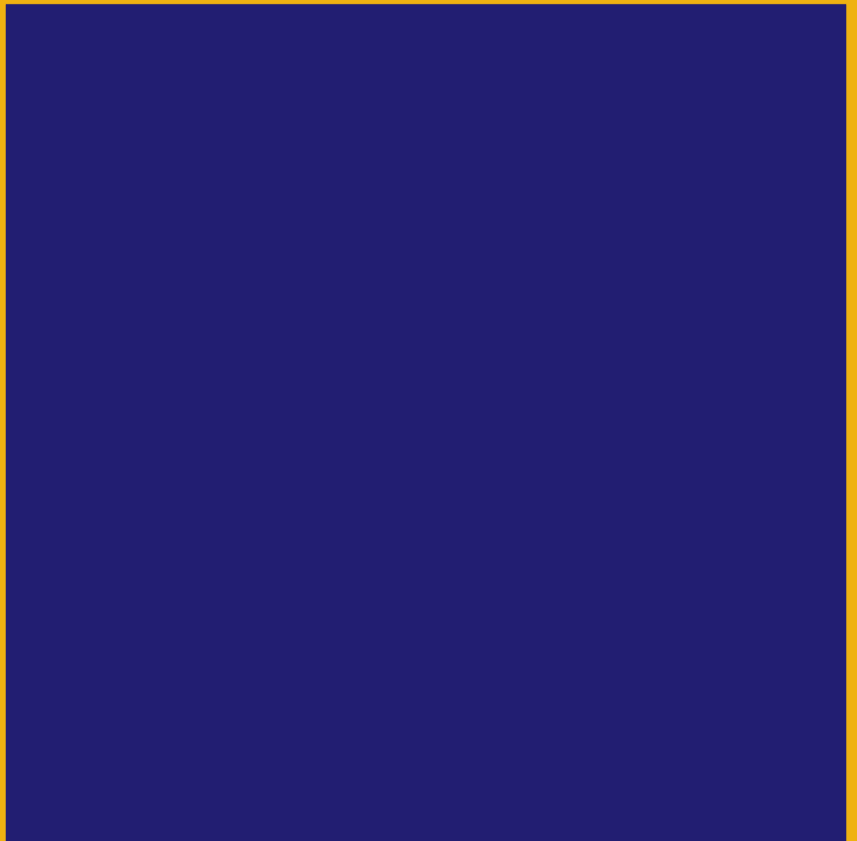
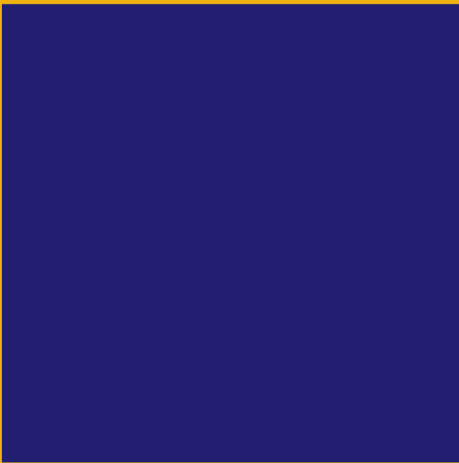


Level 2 Kishorn Court
58 Kishorn Road
Mount Pleasant 6153
Western Australia

PO Box 1036
Canning Bridge 6153
Western Australia

Tel: (08) 9315 9955
Email: office@portereng.com.au

www.portereng.com.au



GABRIELS HEARNE FARRELL



ENVIRONMENTAL ACOUSTIC REPORT

DEVELOPMENT APPLICATION REPORT

6th February 2023



For

IREDALE PEDERSON HOOK ARCHITECTS

**Suite 8 / 329-331 Murray Street
PERTH WA 6000**

CONTENTS	PAGE
1. INTRODUCTION	3
1.1 QUALIFICATIONS OF CONSULTANT	3
2. ENVIRONMENTAL NOISE EMISSIONS	3
2.1 ASSIGNED NOISE LEVELS	4
2.2 ADJUSTMENTS FOR NOISE CHARACTER	4
2.3 NOISE SENSITIVE RECEIVERS	4
3. NOISE SOURCES	5
3.1 TRAINING EXERCISES	5
3.2 MECHANICAL SERVICES	6
3.3 NOISE BREAKOUT FROM INTERNAL SOURCES	6
3.4 EPNR NOISE SPECIFIC CRITERIA	6
3.5 PENALTIES APPLIED TO NOISE SOURCES	8
4. STATE PLANNING POLICY 5.4 - ROAD AND RAIL NOISE	8
5. MODELLING METHODOLOGY	9
5.1 METEOROLOGICAL CONDITIONS	9
5.2 TOPOGRAPHY AND BUILDING FORM	9
6. ACOUSTIC MODELLING	9
6.1 NOISE SENSITIVE RECEIVER LOCATIONS	9
6.2 RESULTS OF ACOUSTIC MODELLING	9
7. INTERNAL ACOUSTICS	11
7.1 DORMITORY ACOUSTIC REQUIREMENTS	11
8. OBSERVATIONS & CONCLUSIONS	12

ATTACHMENTS

- APPENDIX A - SoundPLAN Noise contour Plots (x11)

Report Version	Author	Notes	Date
Initial Report	Michael Ferguson		6 th February 2023



Gabriels Hearne Farrell Pty Ltd is a Member Firm of the Association of Australasian Acoustical Consultants. The report author is a full member of the Australian Acoustical Society.

Disclaimer - The information contained within this report is solely for the use of the client identified on the cover page. The report is based on a specific scope as agreed between Gabriels Hearne Farrell Pty Ltd and the client. Gabriels Hearne Farrell Pty Ltd accepts no liability where this report is used by any third party who may rely upon this document. No section of this report can be used by a third-party without prior approval from the client and Gabriels Hearne Farrell Pty Ltd. This report should not be reproduced or reviewed, except in full.

1. INTRODUCTION

This report addresses the architectural acoustic issues to be addressed during the development approval process of the proposed new Career Fire and Rescue Station, located on Lot 169 Doley Road, Byford. This report is based on the documentation set provided dated 31st January, 2023.

The purpose of this report is to provide an overview of the acoustic design requirements included in Regulations, Codes, and Planning Policies and Australian Standards, relevant to the Development Approval stage. These acoustic requirements must then be addressed in detail prior to the lodgement of the Building Permit documentation.

1.1 Qualifications of Consultant

The author of this report, Michael Ferguson, has been working for Gabriels Hearne Farrell Pty Ltd (formerly Gabriels Environmental Design Pty Ltd) since the beginning of 2010. He became a full member of the Australian Acoustical Society on the 22nd March, 2014. GHF is also a Member Firm of the Association of Australasian Acoustical Consultants.

2. ENVIRONMENTAL NOISE EMISSIONS

Noise emissions generated by the use of the proposed facilities must comply with the Environmental Protection (Noise) Regulations, 1997 (as amended Dec 2013). The criteria for noise emissions from this development to neighbouring premises are called the Assigned Noise Levels, and vary depending on time of day, receiver location, duration of the noise source etc.

The site specific Assigned Noise Level criteria takes into account the land zoning and traffic flows within 100m and 450m of the relevant receiver locations. This has been based on the land zoning information obtained from aerial imagery and the Shire of Serpentine Jarrahdale Intramaps system:



Image 01 - Assigned Noise Level Circumferences & Land Zoning

Land Zoning Influencing Factor

There are no commercial properties within a 450m radius of the proposed development. Therefore there is no additional influencing factor applicable for land zoning.

Transport Influencing Factor

Similar to the land zoning, there are no major or secondary roads within a 450m radius of the proposed development. Therefore there is no additional influencing factor applicable to this development for transport.

2.1 Assigned Noise Levels

Based on the above, there is no Influencing Factor relevant to the residences in the surrounding area to the proposed development. On this basis, the regulatory Assigned Noise Level criteria to be applied to this development are:

Type of premises receiving noise	Time of day	Assigned Noise Level (dB)		
		LA10	LA1	LA max
Noise sensitive premises; highly sensitive area (i.e. within 15m of a residential building)	0700 to 1900 hours Monday to Saturday	45	55	65
	0900 to 1900 hours Sunday and public holidays	40	50	65
	1900 to 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays.	35	45	55
Commercial Premises	All hours	60	75	80

Table 01 - Assigned Noise Levels

The sound level parameters used for the various environmental noise criteria are described below, based on an assessment period of 15 minutes up to 4 hours:

LA10 is the 'A' weighted noise level which is not to be exceeded for more than 10% of the time, e.g. for more than 10 minutes in 100 minutes. This is the parameter relevant to most HVAC equipment, and emissions from other longer term noise sources that run for extended duration.

LA1 is the 'A' weighted noise level which is not to be exceeded for more than 1% of the time, e.g. for more than 1 minute in 100 minutes, or up to 24 minutes in 4 hours. This is the parameter relevant to noise sources that only occur occasionally, for short durations.

L_{Amax} is the 'A' weighted noise level for individual events which is not to be exceeded at any time.

2.2 Adjustments for Noise Character

Regulation 7 requires that the noise emission must be free of annoying characteristics, namely tonality (e.g. whining, droning), modulation (like a siren), and impulsiveness (e.g. thumping). Where noise emissions do exhibit the above noise characteristics, an adjustment is made to the measured/calculated noise level:

<i>Tonality</i>	5dB is added to the measured level
<i>Modulation</i>	5dB is added to the measured level
<i>Impulsiveness</i>	10dB is added to the measured level

Where the noise emission is music the following adjustments to the measured noise levels apply:

<i>Impulsiveness not present</i>	10dB is added to the measurement level
<i>Impulsiveness present</i>	15dB is added to the measurement level

The above adjustments only apply where the noise character is audible and measurable at the receiver position. For this project however it is likely that all noise sources are tonal in nature and therefore this has been applied to all predicted noise levels in this report.

2.4 Noise Sensitive Receivers

Whilst not currently constructed, we have assumed that the land directly to the North is a new residential development, and this along with the existing house to the East are the only applicable noise sensitive premises for this project. There is an existing residence to the West however this is noticeably further in distance from the development, however it should be noted that if this land is redeveloped into residential lots in the future then this will have implications on the results outlined in this report. Note at this stage we have based our analysis in this report on the North residences only.

3. NOISE SOURCES

3.1 Training Exercises

On-site noise level measurements were conducted on the 11th of January 2019 at the Vincent Career Fire Station on Carr St. These measurements were conducted with both a long term monitor as well as simultaneously with a closer hand held sound level meter. The purpose of these measurements was to determine the noise level of certain activities and training actions, as well as the individual noise level of equipment, where applicable.

Based on these measurements the Sound Power Levels used for individual noise sources in the acoustic modelling process are as follows:

Sound Power Level of Noise Sources (Individual Sources)								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	dB(A)
Appliance Engine Idling	81.8	76.8	78.3	80.2	81.9	78.2	73.9	85.2
Appliance Engine Running at 1510 rpm	95.5	93.4	93.5	93.6	94.2	93.1	90.0	99.0
Engine Switching Over	95.8	92.7	104.9	105.1	110.3	99.5	91.1	111.5
Priming pump	96.8	96.0	103.4	103.8	99.8	93.8	89.8	104.6
Water pumping at nozzle	88.7	86.2	87.9	83.0	81.9	79.9	78.8	87.6
Water pumping hitting concrete at angle	86.2	77.5	71.9	72.0	74.4	78.6	83.9	89.3
Locker Shutters	87.4	85.8	86.0	91.1	91.5	92.1	93.2	98.5
Powerpack for Jaws	92.7	89.7	93.3	87.7	92.7	91.4	87.1	96.9
Stem Light	77.7	71.2	62.7	71.7	67.6	70.8	90.8	91.4
Breaking Window	77.8	83.6	83.7	85.8	85.2	83.6	81.1	90.2
Shovel Cleaning Glass off concrete	73.1	71.4	78.7	81.5	83.0	91.7	90.2	95.6
Grinding Car Door	72.3	75.1	78.6	79.8	85.1	95.7	93.5	99.4
Halligan tool on car panel	101.0	103.3	99.4	98.5	96.6	91.6	82.7	100.7
Reciprocating Saw on car panel	99.7	104.0	106.1	109.7	110.2	103.3	95.4	112.7
Hammering on car panel	94.1	96.2	97.3	99.0	96.8	93.7	88.2	101.2
Stihl Quick-Cut Saw on car panel	85.7	100.9	110.3	108.2	106.7	109.4	116.3	119.9
Timber stabilisation blocks on concrete	82.5	77.1	80.9	87.2	94.1	92.3	82.7	97.2
Ratchet Drill	69.7	78.3	80.3	86.3	91.3	94.0	97.4	102.2
Removing & Replacing Ladder from Truck	83.7	80.1	85.4	84.4	86.9	82.1	77.3	89.8
Extending & Retracting Ladder	67.3	64.9	78.9	83.3	87.1	89.9	89.9	95.5
PDA Manual Alarm	66.2	65.6	58.2	62.1	55.3	103.5	101.8	106.7
BA set low pressure test	81.6	77.0	70.1	68.5	69.8	84.4	68.2	85.9
Oxy-Viva Resuscitator	75.0	67.8	72.8	69.2	68.7	61.8	60.5	72.8
Vehicle Washdown - hose of vehicle panel	87.0	81.6	79.9	78.2	76.6	75.0	77.7	84.3
Light Tanker Generator Full Load	98.3	104.2	98.2	95.0	92.6	92.7	92.8	100.1
Light Tanker Engine	91.3	86.2	79.5	75.0	73.8	73.7	65.1	80.0

Table 02 - Individual Sources Sound Power Levels

Further to the previously listed individual noise sources, the following noise sources were used for modelling activities as a whole:

Sound Power Level of Noise Sources (Combined Activities)								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	dB(A)
Vehicle Checks - ≈ 15 mins	102.1	102.6	101.3	102.4	103.3	100.1	95.7	104.5
Road Crash Rescue L10 - ≈ 1.5hrs	91.0	90.6	92.3	89.7	90.2	91.0	93.4	98.4
Road Crash Rescue L1* - ≈ 1.5hrs	106.8	106.4	108.1	105.5	106.0	106.8	109.2	114.2
Ladder Drill - ≈ 1 hour	96.0	91.3	93.2	93.8	95.7	94.0	90.2	100.0

Table 03 - Combined Activities Sound Power Levels

*Note due to the significant difference in noise level between the L10 and L1 of this activity we have modelled both criteria.

It should also be noted that the combined activity noise from a typical Appliance & Hose Training Exercise was not measured. However the individual noise sources within this activity are expected to be reasonably constant and therefore the long term noise sources within this activity are combined to assess the LA10 noise emissions. Similarly the BA Training has been assessed using the PDA Manual Alarm only as this is significantly higher than other noise sources during this activity.

3.2 Mechanical Services

Potential noise emissions from all mechanical equipment will be addressed in the design and documentation stages, to ensure appropriate mechanical acoustic design and specifications are incorporated, to comply with the relevant 'Assigned Levels'. For HVAC equipment the relevant Assigned Level parameter is LA10, as equipment will typically run for more than 10% of the time. Therefore this must achieve 35 dB(A) at the boundary position, or 30 dB(A) once allowing for tonality, during the over night period, or 40 dB(A) at the boundary position, or 35 dB(A) once allowing for tonality on Sundays.

At this stage our main concern regarding noise emissions from mechanical plant is the proposed mechanical plant area to the North of the proposed Fire station, as well as any roof mounted exhaust fans over the Appliance Bay. Given the relatively short distances to the neighbouring properties this may impact on the potential compliance with the Regulations, however this will be confirmed once noise level information and locations are provided.

3.3 Noise Breakout from Internal Sources

It is generally considered that noise emissions from internal activities are generally quiet enough to maintain compliance with the Regulations. However based on previous involvement in similar projects it may be prevalent to assess the potential noise emissions from the gym and other noisy spaces. At this stage we do not foresee any complications regarding these potential emissions to achieve compliance.

3.4 EPNR Noise Specific Criteria

Based on the above, the relevant EPNR criteria are shown against the noise emissions listed above. The most stringent Assigned Noise Level criteria applicable to these periods will therefore be applied (as seen below).

Noise Emissions from Vehicle Checks		
	Time of Day	Relevant Assigned Noise Level
Daytime - Monday to Saturday	7am to 7pm	LA10 45 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	LA10 40 dB(A)
Evening - All Days	7pm to 10pm	LA10 40 dB(A)
Overnight - All Days	All other times from above	LA10 35 dB(A)

Table 04 - Relevant Assigned Noise Levels - Vehicle Checks

Noise Emissions from Breathing Apparatus Training		
	<i>Time of Day</i>	<i>Relevant Assigned Noise Level</i>
Daytime - Monday to Saturday	7am to 7pm	L _{Amax} 65 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L _{Amax} 65 dB(A)
Evening - All Days	7pm to 10pm	L _{Amax} 55 dB(A)
Overnight - All Days	All other times from above	L _{Amax} 55 dB(A)

Table 05 - Relevant Assigned Noise Levels - Vehicle Checks

Noise Emissions from Appliance & Hose Training		
	<i>Time of Day</i>	<i>Relevant Assigned Noise Level</i>
Daytime - Monday to Saturday	7am to 7pm	L _{A10} 45 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L _{A10} 40 dB(A)
Evening - All Days	7pm to 10pm	L _{A10} 40 dB(A)
Overnight - All Days	All other times from above	L _{A10} 35 dB(A)

Table 06 - Relevant Assigned Noise Levels - Vehicle Checks

Noise Emissions from Road Crash Rescue Training (L₁₀)		
	<i>Time of Day</i>	<i>Relevant Assigned Noise Level</i>
Daytime - Monday to Saturday	7am to 7pm	L _{A10} 45 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L _{A10} 40 dB(A)
Evening - All Days	7pm to 10pm	L _{A10} 40 dB(A)
Overnight - All Days	All other times from above	L _{A10} 35 dB(A)

Table 07 - Relevant Assigned Noise Levels - Vehicle Checks

Noise Emissions from Road Crash Rescue Training (L₁)		
	<i>Time of Day</i>	<i>Relevant Assigned Noise Level</i>
Daytime - Monday to Saturday	7am to 7pm	L _{A1} 55 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L _{A1} 50 dB(A)
Evening - All Days	7pm to 10pm	L _{A1} 50 dB(A)
Overnight - All Days	All other times from above	L _{A1} 45 dB(A)

Table 08 - Relevant Assigned Noise Levels - Vehicle Checks

Noise Emissions from Ladder Drill		
	<i>Time of Day</i>	<i>Relevant Assigned Noise Level</i>
Daytime - Monday to Saturday	7am to 7pm	L _{A1} 55 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L _{A1} 50 dB(A)
Evening - All Days	7pm to 10pm	L _{A1} 50 dB(A)
Overnight - All Days	All other times from above	L _{A1} 45 dB(A)

Table 09 - Relevant Assigned Noise Levels - Vehicle Checks

Further to the above combined activities, the relevant criteria for individual sources are listed in the table below. This is on the basis that each noise source is not present for more than 2.4 minutes within a 4 hour period.

The majority of these sources have therefore been assessed against an L_{Amax} criteria on the basis that when multiple tools are used together this has already been assessed as a part of the Road Crash Rescue L_{A1} assessment. The purpose of modelling the individual noise sources is to provide context as to the potential noise emissions from each tool or activity, and their compliance / exceedance with the Regulations.

Noise Emissions from Individual Sources				
	Day - Mon to Sat	Day - Sun & PH	Evenings	Night
Covered Washdown				
Vehicle Washdown	L_{A1} 55 dB(A)	L_{A1} 50 dB(A)	L_{A1} 50 dB(A)	L_{A1} 45 dB(A)
Light tanker Generator	L_{A1} 55 dB(A)	L_{A1} 50 dB(A)	L_{A1} 50 dB(A)	L_{A1} 45 dB(A)
Appliance & Hose Training				
Engine Switching	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Engine Priming	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Voice Calls	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Road Crash Rescue Training				
Appliance Lockers	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Breaking Window	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Grinding	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Halligan Tool	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Hammering	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Quick Cut Saw	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Ratchet Drill	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Reciprocating Saw	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Shovelling Glass	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)
Stabilisation Blocks	L_{Amax} 65 dB(A)	L_{Amax} 65 dB(A)	L_{Amax} 55 dB(A)	L_{Amax} 55 dB(A)

Table 10 – Relevant Assigned Noise Levels - Individual Sources

3.5 Penalties Applied to Noise Sources

As per Section 2.2 of this report, any noise source modelled from external activities are expected to be tonal in nature. Therefore a + 5 dB(A) penalty has been applied to all modelling results.

4. STATE PLANNING POLICY 5.4 - ROAD AND RAIL NOISE

The proposed develop includes the sleeping dormitories for the staff on-site. Due to the nature of these spaces it is reasonable to assume that the State Planning Policy 5.4 "Road and Rail Noise" applies to these areas.

However for this development there are no major roads located within close proximity to the project site. Therefore there is no requirement to upgrade the building envelope to attenuate potential noise intrusion. Individual vehicles may be audible within the building and advice can be provided on this in later stages of the project once more details of the building façade are understood.

5. MODELLING METHODOLOGY

The noise emissions from the proposed nightclub have been modelled using the *SoundPLAN v8.2* software with the *Concawe* algorithm. This software allows the input of topographical data, building heights and forms, meteorological conditions, and noise source data. The software produces noise contour plans, indicating the predicted noise level over a given area.

Note – the output noise levels from *SoundPLAN* are base noise levels not including adjustment for noise character.

5.1 Meteorological Conditions

The meteorological conditions used in the calculations were as follows (based on the requirements of the Department of Environment Regulation):

Day-time Assessment

- Temperature – 20°C
- Relative Humidity – 50%
- Wind – 4 m/s in all directions simultaneously
- Pasquil Stability Class - E

Night-time Assessment

- Temperature – 15°C
- Relative Humidity – 50%
- Wind – 3 m/s in all directions simultaneously
- Pasquil Stability Class - F

5.2 Topography and Building Form

The building form, height, and configuration were input into the noise model, based on the architectural drawings and the information available on the Shire of Serpentine Jarrahdale Intramaps system.

All roads and carpark areas were input into the noise model as hard reflecting ground surface.

6. ACOUSTIC MODELLING

6.1 Noise Sensitive Receiver Locations

As discussed above, we have conducted our assessment based on the current noise sensitive premises around the site. As a result of this we have provided the predicted noise level at the worst case receiver position for the existing locations along the northern boundary of the site.

6.2 Results of Acoustic Modelling

Based on the above listed sound power levels, the predicted noise levels at the adjacent noise sensitive receiver positions are as follows:

Results of Acoustic Modelling - Predicted Noise Levels		
	<i>Predicted Level</i>	<i>+ Tonality</i>
Vehicle Checks	67 dB(A)	72 dB(A)
BA Training	69 dB(A)	74 dB(A)
Appliance & Hose Training	60 dB(A)	65 dB(A)
Road Crash Rescue Training - L10	58 dB(A)	63 dB(A)
Road Crash Rescue Training - L1	73 dB(A)	78 dB(A)
Ladder Drill	59 dB(A)	64 dB(A)
Covered Washdown		
Vehicle Washdown	45 dB(A)	50 dB(A)
Light Tanker Generator	61 dB(A)	66 dB(A)

Table 11 - Results of Acoustic Modelling - Predicted Noise Levels at Neighbouring Receiver Positions from Training Activities

Results of Acoustic Modelling - Predicted Noise Levels		
Appliance & Hose Training		
Engine Switching	69 dB(A)	74 dB(A)
Engine Priming	62 dB(A)	67 dB(A)
Voice Calls	48 dB(A)	53 dB(A)
Road Crash Rescue Training		
Appliance Lockers	59 dB(A)	64 dB(A)
Breaking Window	49 dB(A)	54 dB(A)
Grinding	60 dB(A)	65 dB(A)
Halligan Tool	58 dB(A)	63 dB(A)
Hammering	59 dB(A)	64 dB(A)
Quick Cut Saw	80 dB(A)	85 dB(A)
Ratchet Drill	62 dB(A)	67 dB(A)
Reciprocating Saw	70 dB(A)	75 dB(A)
Shovelling Glass	55 dB(A)	60 dB(A)
Stabilisation Blocks	55 dB(A)	60 dB(A)

Table 11 (continued) - Results of Acoustic Modelling - Predicted Noise Levels at Neighbouring Receiver Positions from Training Activities

Based on the above predicted noise levels and their associated Assigned Noise Level criteria, the following table outlines the compliance with the Environmental Protection (Noise) Regulations 1997 for different times of the day:

Results of Acoustic Modelling - Level of Exceedance with EPNR				
	Day Time	Sundays & PH	Evenings	Night Time
Vehicle Checks	27 dB(A)	32 dB(A)	32 dB(A)	37 dB(A)
BA Training	9 dB(A)	9 dB(A)	19 dB(A)	19 dB(A)
Appliance & Hose Training	20 dB(A)	25 dB(A)	25 dB(A)	30 dB(A)
Road Crash Rescue Training - L10	18 dB(A)	23 dB(A)	23 dB(A)	28 dB(A)
Road Crash Rescue Training - L1	23 dB(A)	28 dB(A)	28 dB(A)	33 dB(A)
Ladder Drill	9 dB(A)	14 dB(A)	14 dB(A)	19 dB(A)
Covered Washdown				
Vehicle Washdown	YES	YES	YES	5 dB(A)
Light Tanker Generator	11 dB(A)	16 dB(A)	16 dB(A)	21 dB(A)
Appliance & Hose Training				
Engine Switching	9 dB(A)	9 dB(A)	19 dB(A)	19 dB(A)
Engine Priming	2 dB(A)	2 dB(A)	12 dB(A)	12 dB(A)
Voice Calls	YES	YES	YES	YES

Table 12 - Summary of Results of Acoustic Modelling - Level of Exceedance

Results of Acoustic Modelling - Level of Exceedance with EPNR				
Road Crash Rescue Training				
Appliance Lockers	YES	YES	9 dB(A)	9 dB(A)
Breaking Window	YES	YES	YES	YES
Grinding	YES	YES	10 dB(A)	10 dB(A)
Halligan Tool	YES	YES	8 dB(A)	8 dB(A)
Hammering	YES	YES	9 dB(A)	9 dB(A)
Quick Cut Saw	20 dB(A)	20 dB(A)	30 dB(A)	30 dB(A)
Ratchet Drill	2 dB(A)	2 dB(A)	12 dB(A)	12 dB(A)
Reciprocating Saw	10 dB(A)	10 dB(A)	20 dB(A)	20 dB(A)
Shovelling Glass	YES	YES	5 dB(A)	5 dB(A)
Stabilisation Blocks	YES	YES	5 dB(A)	5 dB(A)

Table 12 (continued) - Summary of Results of Acoustic Modelling - Level of Exceedance

7. INTERNAL ACOUSTICS

7.1 Dormitory Acoustic Requirements

Part F5: "Sound Transmission and Insulation" of the Building Code of Australia (BCA) establishes minimum mandatory requirements for the acoustic performance of Class 3 buildings. These acoustic requirements impact on the construction of walls, ceilings, and services.

Further to the above, where requirements are not specifically stated in the BCA we will still provide recommended acoustic performances based on what has been deemed fit-for-purpose on previous similar projects.

The following BCA Part 5 design requirements and acoustic recommendations will be addressed during design and documentation.

Minimum Acoustic NCC Requirements - Class 3	
Walls	
Party walls separating habitable areas in adjoining Sole Occupancy Units	$R_w + C_{tr} 50$
Party walls between wet and habitable areas	$R_w + C_{tr} 50 +$ discontinuous construction
Walls to public corridor or lobby, stairs, or parts of different classification	$R_w 50$
Entry Doors	
Entry Door to Public Area	$R_w 30$
Floors	
Separating sole occupancy units, or parts of different classification - Airborne	$R_w + C_{tr} 50$
Impact sound insulation	L_{nTw} no greater than 62 dB field measurement
Services	
Services adjacent to Habitable room	$R_w + C_{tr} 40$
Services adjacent to Kitchen or Non-habitable room	$R_w + C_{tr} 25$

Table 13 - Minimum NCC Acoustic Requirements

The BCA also stipulates general construction requirements and services access and locations etc. These minimum requirements will be outlined during the following stages of this development to the project Architect for incorporation into the documentation.

Note at this stage we have been advised that the dormitory wing is currently defined at the 'sole-occupancy unit' for the development, not the individual dorm rooms themselves. Our acoustic advice will reflect this building classification, namely the requirements are typically limited to the sound transfer between this wing and the attached fire station area.

8. OBSERVATIONS & CONCLUSIONS

At the Development Application stage of this project the relevant acoustic design issues to consider are:

- Requirement for noise emissions to comply with Environmental Protection (Noise) Regulations,
- Consideration of potential noise emissions from general training activities, including vehicle checks and road crash rescue training etc.
- Consideration of potential noise intrusion such as traffic noise
- Recommendations to meet acceptable internal noise isolation, speech privacy and reverberation times.

This Acoustic Report has addressed each of the project specific acoustic design issues relevant to the Development Application stage. Further detailed consideration of these issues is required throughout the design development and contract documentation stages of the project, to ensure that compliance with the relevant regulations, codes and acoustic quality standards are met.

Based on the acoustic modelling predicted noise levels, it is evident that there are times at which a large portion of training activities are expected to exceed the Assigned Noise Levels. It is our understanding that the majority of training exercises can be limited to day time only, therefore the level of non-compliance may only be relevant to the daytime criteria.

Even with this in mind it is predicted that all activities will exceed the regulations for at least one receiver position, depending upon the location of the noise source. It should be noted that at the time of measurement, the Road Crash Rescue Training did involve the use of a Stihl Quick Cut Saw, which as can be seen in the individual results is significantly higher than the other noise sources. Whilst this saw has been modelled it is possible that this unit not be utilised in the training at the proposed Cardup Station. Should this be the case then we would expect the predicted L₁ noise levels of this training to drop by approximately 7 dB(A). There is minimal change to the L₁₀ results based on all the other noise sources still being present.

Based on these results it is our understanding that the client will be seeking an exemption from meeting the Regulations under Part 1, Section 6 of the Environmental Protection Act 1986: "Power of Minister or Authority to exempt". Due to the outdoor nature and necessity of the training activities for the Fire Station to safely and correctly operate, this ministerial exemption will be required. As a part of this exemption application it is prudent that the client creates a noise management plan, limiting the frequency and timing of certain activities so as to reduce the likelihood of complaints from neighbours. It is also strongly recommended to have a direct line of contact available between the duty manager and any adjacent neighbour such that any concerns can be addressed immediately.

If you have any further queries regarding any of this information, please call the undersigned on 9474 5966.

Regards,

Michael Ferguson

Associate Director *B.IntArch(Hons)* M.A.A.S.



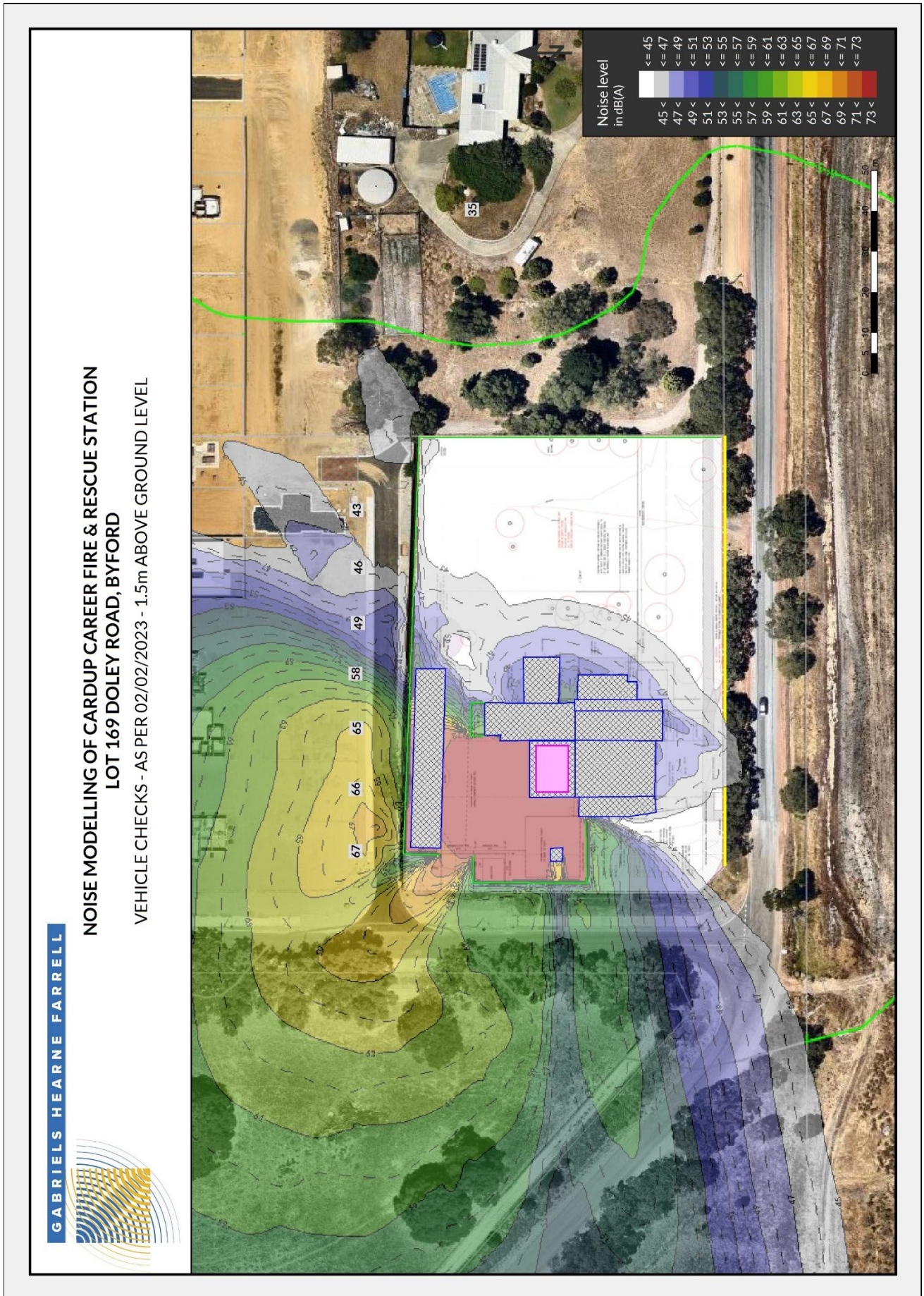
GABRIELS HEARNE FARRELL PTY LTD

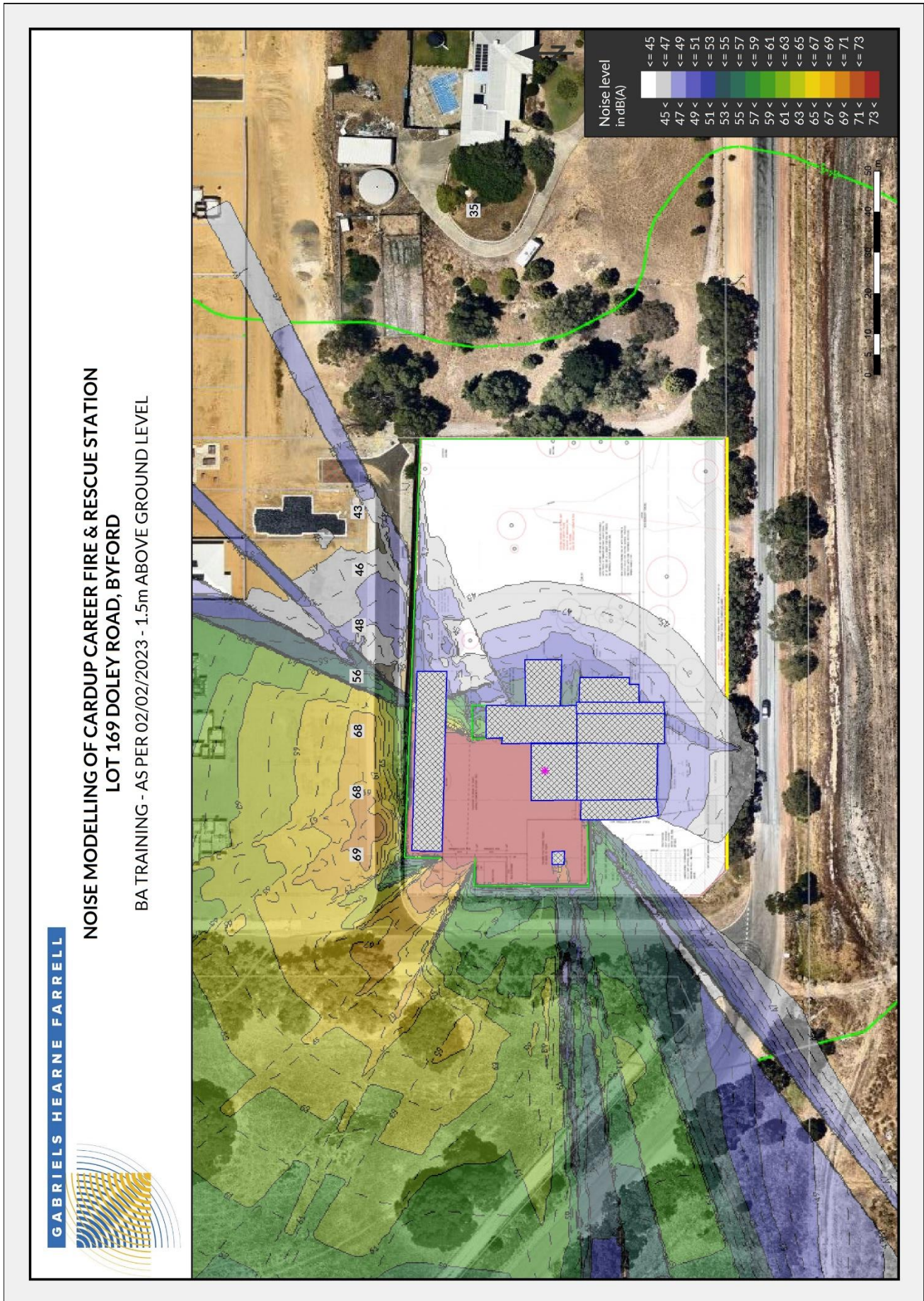
Member Firm - Association of Australasian Acoustical Consultants

A Unit 3 / 2 Hardy St South Perth WA 6151 P (08) 9474 5966
E michael@gabriels.net.au W gabriels.net.au M 0423 880 388

ATTACHMENTS

- APPENDIX A - SoundPLAN Noise contour Plots (x11)



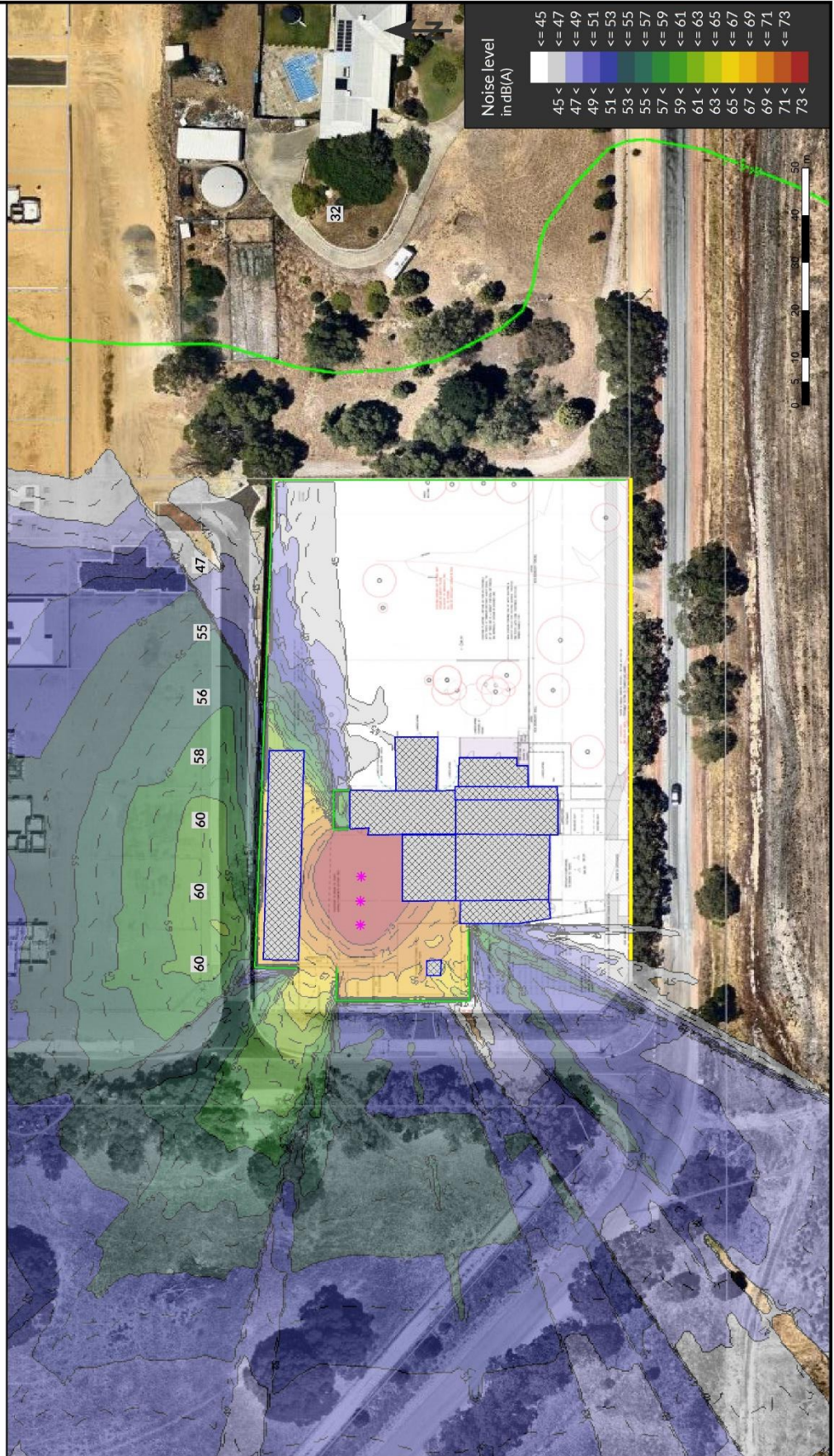


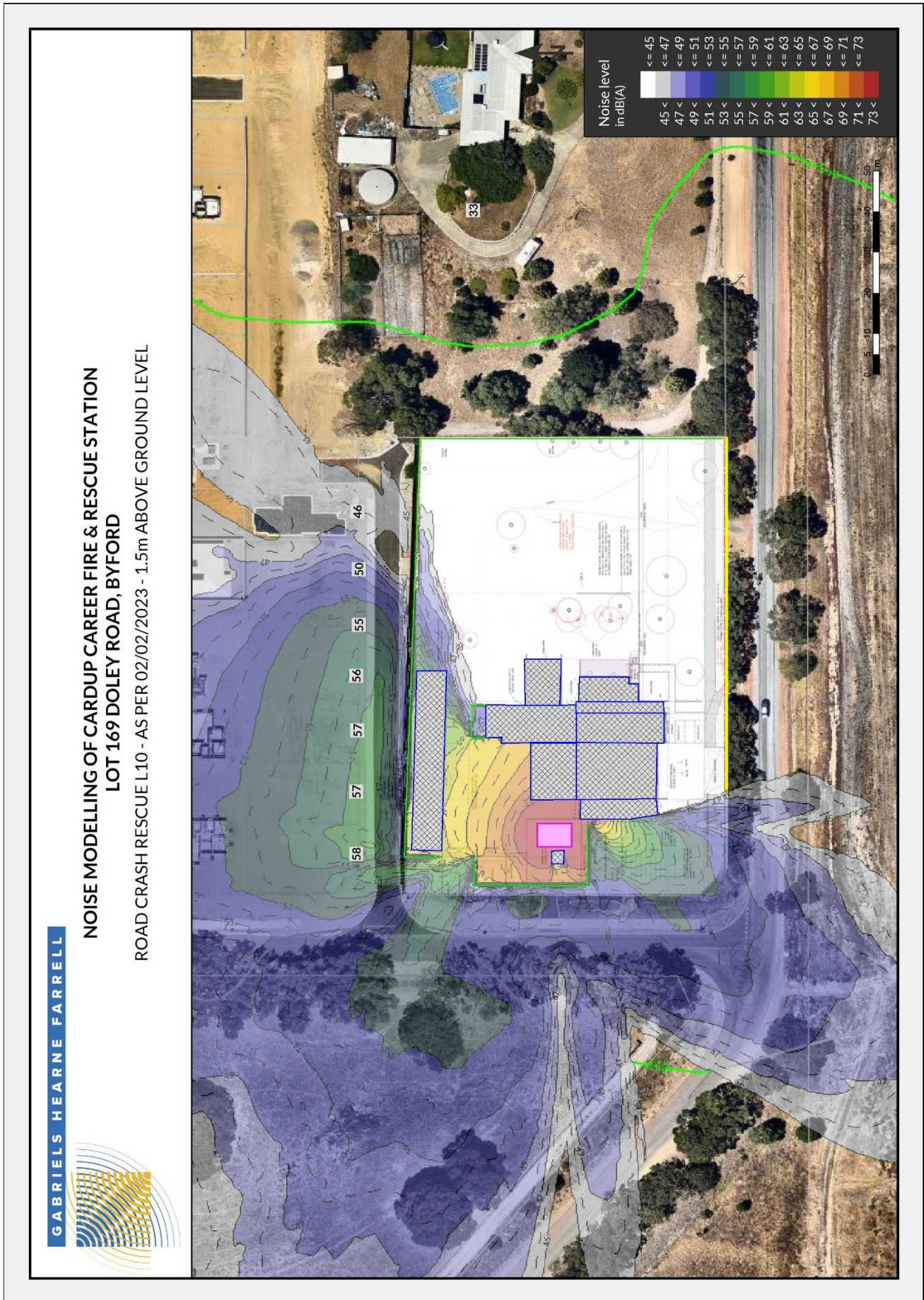
GABRIELS HEARNE FARRELL



NOISE MODELLING OF CARDUP CAREER FIRE & RESCUE STATION LOT 169 DOLEY ROAD, BYFORD

APPLIANCE & HOSE TRAINING - AS PER 02/02/2023 - 1.5m ABOVE GROUND LEVEL



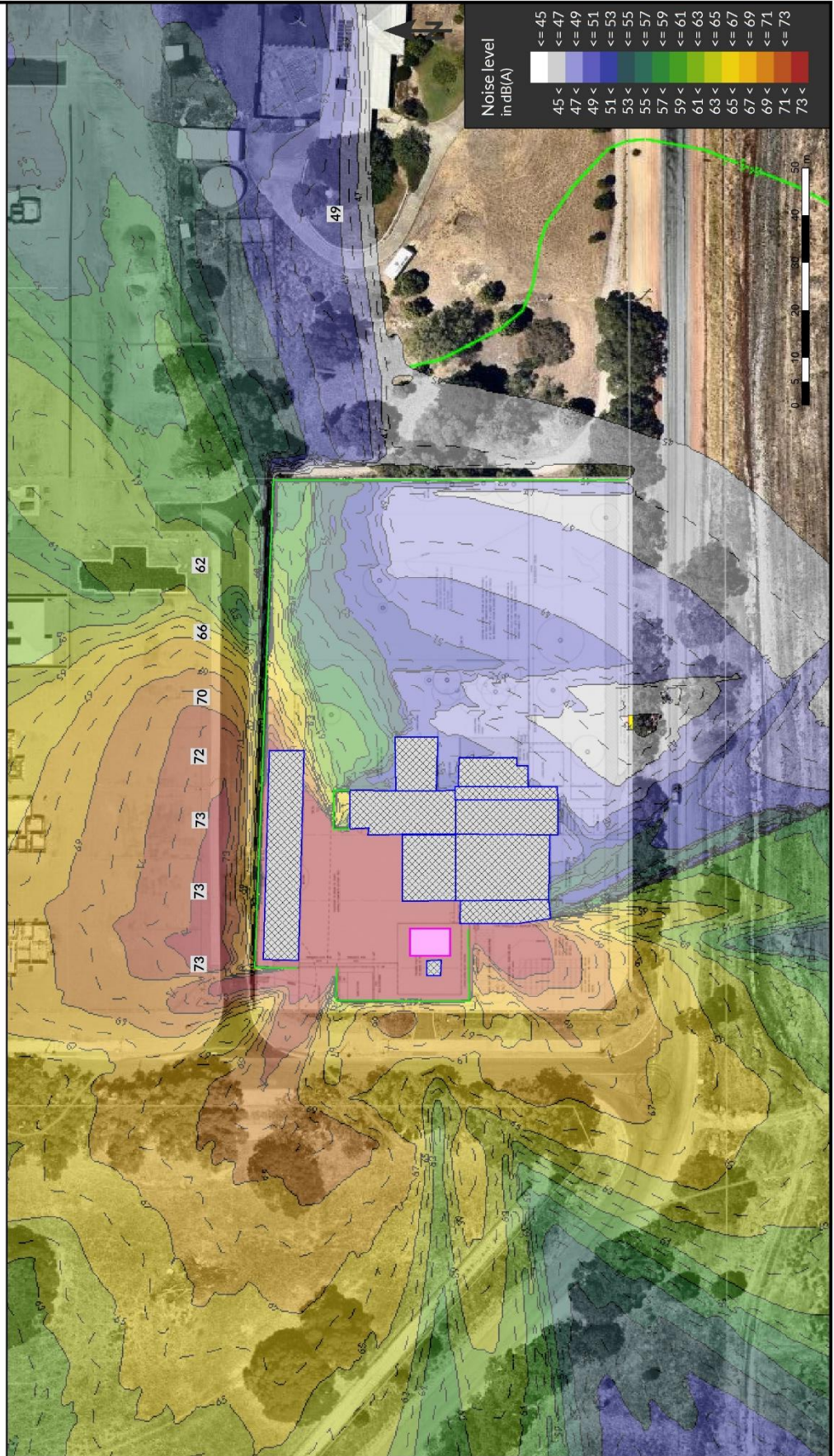


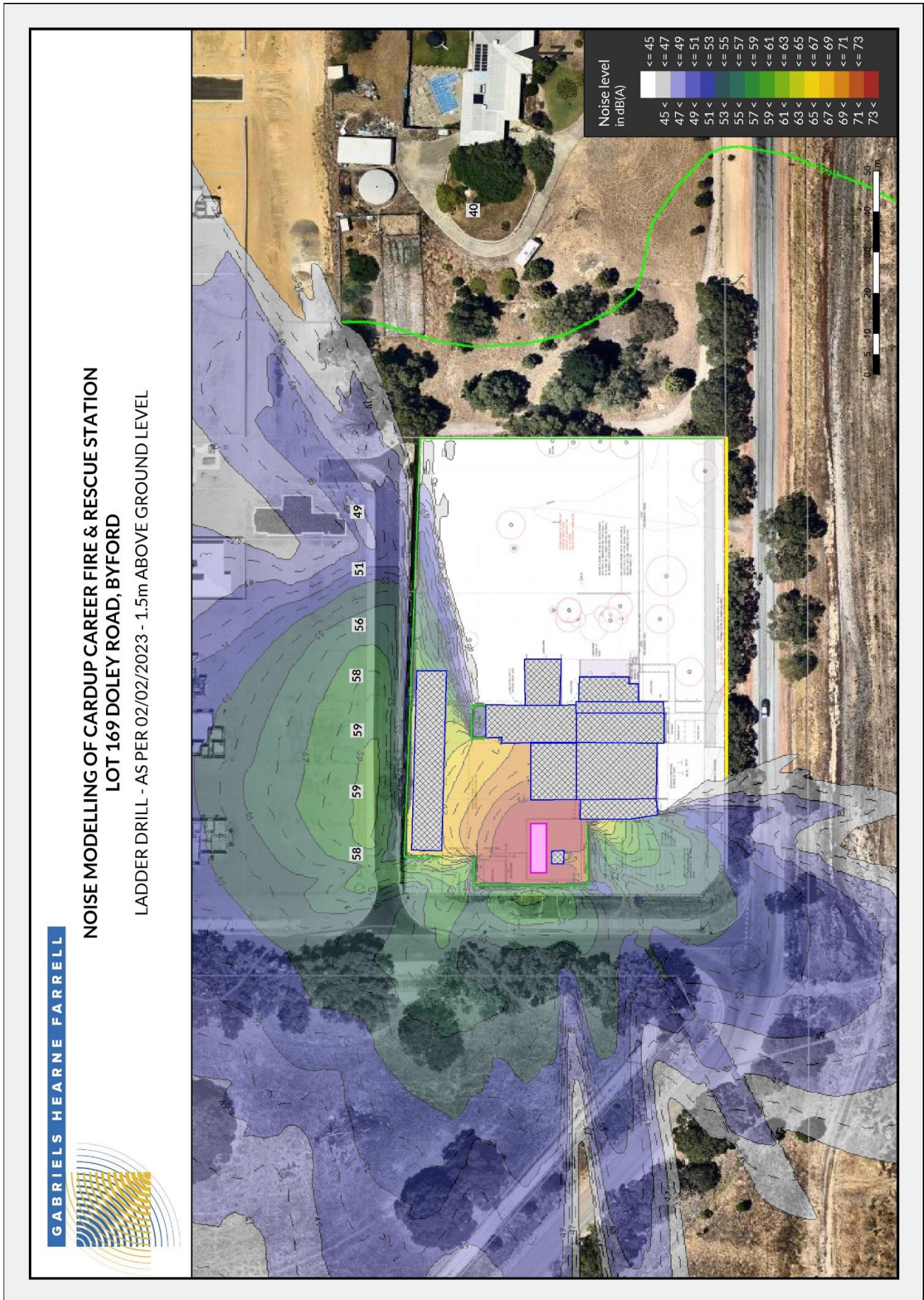
GABRIELS HEARNE FARRELL

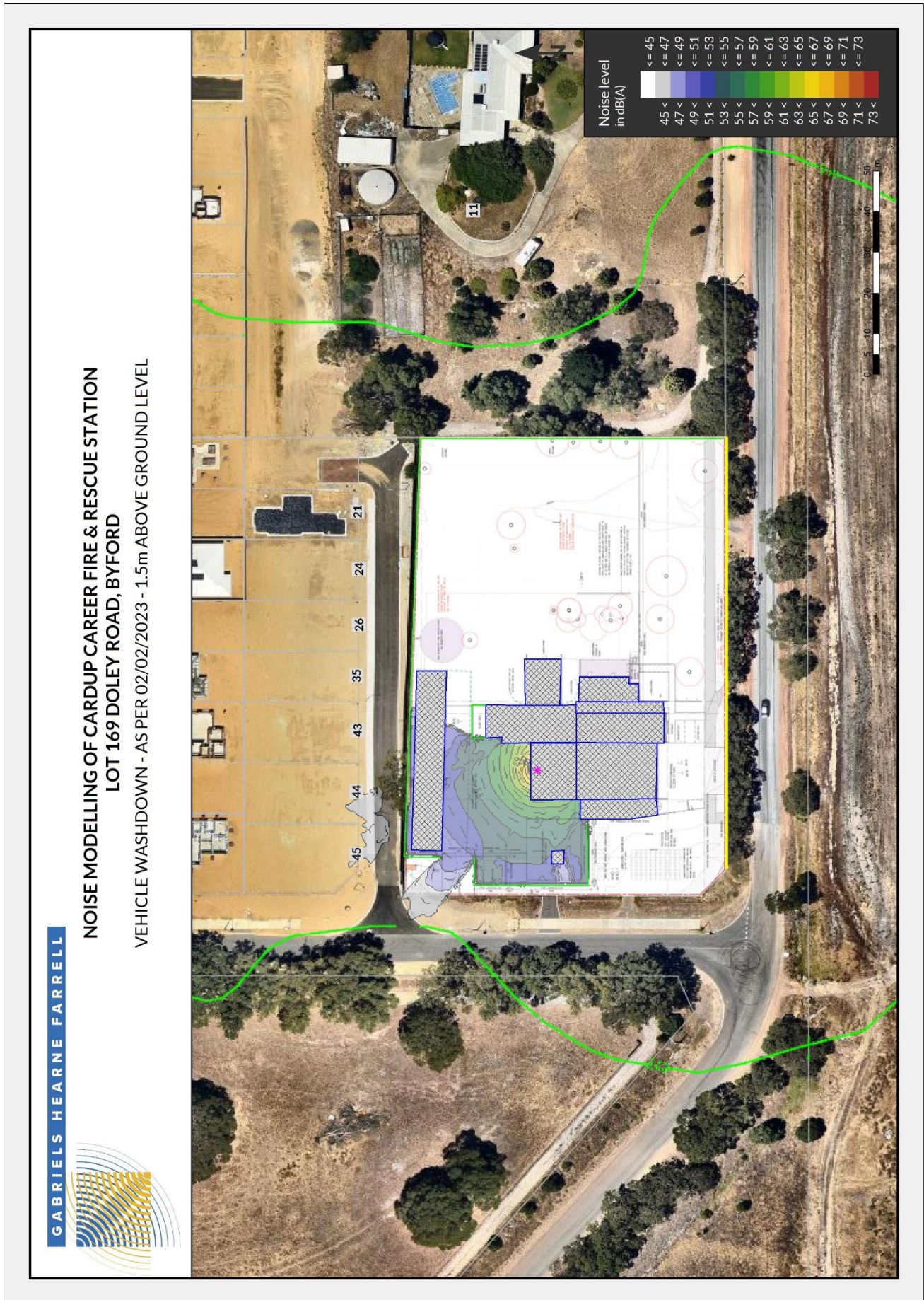


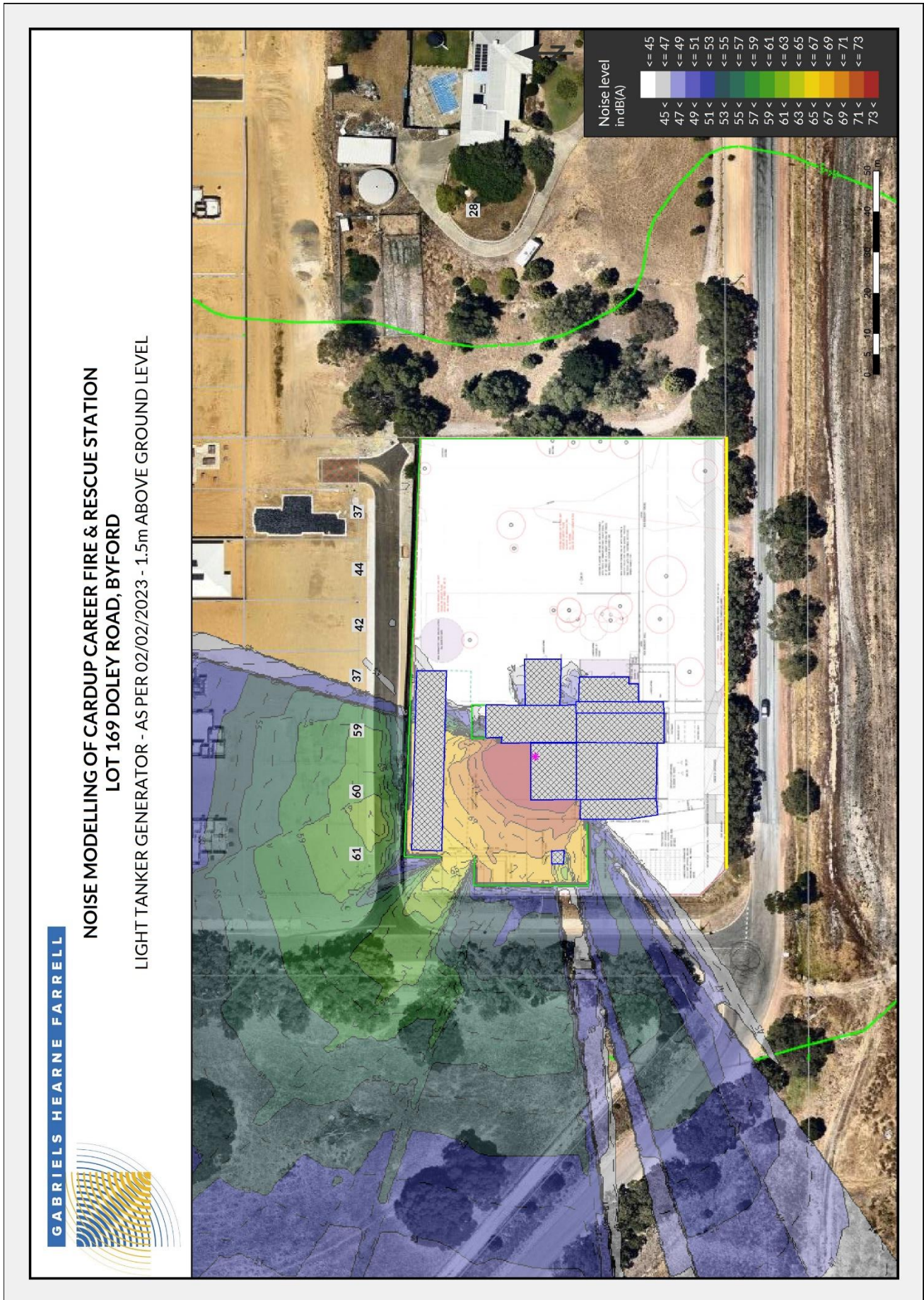
**NOISE MODELLING OF CARDUP CAREER FIRE & RESCUE STATION
LOT 169 DOLEY ROAD, BYFORD**

ROAD CRASH RESCUE L1 - AS PER 02/02/2023 - 1.5m ABOVE GROUND LEVEL





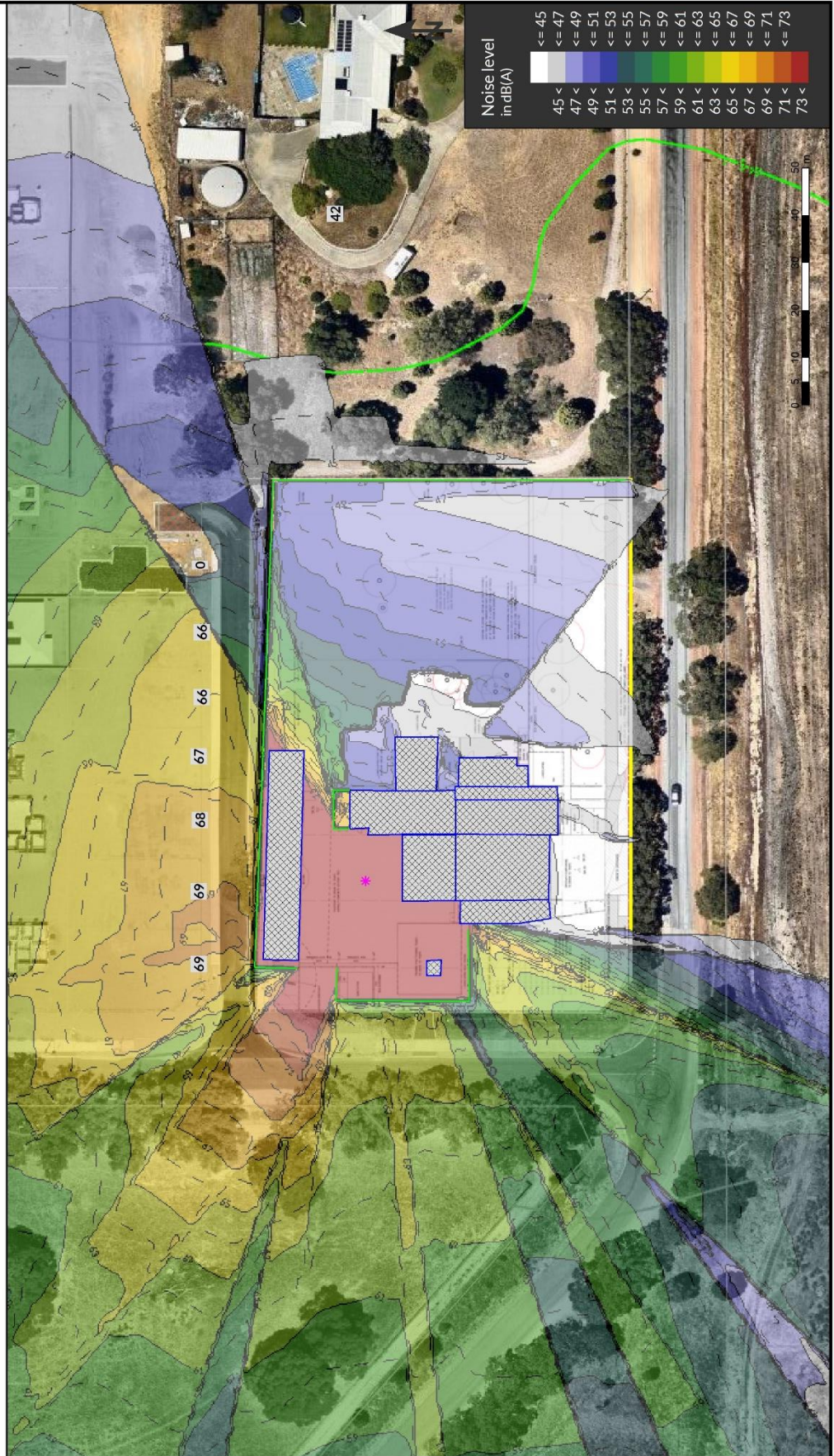


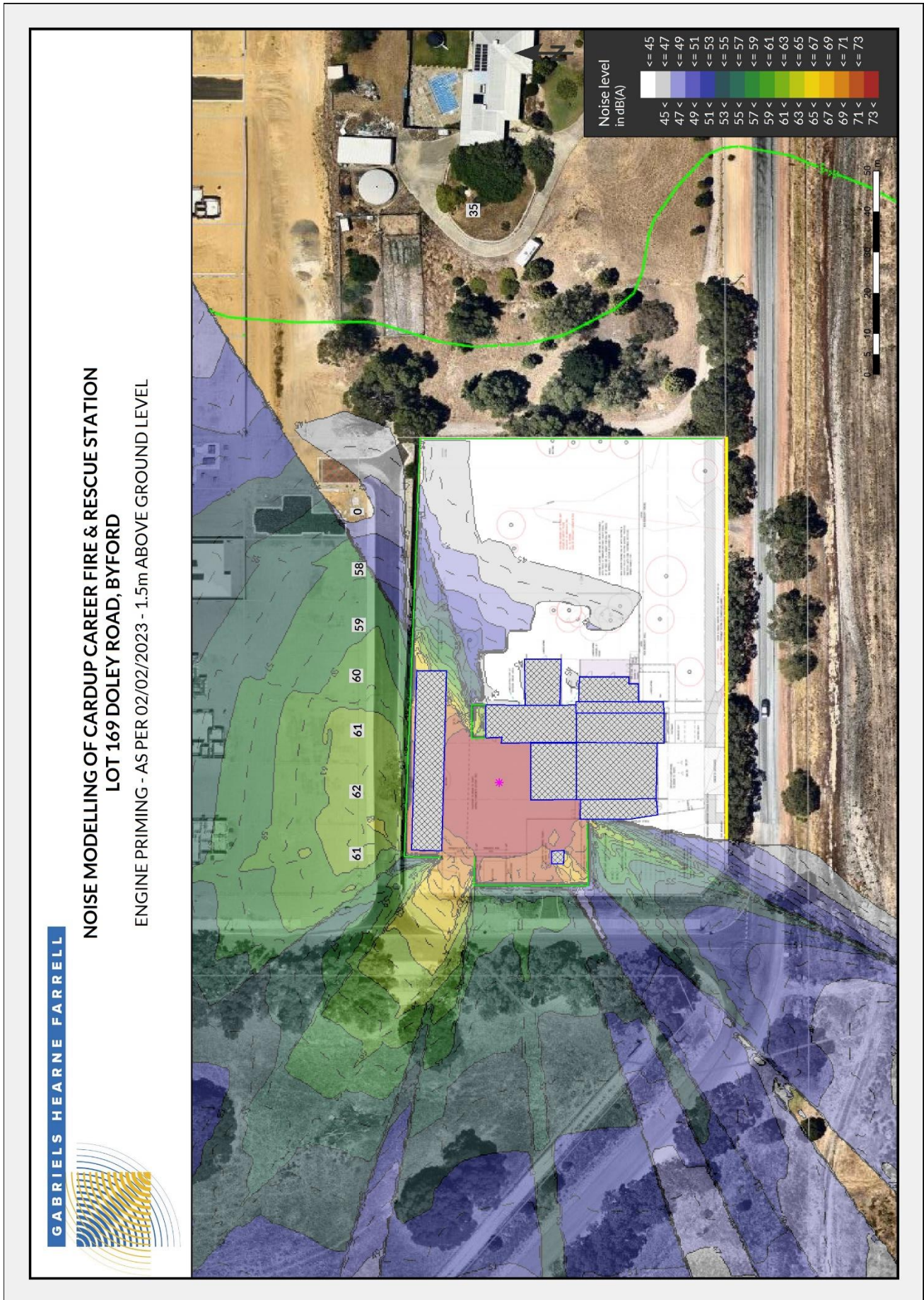


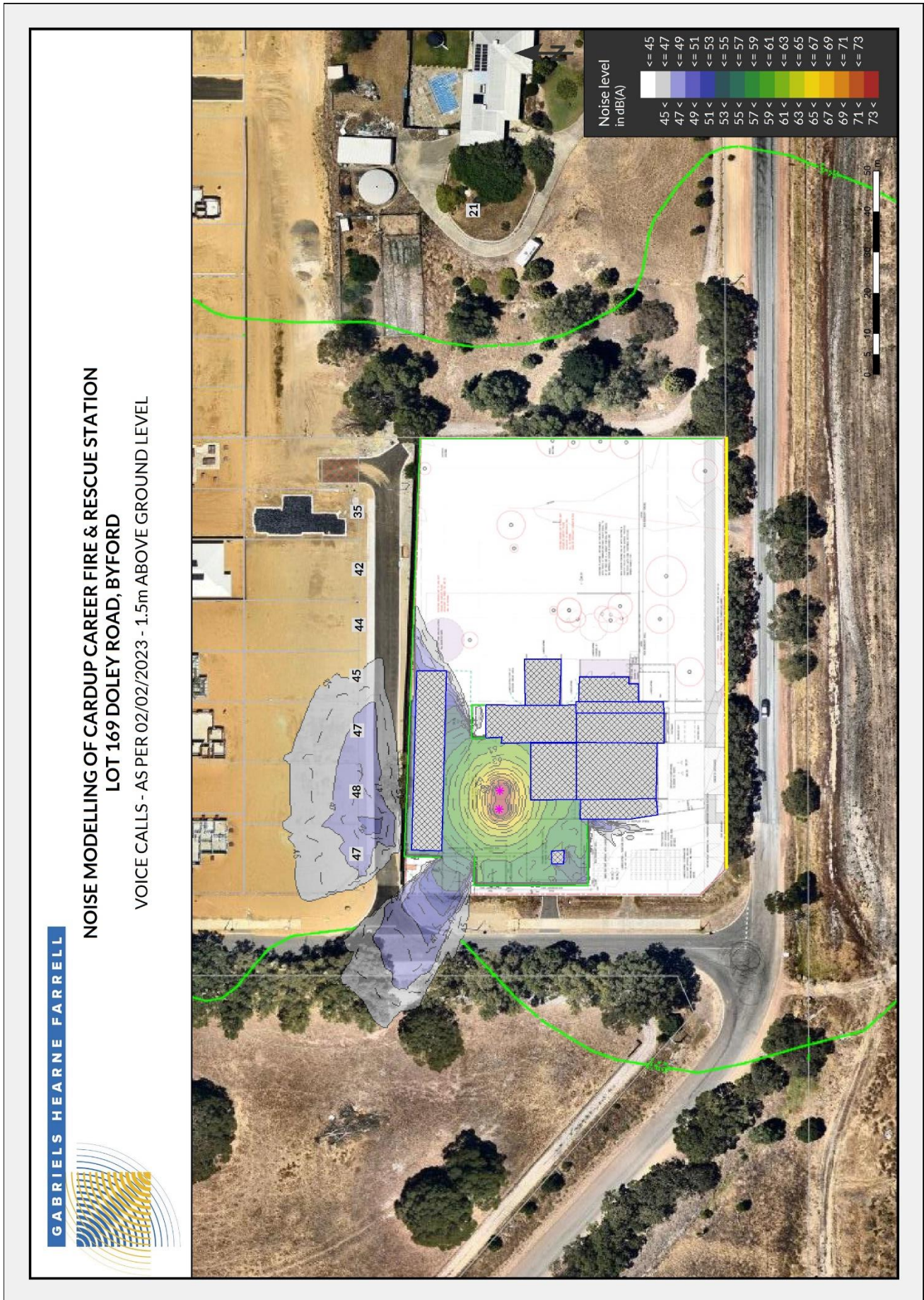
GABRIELS HEARNE FARRELL



**NOISE MODELLING OF CARDUP CAREER FIRE & RESCUE STATION
LOT 169 DOLEY ROAD, BYFORD**
ENGINE SWITCHING - AS PER 02/02/2023 - 1.5m ABOVE GROUND LEVEL

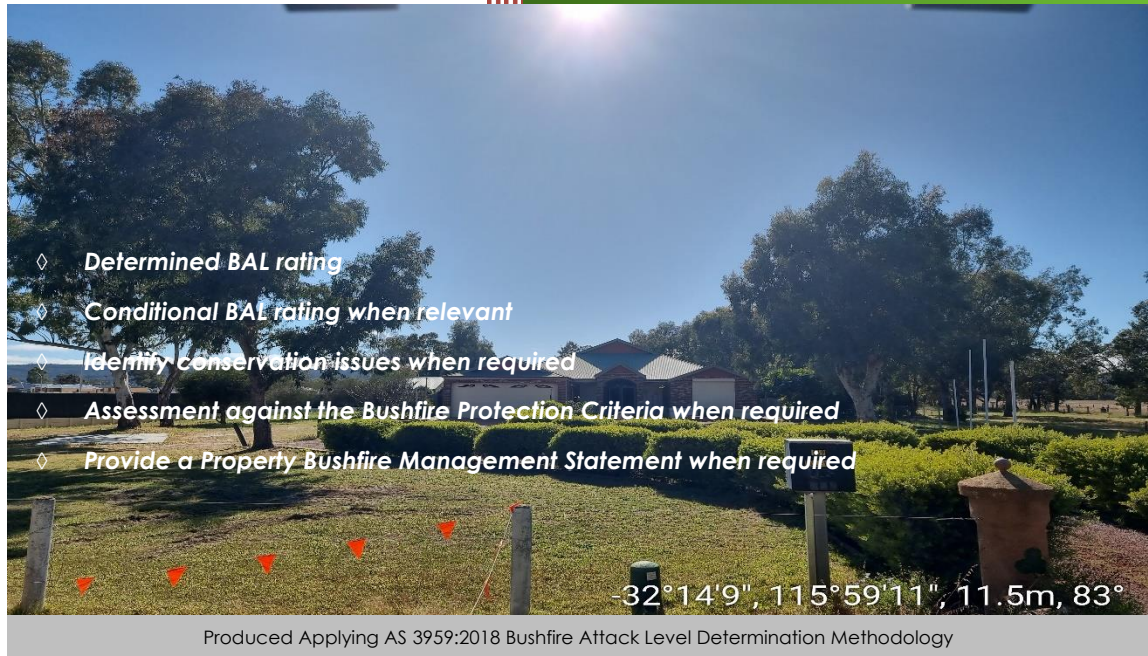








Bushfire Attack Level & Planning Report



Address / Location: Lot 201 (169) Doley Road, Byford

Shire of Serpentine Jarrahdale



Report Date: 21 November 2022

Job Reference

No: 220774

COMPANY AND BUSHFIRE CONSULTANT DETAILS

BPP GROUP PTY LTD
 T/A BUSHFIRE PRONE PLANNING
 ACN: 39 166 551 784 | ABN: 39 166 551 784
 LEVEL 1, 159-161 JAMES STREET
 GUILDFORD WA 6055
 PO BOX 388
 GUILDFORD WA 6935
 08 6477 1144 | admin@bushfireprone.com.au

I hereby declare that I am a BPAD accredited bushfire practitioner.		
Accreditation No.	BPAD 42204	
Signature		
Date	21 November 2022	

Authorised Practitioner Stamp

Author: Sarina Gorman (BPAD Level 2 No. 42204)

Reviewed: Kathy Nastov (BPAD Level 3 No. 27794)

ASSESSMENT AND REPORT DETAILS

THIS REPORT HAS BEEN PREPARED BY AN ACCREDITED BPAD PRACTITIONER USING THE SIMPLIFIED BAL DETERMINATION PROCEDURE (METHOD 1) AS DETAILED IN SECTION 2 OF AS 3959:2018.

Fire Protection Association Australia, as the accrediting body for BPAD accreditation, makes no warranties as to the accuracy of the information provided in the report. All enquiries related to the information and conclusions presented in this report must be made to the practitioner who prepared this report.

Version	Details	Site Assessment Date	Report Date
1.0	Original	2 November 2022	14 November 2022
1.1	Updates to Original Document – Correction to Building Class		21 November 2022

Period of Validity: Reliance on the assessment and determination of the Bushfire Attack Level contained in this report should not extend beyond a period of 12 months from the date of issue of the report. If this report was issued more than 12 months ago, it is recommended that the validity of the determination be confirmed with the accredited practitioner and where required an updated report and/or BAL certificate issued.

Limitations: The protection measures that will be implemented based on information presented in this report are minimum requirements and they do not guarantee that buildings or infrastructure will not be damaged in a bushfire, persons injured, or fatalities occur either on the subject site or off the site while evacuating.

This is substantially due to the unpredictable nature and behaviour of fire and fire weather conditions. Additionally, the correct implementation of the required protection measures (including bushfire resistant construction) and any other required or recommended measures, will depend upon, among other things, the ongoing actions of the landowners and/or operators over which Bushfire Prone Planning has no control.

All surveys, forecasts, projections and recommendations made in this report associated with the proposed development or use are made in good faith based on information available to Bushfire Prone Planning at the time. All maps included herein are indicative in nature and are not to be used for accurate calculations.

Notwithstanding anything contained therein, Bushfire Prone Planning will not, except as the law may require, be liable for any loss or other consequences whether or not due to the negligence of their consultants, their servants or agents, arising out of the services provided by their consultants.

Copyright © 2022 BPP Group Pty Ltd: All intellectual property rights, including copyright, in format and proprietary content contained in documents created by Bushfire Prone Planning, remain the property of BPP Group Pty Ltd. Any use made of such format or content without the prior written approval of Bushfire Prone Planning, will constitute an infringement on the rights of the Company which reserves all legal rights and remedies in respect of any such infringement.

TABLE OF CONTENTS

1	PROPOSED BUILDING WORKS OR USE	2
1.1.1	SITE PLAN	3
2	INFORMATION FOR LOCAL GOVERNMENT BUILDING SERVICES (& THE LANDOWNER)	5
2.1	BAL ASSESSMENT SUMMARY (CONTOUR MAP FORMAT)	6
2.1.1	BAL DETERMINATION METHOD(S) APPLIED AND THE LOCATION OF DATA AND RESULTS.....	6
2.1.2	BAL RATINGS DERIVED FROM THE CONTOUR MAP.....	6
2.1.3	IDENTIFICATION OF SHIELDED ELEVATIONS.....	7
2.1.5	BAL CONTOUR MAP(S).....	9
	ASSESSMENT DATA (DETAILED) AND SUPPORTING INFORMATION	13
A1:	ASSESSED SITE INPUTS COMMON TO THE METHOD 1 AND METHOD 2 PROCEDURES	13
A1.1:	FIRE DANGER INDICES (FDI/ FDI/GFDI).....	13
A1.2:	VEGETATION ASSESSMENT AND CLASSIFICATION.....	13
A1.3:	EFFECTIVE SLOPE.....	23
A1.4:	SEPARATION DISTANCE.....	24
	APPENDIX B: ADVICE - ONSITE VEGETATION MANAGEMENT - THE APZ	25
B1:	THE DIMENSIONS OF THE APZ TO BE ESTABLISHED AND MAINTAINED.....	25
B2:	THE STANDARDS FOR THE APZ AS ESTABLISHED BY THE GUIDELINES (DPLH, V1.4).....	28
B3:	THE STANDARDS FOR THE APZ AS ESTABLISHED BY THE LOCAL GOVERNMENT	29
B4:	MAINTAINING LOW THREAT AND NON-VEGETATED AREAS EXCLUDED FROM CLASSIFICATION	30
	APPENDIX C: ADVICE - TECHNICAL REQUIREMENTS FOR VEHICULAR ACCESS	31
	APPENDIX E: ADVICE - BAL RATINGS – CORRESPONDING THREATS AND CONSTRUCTION REFERENCES	32

LIST OF FIGURES

Figure 1.1:	Site plans relied upon to locate the building works on the lot.	3
Figure 1.2:	Proposed Development Map.	4
Figure 2:	Classified vegetation and topography map.	8
Figure 3:	BAL Contour Map.....	9

1 PROPOSED BUILDING WORKS OR USE

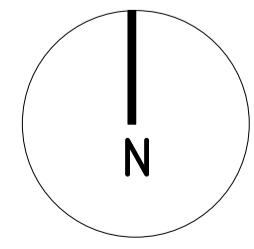
The Proposal's Planning Stage For which certain bushfire planning documents are required to accompany the planning application.		Development Application
Total Area of Subject Lot/Site		8626m ²
Number of Additional Lots Created		N/A
Primary Proposed Construction	Type(s)	New Building(s)
	NCC Classification	Class 3 & 5 (Fire Station Administration and Sleeping Accommodation)
Specific 'Bushfire Planning' Land Use Type When applicable, this classification establishes a requirement to conduct assessments and develop documents that are additional to this Bushfire Management Plan.		N/A
Description of the Proposed Development/Use		
This Bushfire Attack Level (BAL) Contour Report is to accompany a development application for the construction of a new Career Fire and Rescue Service.		



LEGEND

- ↑ PEDESTRIAN MOVEMENT
- ↓ VEHICLE MOVEMENT
- DIRTY AREA - INTERNAL
- DIRTY AREA - COVERED
- TRANSITIONAL AREA - INTERNAL
- CLEAN AREA - INTERNAL
- CLEAN AREA - COVERED
- TRAINING AREA - INTERNAL
- TRAINING AREA - COVERED

iredale pedersen hook architects
 Perth Suite 8, Murray Mews 329-331 Murray Street, 6000,
 PO Box 442 Leederville 6903 t 08 9322 9750 f 08 9322 9752
 www.iredalepedersenhook.com email@iredalepedersenhook.com










CARDUP CFRS		DRAWING No.	
CORNER DOLEY RD & ORTON RD, BYFORD WA 6122		SK.4.1	
SITE PLAN - WITH SATELLITE IMAGE - OPT 4		SCALE	DATE
		1 : 200 @A1 50% REDUCTION @ A3	29/09/22

Figure 1.2

Proposed Development Map

Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

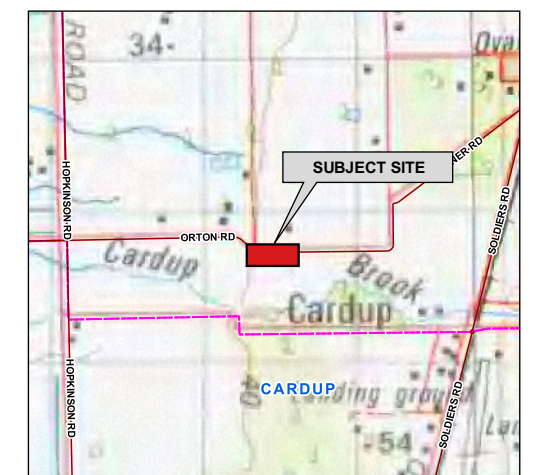
----- LEGEND -----

-  Cadastre
-  Subject Site
- Proposal**
-  Cardup CFRS
-  Training Pad
-  Parking/Hardstand Areas
-  Landscaping
-  Future Expansion
-  Water Tank



Metres

----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 14-11-2022
 SCALE (A3): 1 : 800



2 INFORMATION FOR LOCAL GOVERNMENT BUILDING SERVICES (& THE LANDOWNER)

BUSHFIRE ATTACK LEVELS (BAL) - UNDERSTANDING THE RESULTS

The potential transfer (flux/flow) of radiant heat from the bushfire to a receiving object is measured in kW/m². The AS 3959:2018 BAL determination methodology establishes the ranges of radiant heat flux that correspond to each bushfire attack level. These are identified as BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ.

The bushfire performance requirements for certain classes of buildings are established by the Building Code of Australia (Vol. 1 & 2 of the NCC). The BAL will establish the bushfire resistant construction requirements that are to apply in accordance with AS 3959:2018 - Construction of *buildings in bushfire prone areas* and the NASH Standard – *Steel framed construction in bushfire areas (NS 300 2021)*, whose solutions are deemed to satisfy the NCC bushfire performance requirements.

DETERMINED BAL RATINGS

A BAL Certificate can be issued for a determined BAL. A BAL can only be classed as 'determined' for an existing or future building/structure when:

1. It's final design and position on the lot are known and the stated separation distance from classified bushfire prone vegetation exists and can justifiably be expected to remain in perpetuity; or
2. It will always remain subject to the same BAL regardless of its design or position on the lot after accounting for any regulatory or enforceable building setbacks from lot boundaries as relevant and necessary (e.g., R-codes, restrictive covenants, defined building envelopes) or the retention of any existing classified vegetation either onsite or offsite.

INDICATIVE BAL RATINGS

A BAL Certificate cannot be issued for an indicative BAL. A BAL will be classed as 'indicative' for an existing or future building/structure when the required conditions to derive a determined BAL are not met.

This class of BAL rating indicates what BAL(s) could be achieved and the conditions that need to be met are stated.

Converting the indicative BAL into a determined BAL is conditional upon the currently unconfirmed variable(s) being confirmed by a subsequent assessment and evidential documentation. These variables will include the future building(s) location(s) being established (or changed) and/or classified vegetation being modified or removed to establish the necessary vegetation separation distance. This may also be dependent on receiving approval from the relevant authority for that modification/removal.

2.1 BAL Assessment Summary (Contour Map Format)

INTERPRETATION OF THE BAL CONTOUR MAP

The BAL contour map is a diagrammatic representation of the results of the bushfire attack level assessment.

The map presents different coloured contours extending out from the areas of classified vegetation. Each contour represents a set range of radiant heat flux that potentially will transfer to an exposed element (building, person or other defined element), when it is located within that contour.

Each of the set ranges of radiant heat flux corresponds to a different BAL rating as defined by the AS 3959:2018 BAL determination methodology.

The width of each shaded BAL contour will vary dependant on both the BAL rating and the relevant parameters (calculation inputs) for the subject site. Their width represents the minimum and maximum vegetation separation distances that correspond to each BAL rating (refer to the relevant table below for these distances).

The areas of classified vegetation to be considered in developing the BAL contours, are those that will remain at the intended end state of the subject development once earthworks, clearing and/or landscaping and re-vegetation have been completed. Variations to this statement that may apply include:

- Both pre and post development BAL contour maps are produced; and/or
- Each stage of a development is assessed independently.

2.1.1 BAL Determination Method(s) Applied and the Location of Data and Results

Procedure Method (AS 3959:2018)	Applied to the BAL Assessment	Location of the Site Assessment Data			Location of the Results
		Site Assessment Map	Calculation Input Variables		Assessed Bushfire Attack Levels and/or Radiant Heat Levels
			Summary Data	Detailed Data with Explanatory and Supporting Information	
Method 1 (Simplified)	Yes	Figure 2	Table 2.3	Appendix A1	Table 2.4 BAL Contour Map

2.1.2 BAL Ratings Derived from the Contour Map

Table 2.1: Indicative and determined BAL(s) for existing and/or proposed building works.

BUSHFIRE ATTACK LEVEL FOR EXISTING/PLANNED BUILDINGS/STRUCTURE ¹		
Building/Structure Description	Indicative BAL ²	Determined BAL ²
Proposed Career Fire & Rescue Service	BAL-12.5	N/A

¹ The assessment data used to derive the BAL ratings is sourced from Table 2.4 and Figure 3.
² Refer to the start of Section 3 for an explanation of indicative versus determined BAL ratings.



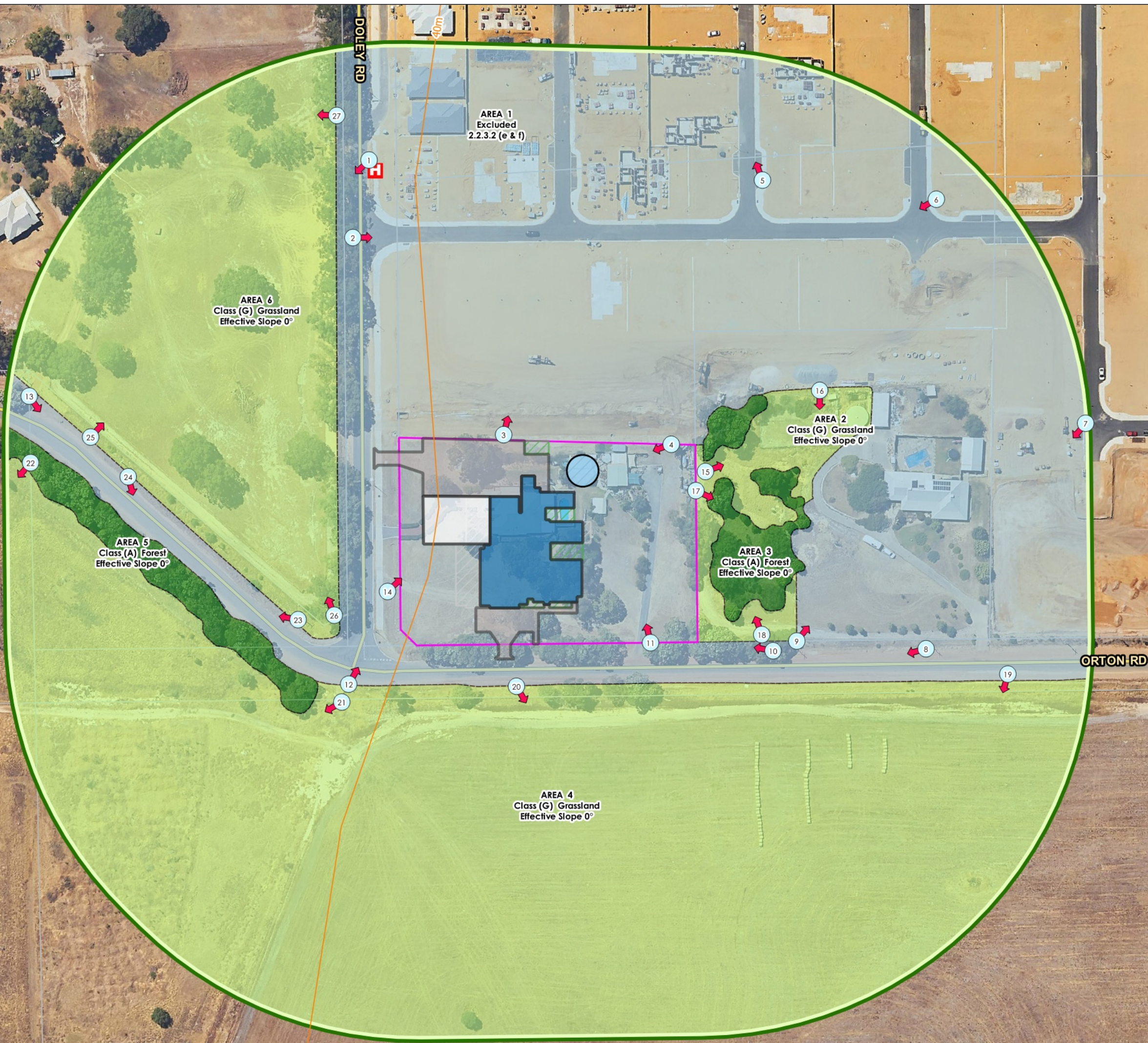
2.1.3 Identification of Shielded Elevations

IDENTIFICATION OF SHIELDED ELEVATION(S) – REDUCTION IN CONSTRUCTION REQUIREMENTS		
<p>In accordance with AS 3959:2018 Clause 3.5, where an elevation is not exposed to the source of bushfire attack, the construction requirements for that elevation can reduce to the next lower BAL, but not below BAL-12.5. This shall apply to all elements of the wall, including openings, but shall not apply to subfloors or roofs.</p> <p>When applicable, the shielded elevation(s) are identified on the site plan when practical, otherwise a separate diagram is provided as an addendum.</p>		
Proposed Building Works	Proposed Career Fire & Rescue Service	The shielding provisions cannot be applied.

Figure 2

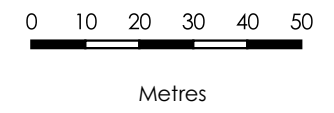
Classified Vegetation & Topography Map

Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

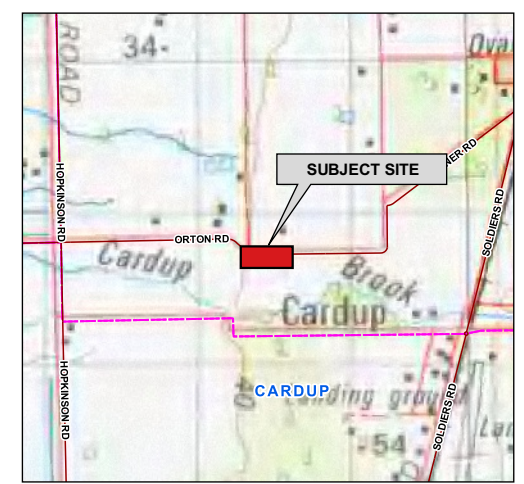


----- LEGEND -----

- Photos
- Hydrants
- Elevation (m)
- Subject Site
- Proposal**
- Cardup CFRS
- Training Pad
- Parking/Hardstand Areas
- Landscaping
- Future Expansion
- Water Tank
- Assessment Area**
- 150m Buffer
- Classified Vegetation**
- Class A - Forest
- Class G - Grassland
- Exclusion 2.2.3.2



----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 14-11-2022
 SCALE (A3): 1 : 1400

Figure 3

BAL Contour Map

Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

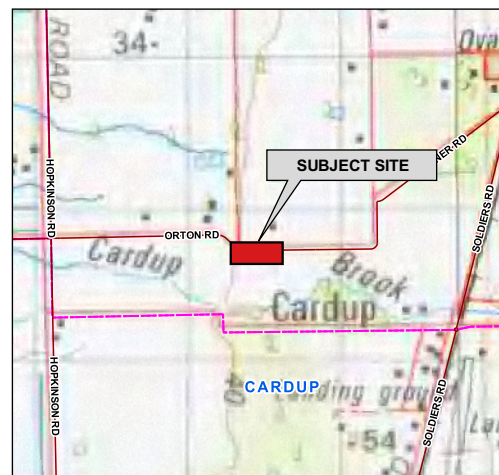
----- LEGEND -----

- Subject Site
- Proposal**
- Cardup CFRS
- Training Pad
- Parking/Hardstand Areas
- Landscaping
- Future Expansion
- Water Tank
- Assessment Area**
- 100m Buffer
- 150m Buffer
- Bushfire Attack Levels**
- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW



Metres

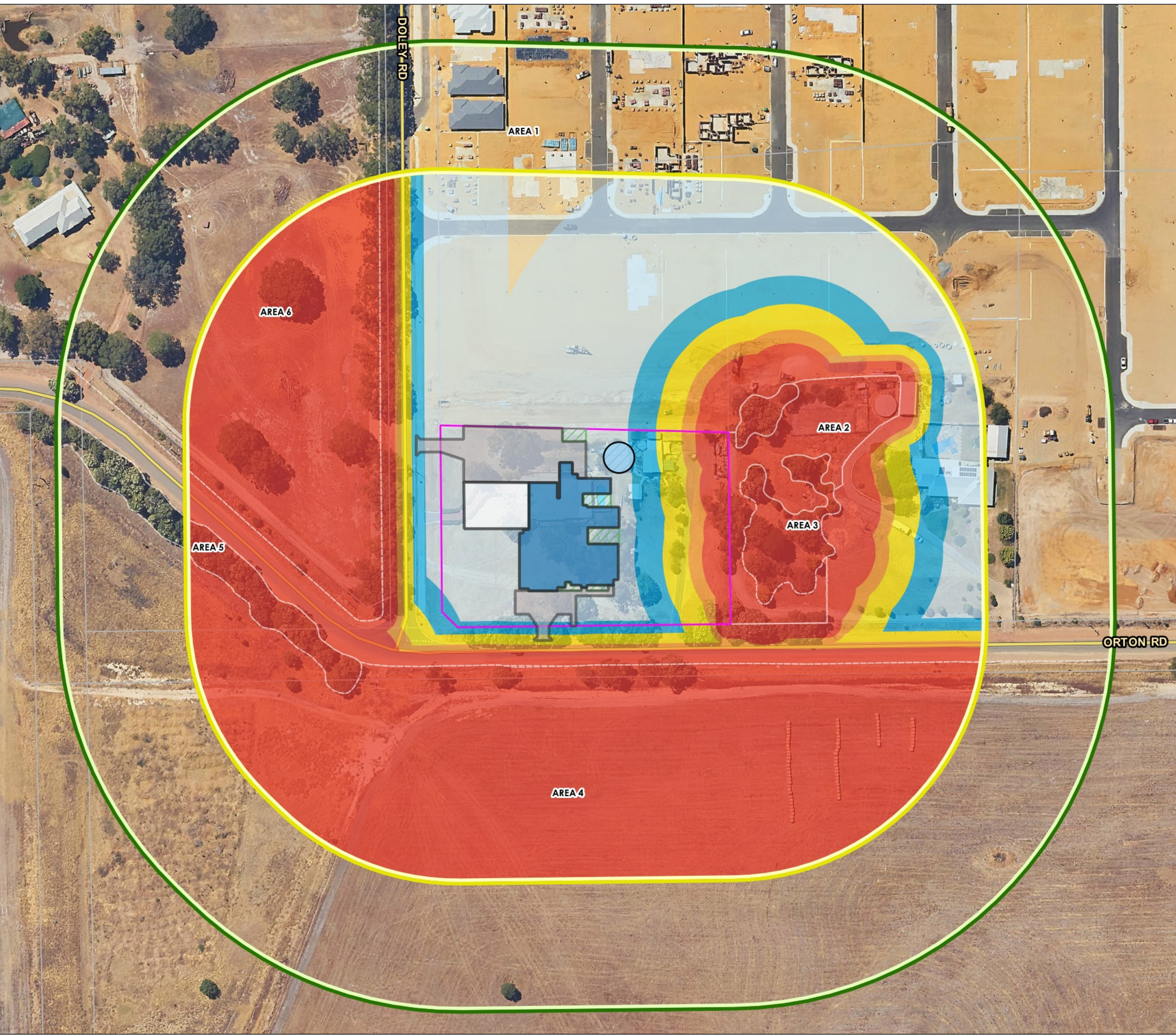
----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 14-11-2022
 SCALE (A3): 1 : 1400



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

2.1.6 Site Assessment Data Applied to Construction of the BAL Contour Map(s)

RELEVANT CLASSIFIED VEGETATION	
Identification of Classified Vegetation that is Relevant to the Production of the BAL Contour Map(s)	Relevant Map
All identified areas of classified vegetation that exist at the time of the site assessment – both within the subject site (onsite) and external to the subject site (offsite) will be the relevant vegetation.	Figure No. 2
<p>All identified classified vegetation areas, or portions of areas, within the subject lot are excluded. It is the classified vegetation external to the lot boundaries that is the relevant vegetation.</p> <p>This approach is applied to indicate the achievable bushfire attack levels within the specified lot and the resultant area of developable land where buildings will be subject to BAL-29 or less. It is based on the following assumptions:</p> <ol style="list-style-type: none"> 1. Any classified vegetation within a lot can potentially be managed or removed by the landowner to meet asset protection zone standards; and 2. Future development and consequent removal/management of vegetation that may take place on any adjoining lot cannot be part of considerations for the subject lot. 	Figure No's. 2 & 3
The areas of classified vegetation that will remain at the intended end state of the subject development once earthworks, any clearing and/or landscaping and re-vegetation have been completed, will be the relevant vegetation for the post-development BAL contour map.	Figure No. 3
<p>Supporting Assessment Details:</p> <p>None Required.</p>	

Table 2.3: The calculation inputs applied to determining the site specific separation distances corresponding to levels of potential radiant heat transfer (including BAL's).

SUMMARY OF CALCULATION INPUT VARIABLES APPLIED TO THE DETERMINATION OF SEPARATION DISTANCES CORRESPONDING TO RADIANT HEAT LEVELS ¹												
Applied BAL Determination Method		METHOD 1 - SIMPLIFIED PROCEDURE (AS 3959:2018 CLAUSE 2.2)										
The Calculation Variables Corresponding to the BAL Determination Method Applied												
Methods 1 and 2		Method 1			Method 2							
Vegetation Classification		FDI	Effective Slope		Site Slope	FFDI or GFDI	Flame Temp.	Elevation of Receiver	Flame Width	Fireline Intensity	Flame Length	Modified View Factor
			Applied Range	Measured								
Area	Class		degree range	degrees	degrees		K	metres	metres	kW/m	metres	% Reduction
1	Excluded cl 2.2.3.2(e & f)	N/A	N/A	N/A								
2	(G) Grassland	80	Upslope or flat 0	flat 0								
3	(A) Forest	80	Upslope or flat 0	flat 0								
4	(G) Grassland	80	Upslope or flat 0	flat 0								
5	(A) Forest	80	Upslope or flat 0	flat 0								
6	(G) Grassland	80	Upslope or flat 0	flat 0								

¹ All data and information supporting the determination of the classifications and values stated in this table and any associated justification, is presented in Appendix A. Where the values are stated as 'default' these are either the values stated in AS 3959:2018, Table B1 or the values calculated as intermediate or final outputs through application of the equations of the AS 3959:2018 BAL determination methodology. They are not values derived by the assessor.

Table 2.4: Vegetation separation distances corresponding to the radiant heat levels illustrated as BAL contours in Figure 3.

THE CALCULATED VEGETATION SEPARATION DISTANCES CORRESPONDING TO THE STATED LEVEL OF RADIANT HEAT ¹									
Vegetation Classification		Separation Distances Corresponding to Stated Level of Radiant Heat (metres)							
		Bushfire Attack Level						Maximum Radiant Heat Flux	
Area	Class	BAL-FZ	BAL-40	BAL-29	BAL-19	BAL12.5	BAL-LOW	10 kW/m ²	2 kW/m ²
1	Excluded cl 2.2.3.2(e & f)	N/A	N/A	N/A	N/A	N/A	N/A		
2	(G) Grassland	<6	6-<8	8-<12	12-<17	17-<50	>50		
3	(A) Forest	<16	16-<21	21-<31	31-<42	42-<100	>100		
4	(G) Grassland	<6	6-<8	8-<12	12-<17	17-<50	>50		
5	(A) Forest	<16	16-<21	21-<31	31-<42	42-<100	>100		
6	(G) Grassland	<6	6-<8	8-<12	12-<17	17-<50	>50		

¹ All calculation input variables are presented in Table 2.3. The summary 'printouts' of calculation input and output values for each area of classified vegetation are presented in Appendix A.

ASSESSMENT DATA (DETAILED) AND SUPPORTING INFORMATION

A1: Assessed Site Inputs Common to the Method 1 and Method 2 Procedures

A1.1: FIRE DANGER INDICES (FDI/ FDI/GFDI)

When using Method 1 the relevant FDI value required to be applied for each state and region is established by AS 3959:2018, Table 2.1. Each FDI value applied in Tables 2.4 – 2.7 represents both the Forest Fire Danger Index (FFDI) and a deemed equivalent for the Grassland Fire Danger Index (GFDI), as per Table B2 in Appendix B. When using Method 2, the relevant FFDI and GFDI are applied.

The values may be able to be refined within a jurisdiction, where sufficient climatological data is available and in consultation with the relevant authority.

Relevant Jurisdiction:	WA	Region:	Whole State	Method 1	Applied FDI:	80
				Method 2	Applied FFDI:	N/A
					Applied GFDI:	N/A

A1.2: VEGETATION ASSESSMENT AND CLASSIFICATION

Vegetation Types and Classification

In accordance with AS 3959:2018 clauses 2.2.3 and C2.2.3.1, all vegetation types within 100 metres of the 'site' (defined as "the part of the allotment of land on which a building stands or is to be erected"), are identified and classified. Any vegetation more than 100 metres from the site that has influenced the classification of vegetation within 100 metres of the site, is identified and noted. The maximum excess distance is established by AS 3959: 2018 cl 2.2.3.2 and is an additional 100 metres.

Classification is also guided by the Visual Guide for Bushfire Risk Assessment in WA (WA Department of Planning February 2016) and any relevant FPA Australia practice notes.

Modified Vegetation





The vegetation types have been assessed as they will be in their natural mature states, rather than what might be observed on the day. Vegetation destroyed or damaged by a bushfire or other natural disaster has been assessed on its expected re-generated mature state. Modified areas of vegetation can be excluded from classification if they consist of low threat vegetation managed in a minimal fuel condition, satisfying AS 3959:2018 s2.2.3.2(f), and there is sufficient justification to reasonable expect that this modified state will exist in perpetuity.





The Influence of Ground Slope

Where significant variation in effective slope exists under a consistent vegetation type, these will be delineated as separate vegetation areas to account for the difference in potential bushfire behaviour, in accordance with AS 3959:2018 clauses 2.2.5 and C2.2.5.



THE INFLUENCE OF VEGETATION GREATER THAN 100 METRES FROM THE SUBJECT SITE



Vegetation area(s) within 100m of the site whose classification has been influenced by the existence of bushfire prone vegetation from 100m – 200m from the site:	None
Assessment Statement:	No vegetation types exist close enough, or to a sufficient extent, within the relevant area to influence classification of vegetation within 100 metres of the subject site.



VEGETATION AREA 1						
Classification	N/A					
Types Identified	N/A					
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.					
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A	
Foliage Cover (all layers)	N/A	Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>Note: Photo ID: 1 – Single row of trees/windbreak on adjoining lot.</p> <p>Note: Area 6 can be seen in the background of Photo ID: 1</p>					
Post Development Assumptions:	Not Applicable.					
 <p>32°14'5", 115°59'11", 11.1m, 315° 02/11/2022 08:14:32 am</p>			 <p>32°14'6", 115°59'11", 19.1m, 60° 02/11/2022 08:13:31 am</p>			
PHOTO ID: 1			PHOTO ID: 2			
 <p>32°14'8", 115°59'13", 11.3m, 14° 02/11/2022 08:21:11 am</p>			 <p>32°14'8", 115°59'16", 11.8m, 6° 02/11/2022 07:32:25 am</p>			
PHOTO ID: 3			PHOTO ID: 4			

VEGETATION AREA 1						
Classification	N/A					
Types Identified	N/A					
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.					
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A	
Foliage Cover (all layers)	N/A	Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>Note – Area 4 can be seen in the background of Photo ID: 8</p>					
Post Development Assumptions:	Not Applicable.					
 <p style="text-align: right; font-size: small;">-32°14'4", 115°59'16", 15.0m, 339° 02/11/2022 08:25:17 am</p>			 <p style="text-align: right; font-size: small;">-32°14'5", 115°59'19", 9.3m, 349° 02/11/2022 07:40:30 am</p>			
PHOTO ID: 5			PHOTO ID: 6			
 <p style="text-align: right; font-size: small;">-32°14'8", 115°59'22", 15.5m, 8° 02/11/2022 07:42:34 am</p>			 <p style="text-align: right; font-size: small;">-32°14'11", 115°59'19", 10.6m, 3° 02/11/2022 07:47:03 am</p>			
PHOTO ID: 7			PHOTO ID: 8			



VEGETATION AREA 1						
Classification	N/A					
Types Identified	N/A					
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.					
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A	
Foliage Cover (all layers)	N/A	Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>NOTE: Photo ID: 10 – Single row of trees/windbreak on adjoining lot.</p>					
Post Development Assumptions:	Not Applicable.					
PHOTO ID: 9			PHOTO ID: 10			
PHOTO ID: 11			PHOTO ID: 12			




VEGETATION AREA 1						
Classification	N/A					
Types Identified	N/A					
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.					
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A	
Foliage Cover (all layers)	N/A	Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>Note – Areas 5 and 6 can be seen in Photo ID: 13</p>					
Post Development Assumptions:	Not Applicable.					
 <p>32°14'8", 115°59'6", 7.4m, 62° 02/11/2022 08:03:02 am</p>			 <p>32°14'10", 115°59'11", 10.6m, 47° 02/11/2022 08:07:57 am</p>			
PHOTO ID: 13			PHOTO ID: 14			

VEGETATION AREA 2				
Classification	G. GRASSLAND			
Types Identified	Tussock grassland G-22	Tussock grassland G-22	Dense sown pasture G-25	
Exclusion Clause	N/A			
Effective Slope	Measured	flat 0 degrees	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	<p>Assessed as Grassland due to areas of grasses present in paddock/open areas. Currently in an unmanaged state and required to be classified in accordance with AS3959-2018. Foliage cover less than 10%.</p> <p>Note – It is recognised that a firebreak is present along the eastern boundary (on the neighbouring allotment). It is assumed for the purposes of assessment that the firebreak will not be maintained. As such, the area has been classified as a precautionary measure.</p>			
Post Development Assumptions:	Not Applicable.			
				
PHOTO ID: 15		PHOTO ID: 16		

VEGETATION AREA 3							
Classification	A. FOREST						
Types Identified	Open forest A-03			Woodland B-05			
Exclusion Clause	N/A						
Effective Slope	Measured	flat 0 degrees		Applied Range (Method 1)		Upslope or flat 0 degrees	
Foliage Cover (all layers)	>30%	Shrub/Heath Height		>2m	Tree Height		Up to 30m
Description/Justification:	Forest Dominant Area - Mixed species of trees inclusive of Eucalypts. Understorey consists of unmanaged grasses, low shrub and low trees in some sections. Other sections have minimal understorey. Occasional open areas between canopies.						
Post Development Assumptions:	Not Applicable						
							
PHOTO ID: 17				PHOTO ID: 18			

VEGETATION AREA 4				
Classification	G. GRASSLAND			
Types Identified	Tussock grassland G-22	Tussock grassland G-22	Dense sown pasture G-25	
Exclusion Clause	N/A			
Effective Slope	Measured	flat 0 degrees	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	Assessed as Grassland due to areas of grasses present in paddock/open areas. Currently in an unmanaged state and required to be classified in accordance with AS3959-2018. Foliage cover less than 10%.			
Post Development Assumptions:	Not Applicable.			
				
PHOTO ID: 19		PHOTO ID: 20		
				
PHOTO ID: 21		PHOTO ID: 22		

VEGETATION AREA 5							
Classification	A. FOREST						
Types Identified	Open forest A-03			Woodland B-05			
Exclusion Clause	N/A						
Effective Slope	Measured	flat 0 degrees		Applied Range (Method 1)		Upslope or flat 0 degrees	
Foliage Cover (all layers)	>30%	Shrub/Heath Height		>2m	Tree Height		Up to 30m
Description/Justification:	Eucalypt dominant area. Understorey consists of unmanaged grasses, low shrub and low trees.						
Post Development Assumptions:	Not Applicable						
							
PHOTO ID: 23				PHOTO ID: 24			

VEGETATION AREA 6				
Classification	G. GRASSLAND			
Types Identified	Tussock grassland G-22	Tussock grassland G-22	Dense sown pasture G-25	
Exclusion Clause	N/A			
Effective Slope	Measured	flat 0 degrees	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	Assessed as Grassland due to areas of grasses present in paddock/open areas. Currently in an unmanaged state and required to be classified in accordance with AS3959-2018. Foliage cover less than 10%.			
Post Development Assumptions:	Not Applicable.			
 <p style="text-align: right; font-size: small;">-32°14'8", 115°59'7", 8.1m, 43° 02/11/2022 08:02:25 am</p>		 <p style="text-align: right; font-size: small;">-32°14'10", 115°59'11", 6.2m, 359° 02/11/2022 08:07:09 am</p>		
PHOTO ID: 25		PHOTO ID: 26		
 <p style="text-align: right; font-size: small;">-32°14'4", 115°59'11", 2.8m, 272° 02/11/2022 08:15:30 am</p>				
PHOTO ID: 27				

A1.3: EFFECTIVE SLOPE

Measuring

Effective slope refers to the slope “under the classified vegetation which most significantly influences bushfire behaviour (AS 3959:2018, clause B4, CB4). It is not the average slope.

It is described as upslope, flat or downslope when viewed from the exposed element (e.g., building) looking towards the vegetation – and measured in degrees. Ground slope has a direct and significant influence on a bushfire's rate of spread and intensity, which increases when travelling up a slope.

The slope under the vegetation in closest proximity to the exposed element(s), over the distance that will most likely carry the entire depth of the flaming front, will be a significant consideration in the determination of the effective slope. This distance is determined as a function of the potential quasi-steady rate of spread and expected residence time (i.e., the flaming combustion period at a single point on the ground), of a bushfire in the specific vegetation type/landscape scenario.

Slope Variation Within Areas of Vegetation

Where a significant variation in effective slope exists under a consistent vegetation type, these will be delineated as separate vegetation areas to account for the difference in potential bushfire behaviour, in accordance with AS 3959:2018 clauses 2.2.5 and C2.2.5.

Slope Variation Due to Multiple Development Sites

When the effective slope, under a given area of bushfire prone vegetation, will vary significantly relative to multiple proposed development sites (exposed elements), then the effective slopes corresponding to each of the different locations, are separately identified.

The relevant (worst case) effective slope is determined in the direction corresponding to the potential directions of fire spread towards the subject building(s).

Differences in Application of Effective Slope - AS 3959:2018 Method 1 versus Method 2 Procedures

The Method 1 procedure provides five different slope ranges from flat (including all upslopes) to 20 degrees downslope to define the effective slope and bushfire behaviour model calculations apply the highest value in each range (i.e., 0°, 5°, 10°, 15° or 20°).

The Method 2 procedure requires an actual slope (up or down in degrees) to be determined. AS 3959:2018, clause B1 limits the effective slope that can be applied to 30 degrees downslope and 15 degrees upslope. Where any upslope is greater than 15 degrees, then 15 degrees is to be used.

SITE ASSESSMENT DETAILS - EXPLANATION & JUSTIFICATION

The effective slopes determined from the site assessment are recorded in Table 2.3 of this report. When their derivation requires additional explanation and justification, this is provided below.

A1.4: SEPARATION DISTANCE

Measuring

The separation distance is the distance in the horizontal plane between the receiver (building/structure or area of land being considered) and the edge of the classified vegetation (AS 3959:2018, clause 2.2.4)

The relevant parts of a building/structure from which the measurement is taken is the nearest part of an external wall or where a wall does not exist, the supporting posts or columns. Certain parts of buildings are excluded including eaves and roof overhangs.

The edge of the vegetation, for forests and woodlands, will be determined by the unmanaged understorey rather than either the canopy (drip line) or the trunk (AS 3959:2018, clause C2.2.5).

Measured Separation Distance as a Calculation Input

If a separation distance can be measured because the location of the building/structure relative to the edge of the relevant classified vegetation is known, this figure can be entered into the BAL calculation. The result is a determined BAL rating.

Assumed Separation Distance as a Calculation Input

When the building/structure location within the lot is not known, an assumed building location may be applied that would establish the closest positioning of the building/structure relative to the relevant area of vegetation.

The assumed location would be based on a factor that puts a restriction on a building location such as:

- An established setback from the boundary of a lot, such as a residential design code setback or a restrictive covenant; or
- Within an established building envelope.

The resultant BAL rating would be indicative and require later confirmation (via a Compliance Report) of the building/structure actual location relative to the vegetation to establish the determined BAL rating.

SITE ASSESSMENT DETAILS - EXPLANATION & JUSTIFICATION

Measured and assumed separation distances determined from the site assessment are recorded in Table 2.3 of this report.

When their derivation requires additional explanation and justification, including when the relevant R-Code or other regulated building setbacks are being applied, this is provided below.

APPENDIX B: ADVICE - ONSITE VEGETATION MANAGEMENT - THE APZ

THE ASSET PROTECTION ZONE (APZ) - DESCRIPTION

This is an area surrounding a habitable building containing either no fire fuels and/or low threat fire fuels that are managed in a minimal fuel condition. The primary objectives include:

- To ensure the building is sufficiently separated from the bushfire hazard to limit the impact of its direct attack mechanisms. That is, the dimensions of the APZ will, for most site scenarios, remove the potential for direct flame contact on the building, reduce the level of radiant heat to which the building is exposed and ensure some reduction in the level of ember attack (with the level of reduction being dependent on the vegetation types of present);
- To ensure any vegetation retained within the APZ is low threat and prevents surface fire spreading to the building;
- To ensure other combustible materials that can result in consequential fire (typically ignited by embers) within both the APZ and parts of the building, are eliminated, minimised and/or appropriately located or protected. (Note: The explanatory notes in the Guidelines provide some guidance for achieving this objective and other sources are available. Research shows that consequential fire, ignited by embers, is the primary cause of building loss in past bushfire events); and
- To provide a defensible space for firefighting activities.

B1: The Dimensions of the APZ to be Established and Maintained

UNDERSTANDING THE APZ PLANNING ASSESSMENT VERSUS ITS IMPLEMENTATION REQUIREMENTS

THE 'PLANNING BAL-29' APZ

It is important to understand is that the 'Planning BAL-29' APZ is not necessarily the size of the APZ that must be physically established and maintained by a landowner. It is a screening tool for making planning approval decisions.

The assessment against the Bushfire Protection Criteria is conducted for planning approval purposes. To satisfy acceptable solution 'A2.1: Asset Protection Zone', it must be demonstrated that certain minimum separation distances between the relevant building/structure and different classes of bushfire prone vegetation either exist or can be created and will remain in perpetuity.

The required minimum separation distances are those that will ensure the potential radiant heat impact on relevant existing or future buildings does not exceed 29 kW/m². The area of land contained within these separation distances is described as an Asset Protection Zone (APZ) and is to be comprised of non-vegetated land or low threat vegetation managed in a minimal fuel condition.

The applicable minimum separation distances will vary dependent on the vegetation types, the slope of the land they are growing on and other relevant factors specific to the site and its use.

The resulting 'Planning BAL-29' APZ dimensions may extend outside subject lot boundaries.

It is the purpose of the bushfire consultant's 'Supporting Assessment Detail', that is presented in the assessment against the acceptable solution A2.1, that will identify and justify how any offsite land within the 'Planning BAL-29 APZ (which the subject landowner has no authority or responsibility to manage), will meet the requirements of being either non-vegetated land or low threat vegetation managed in a minimal fuel condition and justifiably can be considered likely to remain in this state in perpetuity. Or otherwise, explain how this condition cannot be met.

It is the 'Planning BAL-29' APZ dimensions that will be stated in relevant tables and shown on maps as necessary in this BMP. The exceptions are the tables that are included within this appendix - when relevant to the subject lot(s) - which will present 'BAL Rating' and 'Landowner' APZ dimensions.

THE 'BAL RATING' APZ

The 'BAL Rating' APZ will ensure that the potential radiant heat exposure of the building/structure will be limited to the level that the applied construction requirements, (i.e., those corresponding to the building/structure's determined BAL rating), are designed to resist.

The minimum dimensions of the 'BAL Rating' APZ to be established and maintained will be those that correspond to the determined BAL rating for the specific building/structure. They will account for the specific conditions on and surrounding the subject lot.

The required dimensions of the 'BAL Rating' APZ establish the size of the APZ that must physically exist either entirely within a subject lot or in combination with an area of adjoining land.

If in combination with adjoining (offsite) land, it must be justified how the offsite land can most reasonably be expected to either remain unvegetated or be able to meet and maintain the APZ Standards in perpetuity, without any actions by the owner of the subject lot.

The applicable determined BAL rating will have been stated in the relevant assessment section of this BMP when it can be assessed as a 'determined' rather than 'indicative' rating. Otherwise, it will be shown on the BAL Certificate that is submitted as part of a building application.

THE 'LANDOWNER' APZ

Dimensions: The 'Landowner' APZ is to be established and maintained by the owner of the subject lot. The minimum dimensions are the 'BAL Rating' APZ dimensions except that they will be limited to the distance that they can be established within the subject lot. (Note: Any removal of native vegetation may require the approval of the relevant authority.

The remaining required separation distance outside the subject lot has been assessed by the bushfire consultant and it can justifiably be considered likely to remain as low threat vegetation, managed in a minimal fuel condition (if necessary) in perpetuity without the owner of the subject lot being required to take any action for which they do not have the authority.

These minimum 'within the lot' APZ dimensions will only be greater when the relevant local government's annual firebreak / hazard reduction notice (issued under s33 of the Bushfires Act 1954), specifies the APZ dimensions to be applied within the lot and they are greater. Consequently, the 'Landowner' APZ dimensions can be a combination of the 'BAL Rating' Dimensions and the Local Government requirements. Check their annual notice for revisions to these requirements.

The dimensions of the 'Landowner' APZ establish the size of the APZ that must be established and maintained by the landowner within the subject lot.

Location: The 'Landowner' APZ for which the landowner has the responsibility to establish and maintain, is that which will exist entirely within the boundaries of the relevant lot, unless an approved formal and enforceable agreement allows them to manage a specified area of land external to the subject lot.

In most cases the landowner will only have authority and responsibility to establish and manage the APZ within the subject lot.

Otherwise, when there is a remaining part of the 'BAL Rating' APZ existing outside the subject lot, then these areas of land will, in most situations, include non-vegetated areas (e.g., roads / parking / drainage / water body), formally managed areas of vegetation (e.g., public open space / recreation areas / services installed in a common section of land) or an APZ on a neighbouring lot that is required to be established and maintained by the owner of that adjoining lot.

For vulnerable land uses, the 'BAL Rating' APZ and 'Landowner' APZ will also refer to the dimensions corresponding to radiant heat impact levels of 10 kW/m² and 2 kW/m² (calculated using 1200K flame temperature).

For development applications only, the 'Landowner' APZ dimensions are also shown on the Property Bushfire Management Statement when it is a required component of this report.



Table B1.1: The applicable 'Landowner' APZ Dimensions when indicative BAL ratings have been established by the BMP.

THE 'LANDOWNER' APZ DIMENSIONS TO BE ESTABLISHED AND MAINTAINED							
Relevant Buildings(s)	Classified Vegetation Refer to Fig 2	Minimum Required Separation Distances (m) - Building to Vegetation					
		The 'BAL Rating' APZ Corresponding to the Stated 'Indicative' BAL				As Directed by the Applicable Local Government Firebreak / Hazard Reduction Notice	The 'Landowner' APZ (limited to the subject lot boundary unless otherwise justified)
		BAL-29	BAL-19	BAL-12.5	BAL-LOW		
Career Fire & Rescue Service	Area 1	N/A	N/A	N/A	N/A	20	Will be dependent on the subsequent 'Determined' BAL rating. It is then to be calculated as the greater of the 'BAL Rating' distance or the 'Firebreak Notice' distance, and no greater than the distance to the lot boundary.
	Area 2	8	12	17	50	20	
	Area 3	21	31	42	100	20	
	Area 4	8	12	17	50	20	
	Area 5	21	31	42	100	20	
	Area 6	8	12	17	50	20	
Comments: None Required.							

B2: The Standards for the APZ as Established by the Guidelines (DPLH, v1.4)

Within the Guidelines (source: <https://www.wa.gov.au/government/document-collections/state-planning-policy-37-planning-bushfire-prone-areas>), the management Standards are established by:

- Schedule 1: Standards for Asset Protection Zones (see extract below) established by the Guidelines; and
- The associated explanatory notes (Guidelines E2) that address (a) managing an asset protection zone (APZ) to a low threat state (b) landscaping and design of an asset protection zone and (c) plant flammability.

Guidelines for Planning in Bushfire Prone Areas

71

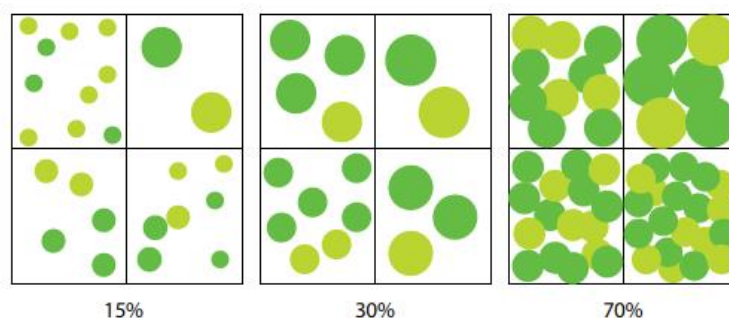


ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Fences within the APZ	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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



Shrub* and scrub* (0.5 metres to six metres in height). Shrub and scrub >6 metres in height are to be treated as trees.	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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.
Grass	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

B3: The Standards for the APZ as Established by the Local Government

Refer to the firebreak / hazard reduction notice issued annually (under s33 of the Bushfires Act 1954) by the relevant local government. It may state Standards that vary from those established by the Guidelines and that have been endorsed by the WAPC and DFES as per Section 4.5.3 of the Guidelines.

A copy of the relevant annual notice is not included here as they are subject to being reviewed and modified prior to issuing each year. Refer to ratepayers notices and/or the local government's website for the current version.

B4: Maintaining Low Threat and Non-Vegetated Areas Excluded from Classification

AS 3959 establishes the methodology for determining a bushfire attack level (BAL). The methodology includes the classification of the subject site's surrounding vegetation according to their 'type' and the application of the corresponding bushfire behaviour models to determine the BAL. Certain vegetation can be considered as low threat and excluded from classification. Where this has occurred in assessing the site, the extract from AS3959:2018 below state the requirements (including the size of the vegetation area if relevant to the assessment) for maintenance of those areas of land.

15

AS 3959:2018

2.2.3.2 Exclusions—Low threat vegetation and non-vegetated areas

The following vegetation shall be excluded from a BAL assessment:

- (a) Vegetation of any type that is more than 100 m from the site.
- (b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.
- (c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other or of other areas of vegetation being classified vegetation.
- (d) Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.
- (e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.
- (f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks.

NOTES:

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

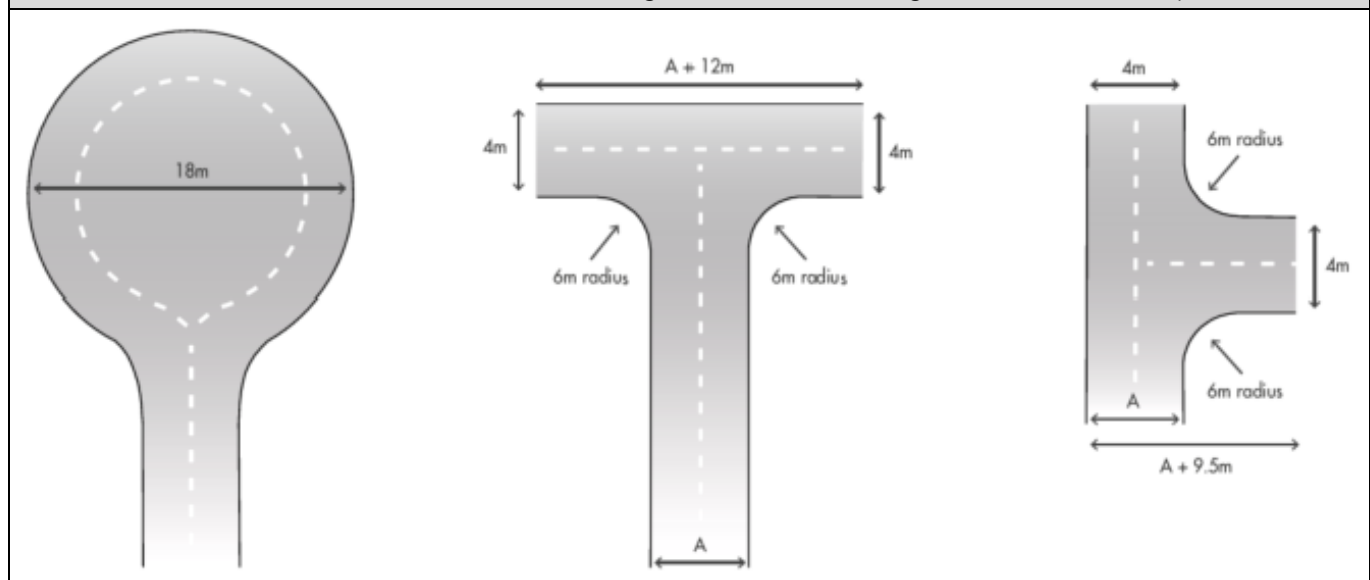
APPENDIX C: ADVICE - TECHNICAL REQUIREMENTS FOR VEHICULAR ACCESS

The design/layout requirements for access are established by the acceptable solutions of the Guidelines (DPLH, 2021 v1.4) Element 3 and vary dependent on the access component, the land use and the presence of 'vulnerable' persons. Consequently, the best reference source are the Guidelines. The technical requirements that are fixed for all components and uses are presented in this appendix.

GUIDELINES TABLE 6, EXPLANATORY NOTES E3.3 & E3.6 AND RELEVANT ACCEPTABLE SOLUTIONS

Technical Component	Vehicular Access Types / Components			
	Public Roads	Emergency Access Way ¹	Fire Service Access Route ¹	Battle-axe and Private Driveways ²
Minimum trafficable surface (m)	In accordance with A3.1	6	6	4
Minimum Horizontal clearance (m)	N/A	6	6	6
Minimum Vertical clearance (m)	4.5			
Minimum weight capacity (t)	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 (m)		8.5		

Turnaround Area Dimensions for No-through Road, Battle-axe Legs and Private Driveways ⁴



Passing Bay Requirements for Battle-axe leg and Private Driveway

When the access component length is greater than the stated maximum, passing bays are required every 200m with a minimum length of 20m and a minimum additional trafficable width of 2m (i.e., the combined trafficable width of the passing bay and constructed private driveway to be a minimum 6m).

Emergency Access Way – Additional Requirements

Provide a through connection to a public road, be no more than 500m in length, must be signposted and if gated, gates must be open the whole trafficable width and remain unlocked.

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% or 7.1 degree) entry and exit angle.

⁴ The turnaround area should be within 30m of the main habitable building.

APPENDIX E: ADVICE - BAL RATINGS – CORRESPONDING THREATS AND CONSTRUCTION REFERENCES

BAL ¹	DESCRIPTION OF PREDICTED BUSHFIRE DIRECT ATTACK MECHANISMS (THREATS) AND LEVELS OF EXPOSURE	REFERENCES FOR CONSTRUCTION REQUIREMENTS	
		AS 3959:2018 Construction of Buildings in Bushfire Prone Areas	The NASH Standard (2021) – Steel Framed Construction in Bushfire Areas
		Referenced by the Building Code of Australia for Building Classes 1, 2, 3 & 10a	Referenced by the Building Code of Australia for Building Classes 1 & 10a
BAL – LOW	There is insufficient risk to warrant specific construction requirements but there is still some risk. <i>(Note: DFES recommend that ember attack protection features be incorporated into the design where practicable).</i>	Section 4. No Requirements	No Requirements
BAL – 12.5	There is a risk of ember attack. Construction elements are expected to be exposed to heat flux not greater than 12.5 kW/m ²	Sections 3 & 5.	All construction requirements for BAL-12.5 to BAL-40 are the same except for windows and external doors, which must comply with AS 3959.
BAL – 19	There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m ² .	Sections 3 & 6	The construction requirements are set out as essentially non-combustible construction systems for each of the following building elements:
BAL – 29	There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m ² .	Sections 3 & 7.	Section 1.4: General Requirements Section 2: Roof and Ceiling System Section 3: External Wall System Section 4: Floor System Section 5: Carports Verandahs and Decks.
BAL – 40	There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux not greater than 40kW/m ² .	Sections 3 & 8.	
BAL – FZ (Flame Zone)	There is an extremely high risk of ember attack and burning debris ignited by windborne embers, and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux greater than 40 kW/m ² .	Sections 3 & 9.	The construction requirements are set out in Sections 1-5 and differ from the requirements for all other BAL ratings.

¹ AS 3959:2018 *Construction of buildings in bushfire prone areas*, defines a Bushfire Attack Level (BAL) as a “means of measuring the severity of a building’s potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat flux expressed in kW/m², and is the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.”

Bushfire management plan/Statement addressing the Bushfire Protection Criteria coversheet

Site address:

Site visit: Yes No

Date of site visit (if applicable): Day Month Year

Report author or reviewer:

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: Accreditation expiry: Month Year

Bushfire management plan version number:

Bushfire management plan date: Day Month Year

Client/business name:

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

Signature of report author or reviewer



Date



Cardup – Career Fire and Rescue Service

Bushfire Management Plan (BMP)



Produced to meet the relevant requirements of STATE PLANNING POLICY 3.7 Planning in Bushfire Prone Areas & Guidelines

Address / Location: Lot 201 (169) Doley Road, Byford

Shire of Serpentine Jarrahdale

Development Application

9 February 2023

Job Reference No: 220774

BPP GROUP PTY LTD T/A BUSHFIRE PRONE PLANNING

ACN: 39 166 551 784 | ABN: 39 166 551 784

**LEVEL 1, 159-161 JAMES STREET
GUILDFORD WA 6055****PO BOX 388
GUILDFORD WA 6935****08 6477 1144 | admin@bushfireprone.com.au****DOCUMENT CONTROL**

PREPARATION					
Author:	Sarina Gorman (BPAD Level 2 No. 42204)				
Reviewed:	Kathy Nastov (BPAD Level 3 No. 27794)				
VERSION HISTORY					
Version	Status/Details				Date
1.0	Original				23 January 2023
1.1	Amendments to Original Document – Design Concept Changes				9 February 2023
DISTRIBUTION					
Destination		Version	No. Copies	Hard Copy	Electronic Copy
Person	Email				
Tania Perrella – Iredale Pedersen Hook Architects	tp@iredalepedersenhook.com	1.1		<input type="checkbox"/>	<input checked="" type="checkbox"/>
		-		<input type="checkbox"/>	<input type="checkbox"/>
<p>Limitations: The protection measures that will be implemented based on information presented in this Bushfire Management Plan are minimum requirements and they do not guarantee that buildings or infrastructure will not be damaged in a bushfire, persons injured, or fatalities occur either on the subject site or off the site while evacuating.</p> <p>This is substantially due to the unpredictable nature and behaviour of fire and fire weather conditions. Additionally, the correct implementation of the required protection measures (including bushfire resistant construction) and any other required or recommended measures, will depend upon, among other things, the ongoing actions of the landowners and/or operators over which Bushfire Prone Planning has no control.</p> <p>All surveys, forecasts, projections and recommendations made in this report associated with the proposed development are made in good faith based on information available to Bushfire Prone Planning at the time. All maps included herein are indicative in nature and are not to be used for accurate calculations.</p> <p>Notwithstanding anything contained therein, Bushfire Prone Planning will not, except as the law may require, be liable for any loss or other consequences whether or not due to the negligence of their consultants, their servants or agents, arising out of the services provided by their consultants.</p> <p>Copyright © 2022 BPP Group Pty Ltd: All intellectual property rights, including copyright, in format and proprietary content contained in documents created by Bushfire Prone Planning, remain the property of BPP Group Pty Ltd. Any use made of such format or content without the prior written approval of Bushfire Prone Planning, will constitute an infringement on the rights of the Company which reserves all legal rights and remedies in respect of any such infringement.</p>					

TABLE OF CONTENTS

SUMMARY STATEMENTS	3
1 PROPOSAL DETAILS AND THE BUSHFIRE MANAGEMENT PLAN	5
1.1 THE PROPOSED DEVELOPMENT/USE DETAILS, PLANS AND MAPS	5
1.2 THE BUSHFIRE MANAGEMENT PLAN (BMP).....	11
1.2.1 COMMISSIONING AND PURPOSE.....	11
1.2.1 OTHER DOCUMENTS WITH IMPLICATIONS FOR DEVELOPMENT OF THIS BMP.....	11
2 BUSHFIRE PRONE VEGETATION – ENVIRONMENTAL & ASSESSMENT CONSIDERATIONS.....	13
2.1 ENVIRONMENTAL CONSIDERATIONS – ‘DESKTOP’ ASSESSMENT	13
2.1.1 DECLARED ENVIRONMENTALLY SENSITIVE AREAS (ESA)	15
2.1.2 OTHER PROTECTED VEGETATION ON PUBLIC LAND	16
2.1.3 RESPONSE OF PROPOSED DEVELOPMENT TO IDENTIFIED ENVIRONMENTAL LIMITATIONS.....	17
2.2 BUSHFIRE ASSESSMENT CONSIDERATIONS.....	18
2.2.1 PLANNED ONSITE VEGETATION LANDSCAPING	18
2.2.2 PLANNED / POTENTIAL OFFSITE REHABILITATION OR RE-VEGETATION.....	18
2.2.3 IDENTIFIED REQUIREMENT TO MANAGE, MODIFY OR REMOVE ONSITE OR OFFSITE VEGETATION	19
2.2.4 VARIATIONS TO ASSESSED AREAS OF CLASSIFIED VEGETATION TO BE APPLIED.....	19
3 BUSHFIRE ATTACK LEVEL (BAL) ASSESSMENT.....	20
3.1 BAL ASSESSMENT SUMMARY (CONTOUR MAP FORMAT)	21
3.1.1 BAL DETERMINATION METHODOLOGY AND LOCATION OF DATA AND RESULTS	21
3.1.2 BAL RATINGS DERIVED FROM THE CONTOUR MAP	21
3.1.3 SITE ASSESSMENT DATA APPLIED TO CONSTRUCTION OF THE BAL CONTOUR MAP(S).....	22
3.1.4 CLASSIFIED VEGETATION AND TOPOGRAPHY MAP(S).....	25
3.1.5 BAL CONTOUR MAP(S).....	27
4 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES.....	28
5 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA (GUIDELINES V1.4).....	29
5.1 BUSHFIRE PROTECTION CRITERIA ELEMENTS APPLICABLE TO THE PROPOSED DEVELOPMENT/USE.....	29
5.2 LOCAL GOVERNMENT VARIATIONS TO APPLY	29
5.3 ASSESSMENT STATEMENTS FOR ELEMENT 1: LOCATION.....	30
5.4 ASSESSMENT STATEMENTS FOR ELEMENT 2: SITING AND DESIGN.....	31
5.5 ASSESSMENT STATEMENTS FOR ELEMENT 3: VEHICULAR ACCESS	34
5.6 ASSESSMENT STATEMENTS FOR ELEMENT 4: WATER.....	38
6.1 DEVELOPER / LANDOWNER RESPONSIBILITIES – PRIOR TO BUILDING AND OCCUPANCY / OPERATION	40
6.2 LANDOWNER / OCCUPIER RESPONSIBILITIES – ONGOING MANAGEMENT.....	42



6.3	LOCAL GOVERNMENT RESPONSIBILITIES – ONGOING MANAGEMENT.....	43
APPENDIX A: DETAILED BAL ASSESSMENT DATA AND SUPPORTING INFORMATION		44
A1:	BAL ASSESSMENT INPUTS COMMON TO THE METHOD 1 AND METHOD 2 PROCEDURES.....	44
A1.1:	FIRE DANGER INDICES (FDI/FDI/GFDI).....	44
A1.2:	VEGETATION ASSESSMENT AND CLASSIFICATION.....	44
A1.3:	EFFECTIVE SLOPE	54
A1.4:	SEPARATION DISTANCE.....	55
APPENDIX B: ADVICE - ONSITE VEGETATION MANAGEMENT - THE APZ.....		56
B1:	ASSET PROTECTION ZONE (APZ) DIMENSIONS.....	56
B1.1:	THE APZ DIMENSIONS REQUIRED TO BE IMPLEMENTED BY THE LANDOWNER	58
B2:	THE STANDARDS FOR THE APZ AS ESTABLISHED BY THE GUIDELINES (DPLH, V1.4).....	59
B3:	THE STANDARDS FOR THE APZ AS ESTABLISHED BY THE LOCAL GOVERNMENT.....	61
B4:	VEGETATION AND AREAS EXCLUDED FROM CLASSIFICATION - ENSURE CONTINUED EXCLUSION	62
APPENDIX C: TECHNICAL REQUIREMENTS FOR VEHICULAR ACCESS		63
APPENDIX D: TECHNICAL REQUIREMENTS FOR FIREFIGHTING WATER SUPPLY		64
D1:	RETICULATED AREAS – HYDRANT SUPPLY	64
D2:	NON-RETICULATED AREAS – STATIC SUPPLY	65
ADDENDUM:		67

LIST OF FIGURES

Figure 1.1:	Proposed Development Plan.	6
Figure 1.2:	Proposed Development Map.....	7
Figure 1.3:	Location map (spatial context).	8
Figure 1.4:	Extract from Map of Bushfire Prone Areas (Office of Bushfire Risk Management, DFES)	10
Figure 2.1:	Land identified with known environmental, biodiversity and conservation values.....	14
Figure 3.1a:	Classified Vegetation and Topography Map – (Existing).....	25
Figure 3.1b:	Classified Vegetation and Topography Map – (Post Development).....	26
Figure 3.2a:	BAL Contour Map.....	27

SUMMARY STATEMENTS

THIS DOCUMENT – STATEMENT OF PURPOSE

The Bushfire Management Plan (BMP)

The BMP sets out the required package of bushfire protection measures to lessen the risks associated with a bushfire event. It establishes the responsibilities to implement and maintain these measures.

The BMP also identifies the potential for any negative impact on any environmental, biodiversity and conservation values that may result from the application of bushfire protection measures or that may limit their implementation.

Risks Associated with Bushfire Events

The relevant risks are the potential for loss of life, injury, or destroyed or damaged assets which results in personal loss and economic loss. For a given site, the level of that risk to persons and assets (the exposed elements) is a function of the potential threat levels generated by the bushfire hazard, and the level of exposure and vulnerability of the at risk elements to the threats.

Bushfire Protection Measures

The required package of protection measures is established by *State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7)*, its associated *Guidelines* and any other relevant guidelines or position statements published by the Department of Planning, Lands and Heritage. These measures are limited to those considered by the WA planning authorities as necessary to be addressed for the purpose of land use planning. They do not encompass all available bushfire protection measures as many are not directly relevant to the planning approval stage. For example:

- Protection measures to reduce the vulnerability of buildings to bushfire threats is primarily dealt with at the building application stage. They are implemented through the process of applying the Building Code of Australia (Volumes 1 and 2 of the national Construction Code) in accordance with WA building legislation and the application of construction requirements based on a building's level of exposure - determined as a Bushfire Attack Level (BAL) rating); or
- Protection measures to reduce the threat levels of consequential fire (ignited by bushfire and involving combustible materials surrounding and within buildings) and measures to reduce the exposure and vulnerability of elements at risk exposed to consequential fire, are not specifically considered.

The package of required bushfire protection measures established by the Guidelines includes:

- The requirements of the bushfire protection criteria which consist of:
 - Element 1: Location (addresses threat levels).
 - Element 2: Siting and Design of Development (addresses exposure levels of buildings).
 - Element 3: Vehicular Access (addresses exposure and vulnerability levels of persons).
 - Element 4: Water (addresses vulnerability levels of buildings).
 - Element 5: Vulnerable Tourism Land Uses (addresses exposure and vulnerability as per Elements 1-4 but in use specific ways and with additional considerations of persons exposure and vulnerability).
- The requirement to develop Bushfire Emergency Plans / Information for 'vulnerable' land uses for persons to prepare, respond and recover from a bushfire event (this addresses vulnerability levels).
- The requirement to assess bushfire risk and incorporate relevant protection measures into the site emergency plans for 'high risk' land uses (this addresses threat, exposure and vulnerability levels).

Compliance of the Proposed Development or Use with SPP 3.7 Requirements

The BMP assesses the capacity of the proposed development or use to implement and maintain the required 'acceptable' solutions and any additionally recommended bushfire protection measures - or its capacity to satisfy the policy intent through the justified application of additional bushfire protection measures as supportable 'alternative' solutions.

THE PROPOSED DEVELOPMENT/USE – BUSHFIRE PLANNING COMPLIANCE SUMMARY		
Environmental Considerations		Assessment Outcome
Will land with identified environmental, biodiversity and conservation values limit the full application of the required bushfire protection measures?		Unlikely (check)
Will land with identified environmental, biodiversity and conservation values need to be managed in the implementation and maintenance of the bushfire protection measures - but not limit their application?		Unlikely (check)
Required Bushfire Protection Measures		Assessment Outcome
The Acceptable Solutions of the Bushfire Protection Criteria (Guidelines)		
Element	The Acceptable Solutions	
1: Location	A1.1 Development location	Fully Compliant
2: Siting and Design of Development	A2.1 Asset Protection Zone (APZ)	Fully Compliant
3: Vehicular Access	A3.1 Public roads	Fully Compliant
	A3.2a Multiple access routes	Fully Compliant
	A3.2b Emergency access way	N/A
	A3.3 Through-roads	N/A
	A3.4a Perimeter roads	N/A
	A3.4b Fire service access route	N/A
	A3.5 Battle-axe legs	N/A
	A3.6 Private driveways	N/A
4: Water	A4.1 Identification of future water supply	Fully Compliant
	A4.2 Provision of water for firefighting purposes	Fully Compliant
Other 'Bushfire Planning' Documents to Be Produced		Required
This necessity for additional documents is determined by the proposed development/use type and the requirements established by SPP 3.7 and the associated Guidelines (as amended). They may be produced concurrently or subsequent to the BMP. Relevant actions will be identified within Section 6 'Responsibilities for Implementation of Bushfire Protection Measures.		
Bushfire Emergency Plan: An operational document presenting prevent, prepare, respond and recover procedures and associated actions. As necessary, supporting information to justify determinations is included.		
Bushfire Emergency Information (Poster): As a concise response information poster for certain vulnerable land uses.		
Bushfire Emergency Information (Content): As content for inclusion into the Site's Emergency Plan for certain high risk land uses:		

1 PROPOSAL DETAILS AND THE BUSHFIRE MANAGEMENT PLAN

1.1 The Proposed Development/Use Details, Plans and Maps

The Proposal's Planning Stage For which certain bushfire planning documents are required to accompany the planning application.		Development Application
The Subject Land/Site		Lot 201 (169) Doley Road, Byford
Total Area of Subject Lot/Site		8626m ²
Number of Additional Lots Created		N/A
Primary Proposed Construction	Type(s)	New Building(s)
	NCC Classification	Class 3 & 5 (Fire Station Administration and Sleeping Accommodation)
The 'Specific' Land Use Type for Bushfire Planning When applicable, this classification establishes a requirement to conduct assessments and develop documents that are additional to this Bushfire Management Plan.		N/A
Description of the Proposed Development/Use		
This Bushfire Management Plan is to accompany a development application for the construction of a new Career Fire and Rescue Service.		



NOTE
 1. READ ALL ARCHITECTURAL DRAWINGS IN CONJUNCTION WITH THE PROJECT SPECIFICATION AND CONJUNCTION WITH ALL SERVICES AND ENGINEERING DRAWINGS.
 2. REFER DRAWING A0.01 FOR GENERAL NOTES, SYMBOLS & ABBREVIATIONS LEGEND.

SITE LEGEND
 Existing survey item to be retained/demolished as noted (Demolition noted as per SK.12)
 Proposed building outline
 Proposed undercover area
 Proposed pavement outline
 Road widening

TRIM EXISTING VEGETATION REMAINING & TREES FROM ADJOINING PROPERTY & ROADWAYS

DATE	REVISION	No.
30/01/23	LOCKER AND WC NOS. UPDATED. DEPTH OF APPLIANCE BAYS REVISED. STORE/WORKSHOP/HOSE ROOM/BA ROOM REVISED. COMMS/STUDY/OFFICE REVISED.	I
23/01/23	SD REPORT	H
13/01/23	SD REPORT	F
11/01/23	SD REPORT	G
22/12/22	SD REPORT	E
13/12/22	NIL WIDENING AT YANDRA ST	D
9/12/22	FORWARD WORKS 50% DOCUMENTATION	C
2/12/22	SLIDING DOORS ADDED, ROAD WIDENING SHOWN	B

DOCUMENTED BY: **iredale pedersen hook architects**
 Perth | Suite 516 Murray Mews 328-331 Murray Street, WA 6000
 PO Box 442 Leederville 6003 | 08 9322 9750 | 08 9322 9752
 www.iredalepedersenhook.com | email@iredalepedersenhook.com



ARCHITECTURAL
CARDUP CFRS STATION
 LOT 169 DOLEY ROAD, BYFORD WA 6122
 PROPOSED SITE PLAN

DRAWN	IPH	DESIGNED	IPH	REDUCED	
CHECKED	IPH	PRINCIPAL		0	25
APPROVED	IPH	ADRIAN IREDALE			
SCALE	As indicated @ A1	DATE	23/01/23	DRAWING No.	REV
DP PROJ	DOFXXX	DP FILE	FINW0305922	SK.11	I
DP PROJ No.	2211				

THIS IS A CADD DRAWING. DO NOT AMEND MANUALLY. 31/01/2023 2:06:05 PM












1 SITE PLAN
 SK.31 1 : 200

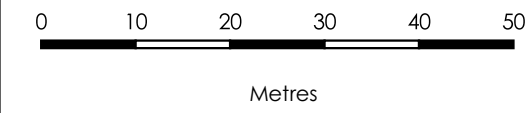
Figure 1.2

Proposed Development Map

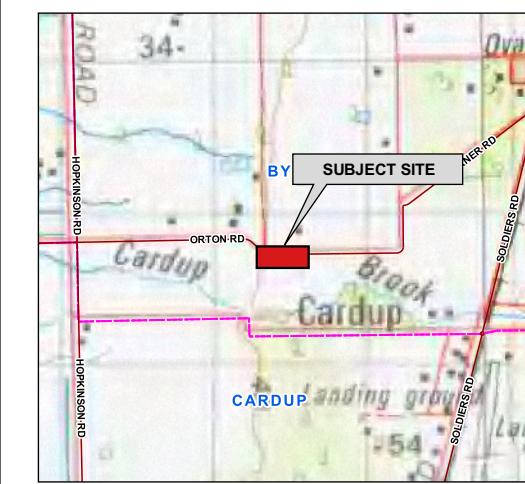
Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

----- LEGEND -----

-  Cadastre
-  Potential Fire/Water Service Connection
-  Subject Site
- Proposal**
-  Cardup CFRS
-  Under Cover Parking
-  Training Pad
-  Water Tank
-  Parking/Hardstand Areas
-  FootPath - Per Landscape Plan
-  Landscaping
-  BAL Setback Line - Per Landscape Plan



----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 09-02-2023
 SCALE (A3): 1 : 800
BUSHFIRE PRONE PLANNING
 Ordinary Council Meeting - 15 May 2023



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

Figure 1.3

Location Plan

Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

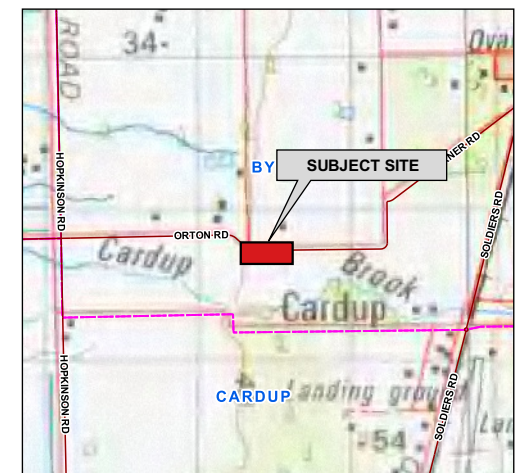
----- LEGEND -----

- Subject Site
- Local Government Authority
- Localities/Suburb
- Reserves
- DFES Stations (DFES-023)**
- Bush Fire Brigade
- DBCA Legislated Lands & Waters**
- Crown Freehold - Dept Managed
- Nature Reserve
- State Forest
- DBCA Lands of Interest (DBCA-012)**
- Crown Freehold
- Crown Reserve
- Unallocated Crown Land



Metres

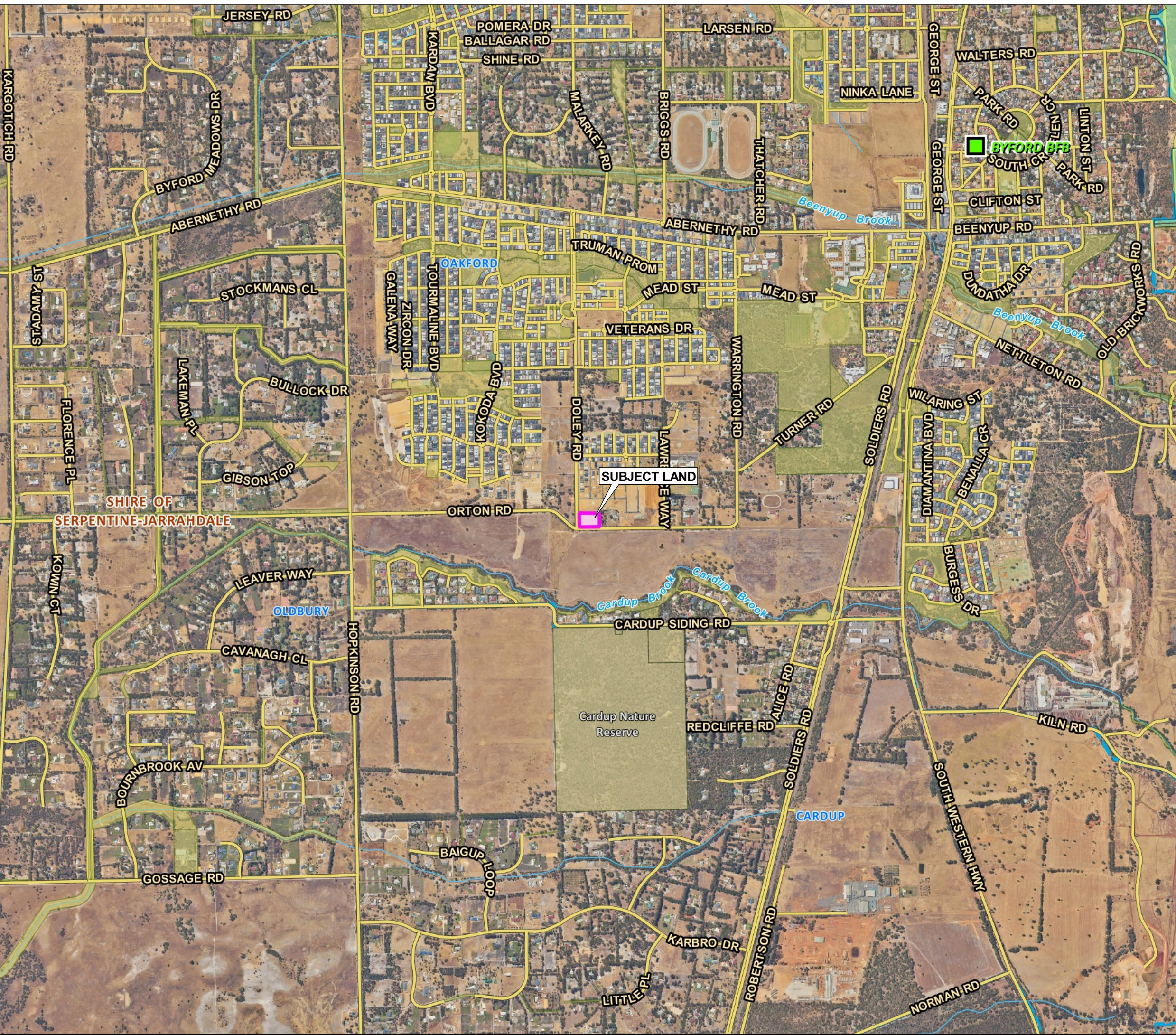
----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 23-01-2023
 SCALE (A3): 1 : 20000



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.



WHERE SPP 3.7 AND THE GUIDELINES ARE TO APPLY – DESIGNATED BUSHFIRE PRONE AREAS

All higher order strategic planning documents, strategic planning proposals, subdivisions and development applications located in designated bushfire prone areas need to address SPP 3.7 and its supporting Guidelines. This also applies where an area is not yet designated as bushfire prone but is proposed to be developed in a way that introduces a bushfire hazard.

For development applications where only part of a lot is designated as bushfire prone and the proposed development footprint is wholly outside of the designated area, the development application will not need to address SPP 3.7 or the Guidelines. (Guidelines DPLH 2021 v1.4, s1.2).

For subdivision applications, if all the proposed lots have a BAL-LOW indicated, a BMP is not required. (Guidelines DPLH 2021 v1.4, s5.3.1).

Figure 1.4

Bushfire Prone Areas

Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

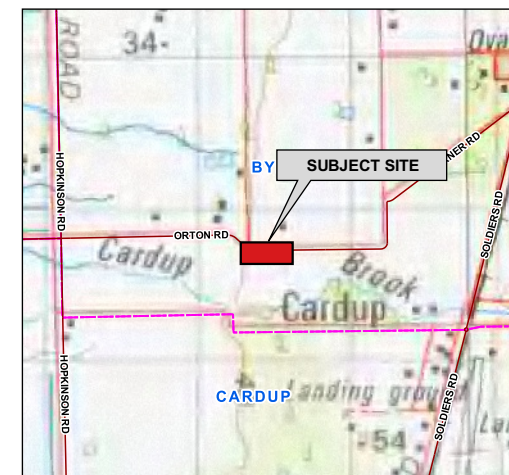
----- LEGEND -----

- Bushfire Prone Areas
 - Local Government Authority
 - Localities/Suburb
 - Cadastre
 - Potential Fire/Water Service Connection
 - Subject Site
- Proposal**
- Cardup CFRS
 - Under Cover Parking
 - Training Pad
 - Water Tank
 - Parking/Hardstand Areas
 - FootPath - Per Landscape Plan
 - Landscaping
 - BAL Setback Line - Per Landscape Plan



Metres

----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 09-02-2023
 SCALE (A3): 1 : 800



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

1.2 The Bushfire Management Plan (BMP)

1.2.1 Commissioning and Purpose

Landowner / proponent:	Department of Finance
Bushfire Prone Planning commissioned to produce the BMP by:	Tania Perrella – Iredale Pedersen Hook Architects
Purpose of the BMP:	To assess the proposal's ability to meet all relevant requirements established by State Planning Policy 3.7: Planning in Bushfire Prone Areas (SPP 3.7), the associated 'Guidelines and any relevant Position Statements; and To satisfy the requirement for the provision of a Bushfire Management Plan to accompany the development application.
BMP to be submitted to:	Shire of Serpentine-Jarrahdale

1.2.1 Other Documents with Implications for Development of this BMP

This section identifies any known assessments, reports or plans that have been conducted and prepared previously, or are being prepared concurrently, and are relevant to the planned proposal for the subject. They potentially have implications for the assessment of bushfire threats and the identification and implementation of the protection measures that are established by this Bushfire Management Plan.

Table 1.4: Other relevant documents that may influence threat assessments and development of protection measures.

RELEVANT DOCUMENTS					
Document	Relevant	Currently Exists	To Be Developed	Copy Provided by Proponent / Developer	Title
Structure Plan	No	N/A	N/A	N/A	-
Bushfire Management Plan	Yes	No	Yes	N/A	-
Bushfire Emergency Plan or Information	No	N/A	N/A	N/A	-
Bushfire Risk Assessment and Management Report	No	N/A	N/A	N/A	-
Environmental Asset or Vegetation Survey	Possible	Unaware	Possible	N/A	-
Landscaping and Revegetation Plan	Yes	Yes	Yes	Yes	Cardup Career Fire Station – Department of Fire and Emergency Services – Landscape Plan – Prepared by EPCAD Pty Ltd

Implications for the BMP: An approved Landscape Management Plan should be provided to demonstrate that the landowner/proponent responsible for the on-going management has an obligation to undertake mitigation works and the approving decision maker (i.e. local government and / or Department of Biodiversity, Conservation and Attractions) support the vegetation classification and management treatments assigned to the subject area.



Note - Where any Landscaping or Revegetation areas are scheduled to occur as a result of ongoing development within the site, consideration must be given as to not increase the bushfire risk and does not alter the indicative BAL ratings indicated in this plan.

Land Management Agreement	No	No	N/A	N/A	-
---------------------------	----	----	-----	-----	---

2 BUSHFIRE PRONE VEGETATION – ENVIRONMENTAL & ASSESSMENT CONSIDERATIONS

2.1 Environmental Considerations – ‘Desktop’ Assessment

This ‘desktop’ assessment must not be considered as a replacement for a full Environmental Impact Assessment. It is a summary of potential environmental values at the subject site, inferred from information contained in listed datasets and/or reports, which are only current to the date of last modification.

These data sources must be considered indicative where the subject site has not previously received a site-specific environmental assessment by an appropriate professional.

Many bushfire prone areas also have high biodiversity values. Consideration of environmental priorities within the boundaries of the land being developed can avoid excessive or unnecessary modification or clearing of vegetation. Approval processes (and exemptions) apply at both Commonwealth and State levels.

Any ‘modification’ or ‘clearing’ of vegetation to reduce bushfire risk is considered ‘clearing’ under the **Environmental Protection Act 1986** (EP Act) and requires a clearing permit under the **Environmental Protection (Clearing of Native Vegetation) Regulations 2004** (Clearing Regulations) – unless for an exempt purpose.

Clearing native vegetation is an offence, unless done under a clearing permit or the clearing is for an exempt purpose. Exemptions are contained in the EP Act or are prescribed in the Clearing Regulations (note: these do not apply in environmentally sensitive areas).

The **Department of Water and Environmental Regulation** (DWER) is responsible for issuing ‘clearing’ permits and the framework for the regulation of clearing. Approvals under other legislation, from other agencies, may also be required, dependent on the type of flora or fauna present.

Local Planning Policy or Local Biodiversity Strategy: Natural areas that are not protected by the above Act and Regulation (or any other National or State Acts) may be protected by a local planning policy or local biodiversity strategy. Permission from the local government will be required for any modification or removal of native vegetation in these Local Natural Areas (LNA's). Refer to the relevant local government for detail.

For further Information refer to Guidelines v1.4, the Bushfire and Vegetation Factsheet - WAPC, Dec 2021 and <https://www.der.wa.gov.au/our-work/clearing-permits>

Figure 2.1

Environmental Considerations

Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

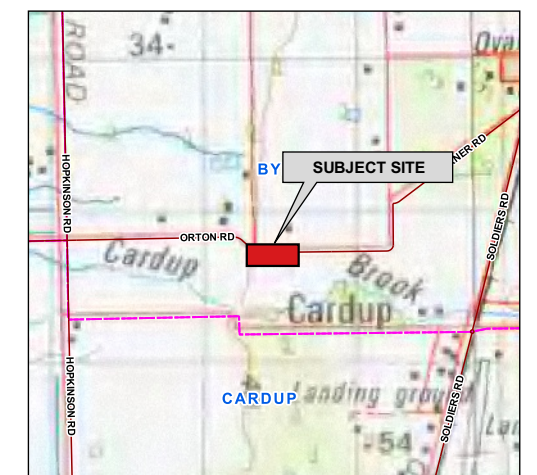
----- LEGEND -----

- Subject Site
- Reserves
- Bush Forever Sites
- Clearing Regulations
- Environmentally Sensitive Areas**
- Declared Rare Fauna
- Threatened Ecological Community
- Declared Rare Flora
- Geomorphic Wetlands Swan Coastal Plain**
- Creek
- Dampland
- Dryland
- Palusplain
- Sumpland



Metres

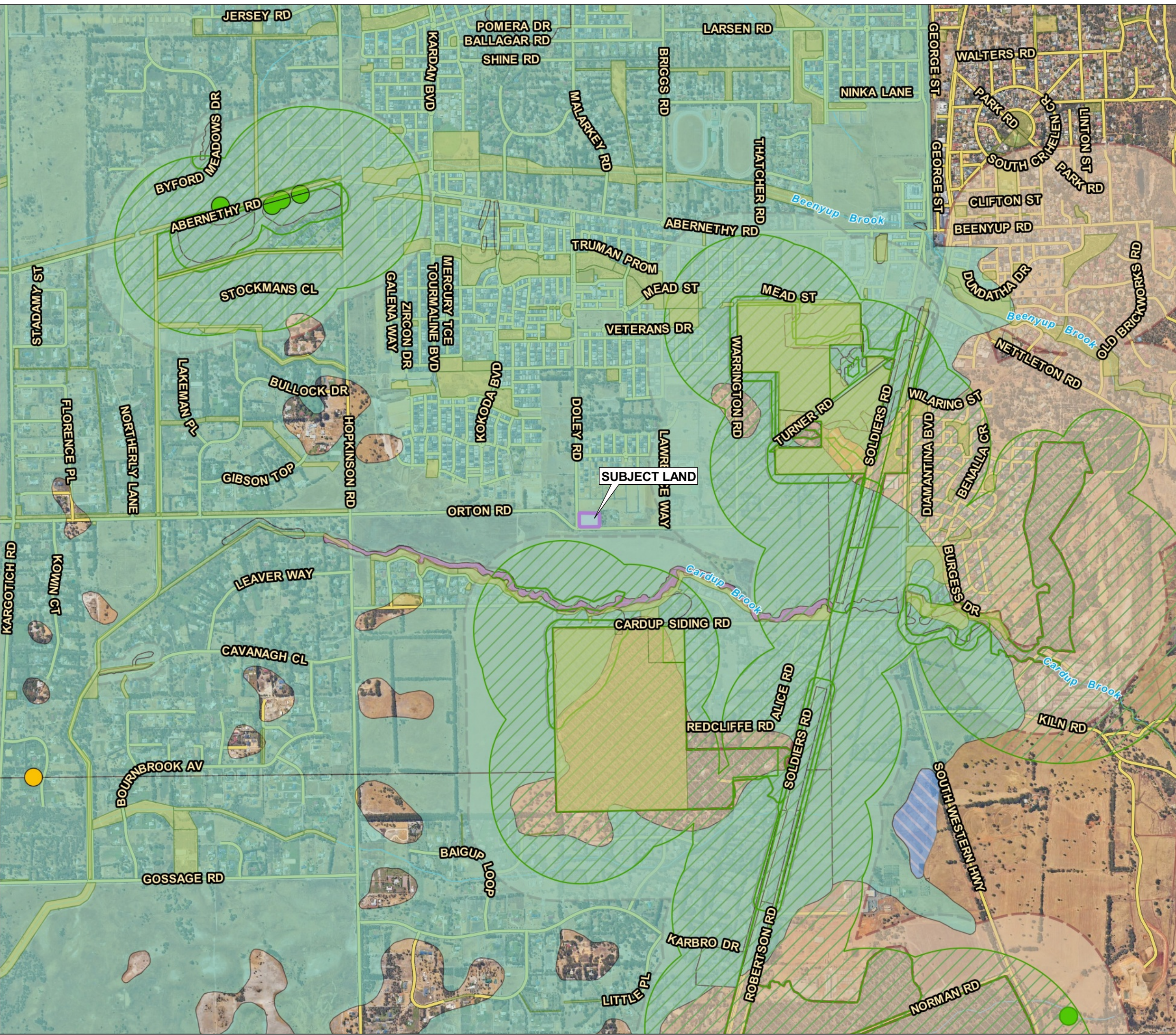
----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 23-01-2023
 SCALE (A3): 1 : 20000



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

2.1.1 Declared Environmentally Sensitive Areas (ESA)

IDENTIFICATION OF RELEVANT ENVIRONMENTALLY SENSITIVE AREAS							
ESA Class	Relevant to Proposal	Influence on Bushfire Threat Levels and / or Application of Bushfire Protection Measures	Relevant Dataset	Information Source(s) Applied to Identification of Relevant Vegetation			Further Action Required
				Dataset	Landowner or Developer	Environmental Asset or Vegetation Survey	
Wetlands and their 50m Buffer (Ramsar, conservation category and nationally important)	No	N/A	DBCA-010 and 011, 019, 040, 043, 044	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None
Bush Forever	No	N/A	DPLH-022, SPP 2.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None
Threatened and Priority Flora + 50m Continuous Buffer	No	N/A	DBCA-036	Restricted Scale of Data Available (security)	<input type="checkbox"/>	<input type="checkbox"/>	None
Threatened Ecological Community	No	N/A	DBCA-038		<input type="checkbox"/>	<input type="checkbox"/>	None
Heritage Areas National / World	No	N/A	Relevant register or mapping	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None

2.1.2 Other Protected Vegetation on Public Land

IDENTIFICATION OF PROTECTED VEGETATION ON PUBLIC LAND							
Land with Environmental, Biodiversity, Conservation and Social Values	Relevant to Proposal	Influence on Bushfire Threat Levels and / or Application of Bushfire Protection Measures	Relevant Dataset	Information Source(s) Applied to Identification of Relevant Vegetation			Further Action Required
				Dataset	Landowner or Developer	Environmental Asset or Vegetation Survey	
Legislated Lands (tenure includes national park/reserve, conservation park, crown reserve and state forest)	No	N/A	DBCA-011	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None
Conservation Covenants	Unknown	Unlikely	DPIRD-023	Only Available to Govt.	<input type="checkbox"/>	<input type="checkbox"/>	None
National World Heritage Areas	No	N/A	-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A

2.1.3 Response of Proposed Development to Identified Environmental Limitations

Consideration of the implications that identified protected areas of vegetation (i.e., those with environmental and subject to conservation) have for the proposed development.

PROPOSED DEVELOPMENT RESPONSE TO IDENTIFIED 'PROTECTED' VEGETATION	
The existence of 'protected' areas of vegetation has implications for the ability of the proposed development to reduce potential bushfire impact through modification or removal of vegetation.	No
Application of Design and/or Construction Responses to Limit Vegetation Modification or Removal	
Modify the development location to reduce exposure by increasing separation distance.	N/A
Comments: Not Applicable	
Redesign development, structure plan or subdivision.	N/A
Comments: Not Applicable	
Reduction of lot yield where this can increase available separation distances.	N/A
Comments: Not Applicable	
Cluster development to limit modification or removal of vegetation.	N/A
Comments: Not Applicable	
Construct building(s) to the requirements corresponding to higher BAL ratings to reduce required separation distances.	N/A
Comments: Not Applicable.	

2.2 Bushfire Assessment Considerations

2.2.1 Planned Onsite Vegetation Landscaping

Identification of areas of the subject site planned to be landscaped, creating the potential for increased or decreased bushfire hazard for proposed development.

PLANNED LANDSCAPING	
Relevant to Proposal:	Yes
<p>Refer to Addendum Contained within this Report - Plan suggests a potential introduction of a bushfire hazard. It is assumed for the purposes of assessment that this area will not receive maintenance to achieve s2.2.3.2 requirements of AS3959-2018. As such, area classified as a precautionary measure.</p> <p>Note - An approved Landscape Management Plan should be provided to demonstrate that the landowner/proponent responsible for the on-going management has an obligation to undertake mitigation works and the approving decision maker (i.e. local government and / or Department of Biodiversity, Conservation and Attractions) support the vegetation classification and management treatments assigned to the subject area.</p> <p>Note - Where any Landscaping or Revegetation areas are scheduled to occur as a result of ongoing development within the site, consideration must be given as to not increase the bushfire risk and does not alter the indicative BAL ratings indicated in this plan.</p>	

2.2.2 Planned / Potential Offsite Rehabilitation or Re-Vegetation

Identification of areas of land adjacent to the subject site on which re-vegetation (as distinct from natural re-generation) will or may occur and is likely to present a greater bushfire hazard for proposed development.

POTENTIAL RE-VEGETATION PROGRAMS		
Land with Environmental, Biodiversity, Conservation and Social Values	Relevant to Proposal	Description
Riparian Zones / Foreshore Areas	No	
Wetland Buffers	No	
Legislated Lands	No	
Public Open Space	No	
Road Verges	Possible	<p>An approved Landscape Management Plan should be provided to demonstrate that the landowner/proponent responsible for the on-going management has an obligation to undertake mitigation works and the approving decision maker (i.e. local government and / or Department of Biodiversity, Conservation and Attractions) support the vegetation classification and management treatments assigned to the subject area.</p> <p>Note - Where any Landscaping or Revegetation areas are scheduled to occur as a result of ongoing development within the site, consideration must be given as to not increase the bushfire risk and does not alter the indicative BAL ratings indicated in this plan.</p>
Other	Possible	As above

2.2.3 Identified Requirement to Manage, Modify or Remove Onsite or Offsite Vegetation

Identification of native vegetation subject to management, modification or removal.

REQUIREMENT TO MANAGE, MODIFY OR REMOVE NATIVE VEGETATION	
Has a requirement been identified to manage, modify or remove onsite native vegetation to establish the required bushfire protection measures on the subject site?	No
Is approval, from relevant state government agencies and/or the local government, to modify or remove onsite native vegetation required? (Note: if 'Yes' evidence of its existence should be provided in this BMP).	No
Has a requirement been identified to manage, modify or remove offsite native vegetation to establish the required bushfire protection measures on the subject site?	No
Is written approval required, from relevant state government agencies and/or the local government, that permits the landowner, or another identified party, to modify or remove offsite bushfire prone vegetation and/or conduct other works, to establish an identified bushfire protection measure(s)? If 'Yes', appropriate evidence of the approval or how it is to be established, shall be provided in this BMP as an addendum.	No
Is a written management agreement required that states the obligation of the landowner, or another responsible party, to manage defined areas of offsite bushfire prone vegetation, in perpetuity, to ensure the conditions of no fire fuels and/or low threat vegetation and/or vegetation managed in a minimal fuel condition, continue to be met? If 'Yes', appropriate evidence of the agreement or how it is to be established, shall be provided in this BMP as an addendum.	No

2.2.4 Variations to Assessed Areas of Classified Vegetation to be Applied

FOR THE PROPOSED DEVELOPMENT SITUATIONS TO BE ACCOUNTED FOR IN ASSESSING THE POTENTIAL BUSHFIRE IMPACT (BAL)	
Area(s) of land will be subject to future vegetation rehabilitation or re-vegetation that will require a change to a higher threat classification of vegetation on that land to. (Note: this is not regeneration to the mature natural state which is accounted for in the 'existing state' assessment in accordance with AS 3959:2018).	Yes
Refer to Addendum Contained within this Report - Plan suggests a potential introduction of a bushfire hazard. It is assumed for the purposes of assessment that this area will not receive maintenance to achieve s2.2.3.2 requirements of AS3959-2018. As such, area classified as a precautionary measure.	
Modification of existing area(s) of classified vegetation due to the implementation of the proposed development and/or prior to the site's occupancy or use. This modification will require a change to a lower threat classification (or exclusion from classification) for that area of vegetation.	No
Complete removal of existing area(s) of classified vegetation due to the implementation of the proposed development and/or prior to the site's occupancy or use. This modification will require an exclusion from classification for that area of vegetation.	No

3 BUSHFIRE ATTACK LEVEL (BAL) ASSESSMENT

BUSHFIRE ATTACK LEVELS (BAL) - UNDERSTANDING THE RESULTS

The potential transfer (flux/flow) of radiant heat from the bushfire to a receiving object is measured in kW/m². The AS 3959:2018 BAL determination methodology establishes the ranges of radiant heat flux that correspond to each bushfire attack level. These are identified as BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ.

The bushfire performance requirements for certain classes of buildings are established by the Building Code of Australia (Vol. 1 & 2 of the NCC). The BAL will establish the bushfire resistant construction requirements that are to apply in accordance with AS 3959:2018 - *Construction of buildings in bushfire prone areas* and the NASH Standard – *Steel framed construction in bushfire areas (NS 300 2021)*, whose solutions are deemed to satisfy the NCC bushfire performance requirements.

DETERMINED BAL RATINGS

A BAL Certificate can be issued for a determined BAL. A BAL can only be classed as 'determined' for an existing or future building/structure when:

1. It's final design and position on the lot are known and the stated separation distance from classified bushfire prone vegetation exists and can justifiably be expected to remain in perpetuity; or
2. It will always remain subject to the same BAL regardless of its design or position on the lot after accounting for any regulatory or enforceable building setbacks from lot boundaries as relevant and necessary (e.g., R-codes, restrictive covenants, defined building envelopes) or the retention of any existing classified vegetation either onsite or offsite.

If the BMP derives determined BAL(s), the BAL Certificate(s) required for submission with building applications can be provided, using the BMP as the assessment evidence.

INDICATIVE BAL RATINGS

A BAL Certificate cannot be issued for an indicative BAL. A BAL will be classed as 'indicative' for an existing or future building/structure when the required conditions to derive a determined BAL are not met.

This class of BAL rating indicates what BAL(s) could be achieved and the conditions that need to be met are stated.

Converting the indicative BAL into a determined BAL is conditional upon the currently unconfirmed variable(s) being confirmed by a subsequent assessment and evidential documentation. These variables will include the future building(s) location(s) being established (or changed) and/or classified vegetation being modified or removed to establish the necessary vegetation separation distance. This may also be dependent on receiving approval from the relevant authority for that modification/removal.

BAL RATING APPLICATION – PLANNING APPROVAL VERSUS BUILDING APPROVAL

1. **Planning Approval:** SPP.3.7 establishes that where BAL- LOW to BAL-29 will apply to relevant future construction (or existing structures for proposed uses), the proposed development may be considered for approval (dependent on the other requirements of the relevant policy measures being met). That is, BAL40 or BAL-FZ are not acceptable on planning grounds (except for certain limited exceptions).

Because planning is looking forward at what can be achieved, as well as looking at what may currently exist, both determined and indicative BAL ratings are acceptable assessment outcomes on which planning decisions can be made (including conditional approvals).

2. **Building Approval:** The Building Code of Australia (Vol. 1 & 2 of the NCC) establishes that relevant buildings in bushfire prone areas must be constructed to the bushfire resistant requirements corresponding to the BAL rating that is to apply to that building. Consequently, a determined BAL rating and the BAL Certificate is required for a building permit to be issued - an indicative BAL rating is not acceptable.

3.1 BAL Assessment Summary (Contour Map Format)

INTERPRETATION OF THE BAL CONTOUR MAP

The BAL contour map is a diagrammatic representation of the results of the bushfire attack level assessment.

The map presents different coloured contours extending out from the areas of classified vegetation. Each contour represents a set range of radiant heat flux that potentially will transfer to an exposed element (building, person or other defined element), when it is located within that contour.

Each of the set ranges of radiant heat flux corresponds to a different BAL rating as defined by the AS 3959:2018 BAL determination methodology.

The width of each shaded BAL contour will vary dependant on both the BAL rating and the relevant parameters (calculation inputs) for the subject site. Their width represents the minimum and maximum vegetation separation distances that correspond to each BAL rating (refer to the relevant table below for these distances).

The areas of classified vegetation to be considered in developing the BAL contours, are those that will remain at the intended end state of the subject development once earthworks, clearing and/or landscaping and re-vegetation have been completed. Variations to this statement that may apply include:

- Both pre and post development BAL contour maps are produced; and/or
- Each stage of a development is assessed independently.

3.1.1 BAL Determination Methodology and Location of Data and Results

LOCATION OF DATA & RESULTS					
BAL Determination Methodology		Location of the Site Assessment Data			Location of the Results
AS 3959:2018	Applied to Assessment	Classified Vegetation and Topography Map(s)	Calculation Input Variables		Assessed Bushfire Attack Levels and/or Radiant Heat Levels
			Summary Data	Detailed Data with Explanatory and Supporting Information	
Method 1 (Simplified)	Yes	Figures 3.1a & 3.1b	Table 3.2	Appendix A1	Table 3.1 Table 3.3 / BAL Contour Map
Method 2 (Detailed)	No	N/A	N/A	N/A	

3.1.2 BAL Ratings Derived from the Contour Map

Table 3.1: Indicative and determined BAL(s) for existing and/or proposed building works.

BUSHFIRE ATTACK LEVEL FOR EXISTING/PLANNED BUILDINGS/STRUCTURE ¹		
Building/Structure Description	Indicative BAL ²	Determined BAL ²
Proposed Career Fire & Rescue Service	BAL-12.5	N/A

¹ The assessment data used to derive the BAL ratings is sourced from Table 2.4 and Figure 3.
² Refer to the start of Section 3 for an explanation of indicative versus determined BAL ratings.

3.1.3 Site Assessment Data Applied to Construction of the BAL Contour Map(s)

RELEVANT CLASSIFIED VEGETATION	
Identification of Classified Vegetation that is Relevant to the Production of the BAL Contour Map(s)	Relevant Map
All identified areas of classified vegetation that exist at the time of the site assessment – both within the subject site (onsite) and external to the subject site (offsite) will be the relevant vegetation.	Figure 3.1a
<p>With the exception of vegetation classified as a precautionary measures resulting from landscaping or re-vegetation that is unlikely to receive management to achieve s2.2.3.2 requirements of AS3959-2018, all identified classified vegetation areas, or portions of areas, within the subject lot are excluded. It is the classified vegetation external to the lot boundaries that is the relevant vegetation.</p> <p>This approach is applied to indicate the achievable bushfire attack levels within the specified lot and the resultant area of developable land where buildings will be subject to BAL-29 or less. It is based on the following assumptions:</p> <ol style="list-style-type: none"> 1. Any classified vegetation within a lot can potentially be managed or removed by the landowner to meet asset protection zone standards; and 2. Future development and consequent removal/management of vegetation that may take place on any adjoining lot cannot be part of considerations for the subject lot. 	Figure 3.1b
The areas of classified vegetation that will remain at the intended end state of the subject development once earthworks, any clearing and/or landscaping and re-vegetation have been completed, will be the relevant vegetation for the post-development BAL contour map.	Figure No. 3.2a
<p>Supporting Assessment Details: None Required.</p>	

Table 3.2: The calculation inputs applied to determining the site specific separation distances corresponding to levels of potential radiant heat transfer (including BAL's).

SUMMARY OF CALCULATION INPUT VARIABLES APPLIED TO THE DETERMINATION OF SEPARATION DISTANCES CORRESPONDING TO RADIANT HEAT LEVELS ¹												
Applied BAL Determination Method		METHOD 1 - SIMPLIFIED PROCEDURE (AS 3959:2018 CLAUSE 2.2)										
The Calculation Variables Corresponding to the BAL Determination Method Applied												
Methods 1 and 2		Method 1			Method 2							
Vegetation Classification		FDI	Effective Slope		Site Slope	FFDI or GFDI	Flame Temp.	Elevation of Receiver	Flame Width	Fireline Intensity	Flame Length	Modified View Factor
			Applied Range	Measured								
Area	Class		degree range	degrees	degrees		K	metres	metres	kW/m	metres	% Reduction
1	Excluded cl 2.2.3.2(e & f)	N/A	N/A	N/A								
2	(G) Grassland	80	Upslope or flat 0	flat 0								
3	(A) Forest	80	Upslope or flat 0	flat 0								
4	(G) Grassland	80	Upslope or flat 0	flat 0								
5	(A) Forest	80	Upslope or flat 0	flat 0								
6	(G) Grassland	80	Upslope or flat 0	flat 0								

¹ All data and information supporting the determination of the classifications and values stated in this table and any associated justification, is presented in Appendix A. Where the values are stated as 'default' these are either the values stated in AS 3959:2018, Table B1 or the values calculated as intermediate or final outputs through application of the equations of the AS 3959:2018 BAL determination methodology. They are not values derived by the assessor.

Table 3.3: Vegetation separation distances corresponding to the radiant heat levels illustrated as BAL contours in Figure 3.2a.

THE CALCULATED VEGETATION SEPARATION DISTANCES CORRESPONDING TO THE STATED LEVEL OF RADIANT HEAT ¹									
Vegetation Classification		Separation Distances Corresponding to Stated Level of Radiant Heat (metres)							
		Bushfire Attack Level						Maximum Radiant Heat Flux	
Area	Class	BAL-FZ	BAL-40	BAL-29	BAL-19	BAL12.5	BAL-LOW	10 kW/m ²	2 kW/m ²
1	Excluded cl 2.2.3.2(e & f)	N/A	N/A	N/A	N/A	N/A	N/A		
*1	(C) Shrubland	<7	7-<9	9-<13	13-<19	19-<100	>100		
2	(G) Grassland	<6	6-<8	8-<12	12-<17	17-<50	>50		
3	(A) Forest	<16	16-<21	21-<31	31-<42	42-<100	>100		
4	(G) Grassland	<6	6-<8	8-<12	12-<17	17-<50	>50		
5	(A) Forest	<16	16-<21	21-<31	31-<42	42-<100	>100		
6	(G) Grassland	<6	6-<8	8-<12	12-<17	17-<50	>50		

¹ All calculation input variables are presented in Table 2.3. The summary 'printouts' of calculation input and output values for each area of classified vegetation are presented in Appendix A.

²*1 indicates vegetation subject to changes post development of this site as a result of proposed landscaping works in some sections within this area. It is assumed for the purposes of assessment that this area (as identified in Figures 3.1b and 3.2a) will not receive maintenance to achieve s2.2.3.2 requirements of AS3959-2018. As such, area classified as a precautionary measure. Planting will result in sections being reclassified to Class C - Shrubland.

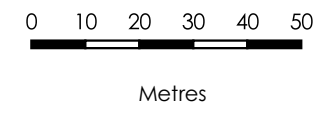
Figure 3.1a

Classified Vegetation & Topography Map - (Existing)

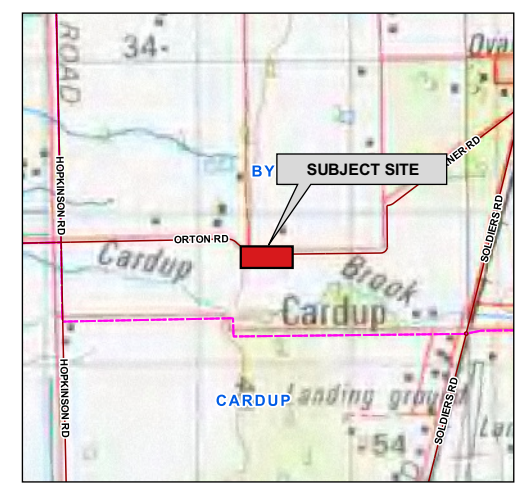
Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

----- LEGEND -----

- Photos
- Hydrants
- Potential Fire/Water Service Connection
- Elevation (m)
- Subject Site
- Proposal**
 - Cardup CFRS
 - Under Cover Parking
 - Training Pad
 - Water Tank
 - Parking/Hardstand Areas
 - FootPath - Per Landscape Plan
 - Landscaping
 - BAL Setback Line - Per Landscape Plan
- Assessment Area**
 - 150m Buffer
- Classified Vegetation**
 - Class A - Forest
 - Class G - Grassland
 - Exclusion 2.2.3.2



----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator Units: Metre
Map by: Sarina Gorman 09-02-2023
SCALE (A3): 1 : 1400



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

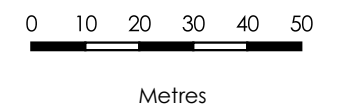
Figure 3.1b

Classified Vegetation & Topography Map - (Post Development)

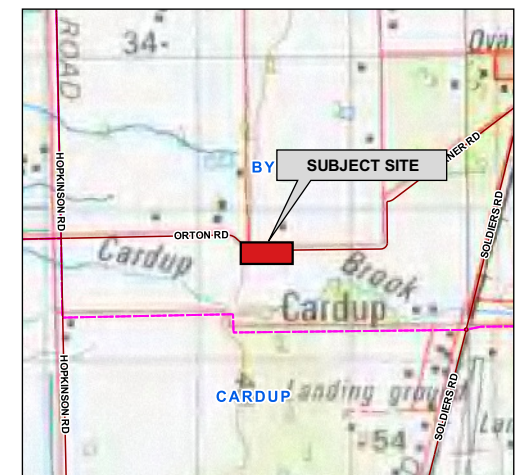
Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

----- LEGEND -----

- Photos
 - Hydrants
 - Potential Fire/Water Service Connection
 - Elevation (m)
 - Subject Site
- Proposal**
- Cardup CFRS
 - Under Cover Parking
 - Training Pad
 - Water Tank
 - Parking/Hardstand Areas
 - FootPath - Per Landscape Plan
 - Landscaping
 - BAL Setback Line - Per Landscape Plan
- Assessment Area**
- 150m Buffer
- Classified Vegetation**
- Class A - Forest
 - Class C - Shrubland
 - Class G - Grassland
 - Exclusion 2.2.3.2



----- LOCALITY -----



AERIAL IMAGERY: Landgate/SLIP

Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 09-02-2023
 SCALE (A3): 1 : 1400

Area of land subject to future Landscaping - Refer to Landscape Plan contained within this Report - Plan suggests a potential introduction of a bushfire hazard. It is assumed for the purposes of assessment that this area will not receive maintenance to achieve s2.2.3.2 requirements of AS3959-2018. As such, area classified as a precautionary measure.

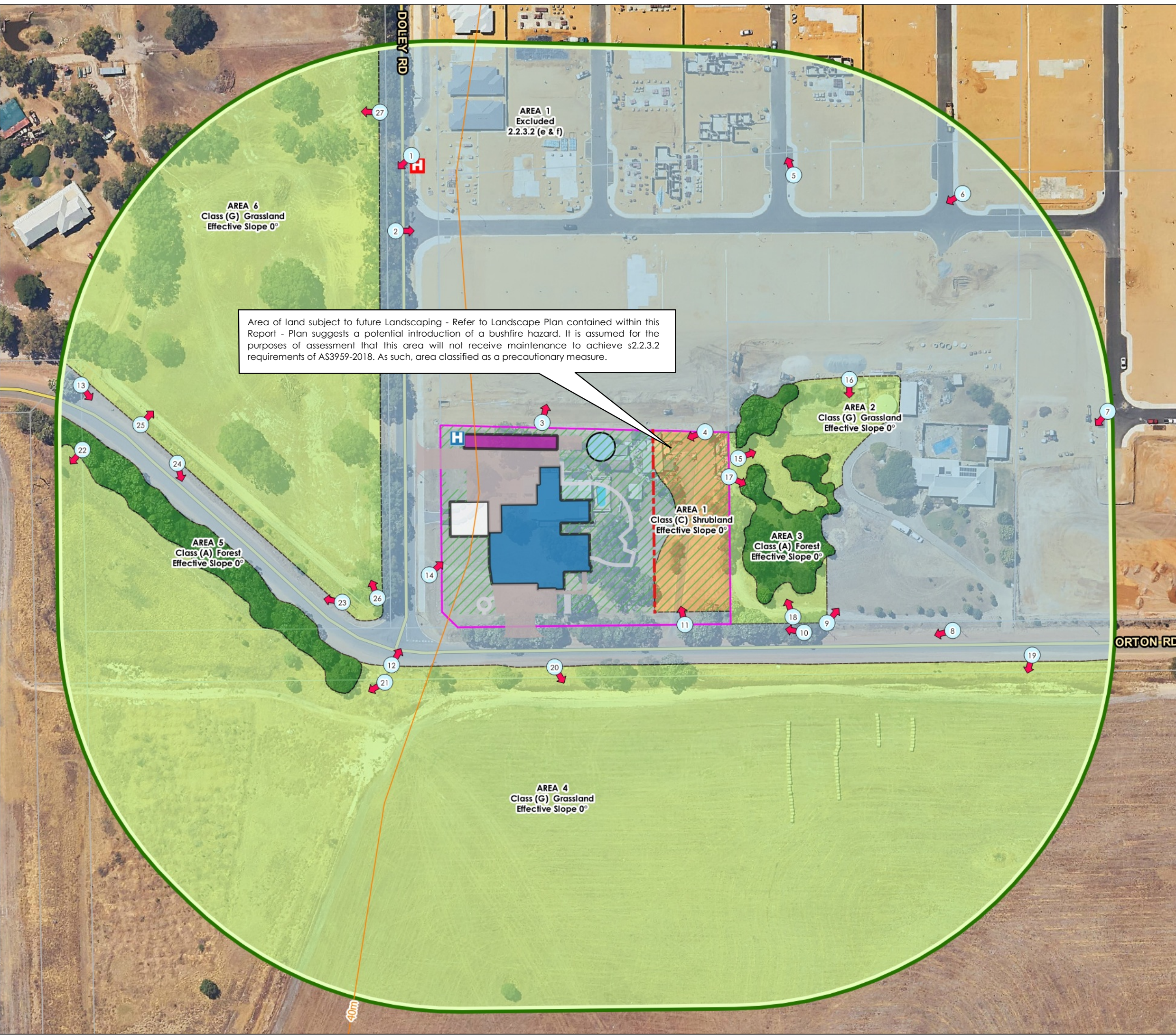


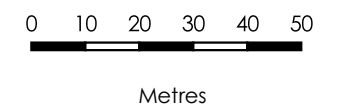
Figure 3.2a

BAL Contour Map - (Post Development)

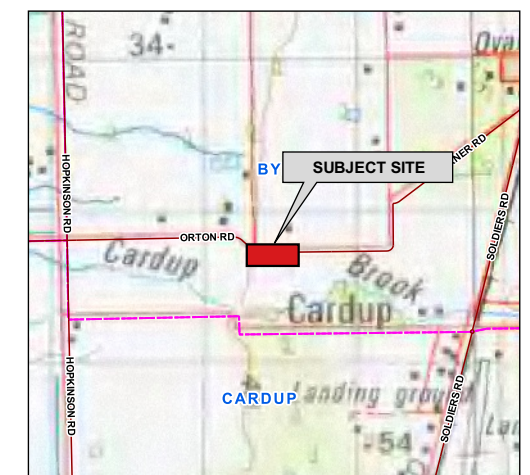
Lot 201 on Plan / Diagram: D094930
169 Doley Road
Byford
Shire of Serpentine-Jarrahdale

----- LEGEND -----

- Subject Site
- Proposal**
- Cardup CFRS
- Under Cover Parking
- Training Pad
- Water Tank
- Parking/Hardstand Areas
- FootPath - Per Landscape Plan
- Landscaping
- BAL Setback Line - Per Landscape Plan
- Assessment Area**
- 100m Buffer
- 150m Buffer
- Bushfire Attack Levels**
- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW



----- LOCALITY -----

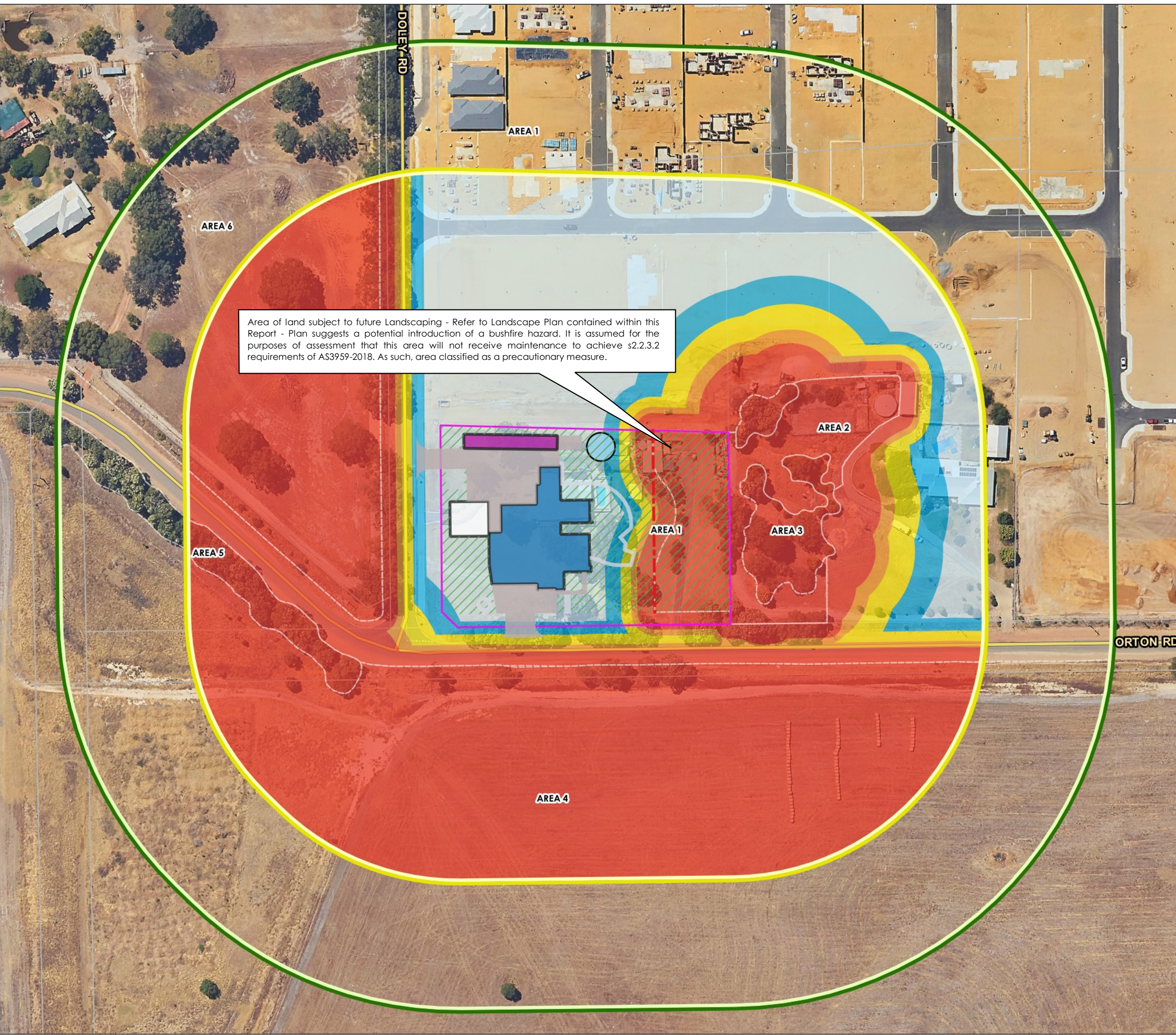


AERIAL IMAGERY: Landgate/SLIP



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator Units: Metre
 Map by: Sarina Gorman 09-02-2023
 SCALE (A3): 1 : 1400

Area of land subject to future Landscaping - Refer to Landscape Plan contained within this Report - Plan suggests a potential introduction of a bushfire hazard. It is assumed for the purposes of assessment that this area will not receive maintenance to achieve s2.2.3.2 requirements of AS3959-2018. As such, area classified as a precautionary measure.



4 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

The Guidelines for Planning in Bushfire Prone Areas (WAPC 2021 v1.4), Appendix 5, establish that the application of this section of the BMP is intended to support **strategic planning** proposals. At the strategic planning stage there will typically be insufficient proposed development detail to enable all required assessments, including the assessment against the bushfire protection criteria.

Strategic Planning Proposals

For strategic planning proposals this section of the BMP will identify:

- Issues associated with the level of the threats presented by any identified bushfire hazard;
- Issues associated with the ability to implement sufficient and effective bushfire protection measures to reduce the exposure and vulnerability levels (of elements exposed to the hazard threats), to a tolerable or acceptable level; and
- Issues that will need to be considered at subsequent planning stages.

All Other Planning Proposals

For all other planning stages, this BMP will address what are effectively the same relevant issues but do it within the following sections:

- Section 2 – Bushfire Prone Vegetation - Environmental and Assessment Considerations: Assess environmental, biodiversity and conservation values;
- Section 3 – Potential Bushfire Impact: Assess the bushfire threats with the focus on flame contact and radiant heat; and
- Section 5 – Assessment Against the Bushfire Protection Criteria (including the guidance provided by the *Position Statement: 'Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2'*): Assess the ability of the proposed development to apply the required bushfire protection measures thereby enabling it to be considered for planning approval for these factors.

Is the proposed development a strategic planning proposal?

No

5 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA (GUIDELINES V1.4)

5.1 Bushfire Protection Criteria Elements Applicable to the Proposed Development/Use

APPLICATION OF THE CRITERIA, ACCEPTABLE SOLUTIONS AND PERFORMANCE ASSESSMENT

The criteria are divided into five elements – location, siting and design, vehicular access, water and vulnerable tourism land uses. Each element has an intent outlining the desired outcome for the element and reflects identified planning and policy requirements in respect of each issue.

The example acceptable solutions (bushfire protection measures) provide one way of meeting the element's intent. Compliance with these automatically achieves the element's intent and provides a straightforward pathway for assessment and approval.

Where the acceptable solutions cannot be met, the ability to develop design responses (as alternative solutions that meet bushfire performance requirements) is an alternative pathway that is provided by addressing the applicable performance principles (as general statements of how best to achieve the intent of the element).

A merit based assessment is established by the SPP 3.7 and the Guidelines as an additional alternative pathway along with the ability of using discretion in making approval decisions (sections 2.5, 2.6 and 2.7). This is formally applied to certain development (minor and unavoidable – sections 5.4.1 and 5.7). Relevant decisions by the State Administrative Tribunal have also supported this approach more generally.

Elements 1 – 4 should be applied for all strategic planning proposals, subdivision or development applications, except for vulnerable tourism land uses which should refer to Element 5. Element 5 incorporates the bushfire protection criteria in Elements 1 – 4 but caters them specifically to tourism land uses. (Guidelines DPLH 2021v1.4)

The Bushfire Protection Criteria	Applicable to the Proposed Development/Use
Element 1: Location	Yes
Element 2: Siting and Design	Yes
Element 3: Vehicular Access	Yes
Element 4: Water	Yes
Element 5: Vulnerable Tourism Land Uses	No

5.2 Local Government Variations to Apply

Local governments may add to or modify the acceptable solutions to recognise special local or regional circumstances (e.g., topography / vegetation / climate). These are to be endorsed by both the WAPC and DFES before they can be considered in planning assessments. (Guidelines DPLH 2021v1.4).

Do endorsed regional or local variations to the acceptable solutions apply to the assessments against the Bushfire Protection Criteria for the proposed development /use?

None known or identified

5.3 Assessment Statements for Element 1: Location

LOCATION			
Element 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.		
Proposed Development/Use – Relevant Planning Stage	(Do) Development application other than for a single dwelling, ancillary dwelling or minor development		
Element Compliance Statement	The proposed development/use achieves the intent of this element by being fully compliant with all applicable acceptable solutions.		
Pathway Applied to Provide an Alternative Solution	N/A		
Acceptable Solutions - Assessment Statements			
All details of acceptable solution requirements are established in the Guidelines for Planning in Bushfire Prone Areas, DPLH v1.4 (Guidelines) and apply the guidance established by the Position Statement: 'Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design' (WAPC Nov 2019) and the 'Bushfire Management Plan Guidance for the Dampier Peninsula' (WA Department of Planning, Lands and Heritage, 2021 Rev B) as relevant. These documents are available at https://www.wa.gov.au/government/document-collections/state-planning-policy-37-planning-bushfire-prone-areas .			
Solution Component Check Box Legend	<input checked="" type="checkbox"/> Relevant & met	<input checked="" type="checkbox"/> Relevant & not met	<input type="checkbox"/> Not relevant
A1.1 Development location	Applicable:	Yes	Compliant: Yes
ASSESSMENT AGAINST THE REQUIREMENTS ESTABLISHED BY THE GUIDELINES			
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> The development application is located in an area that is or will, on completion, be subject to either a moderate or low bushfire hazard level, or BAL-29 or below.			
Supporting Assessment Details:			
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 requirements will not be required to be applied. This meets the requirements established by Acceptable Solution A1.1 and its associated explanatory note. In addition, the vegetation surrounding the proposed development can be classed as a moderate bushfire hazard level.			
ASSESSMENTS APPLYING THE GUIDANCE ESTABLISHED BY THE WAPC ELEMENT 1 & 2 POSITION STATEMENT (2019)			
<p>“Consideration should be given to the site context where ‘area’ is 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, including how a bushfire could affect the site and the conditions for a bushfire to occur within the site.”</p> <p>Strategic Planning Proposals: Consider the threat levels from any vegetation <u>adjoining</u> and <u>within</u> the subject site for which the potential intensity of a bushfire in that vegetation would result in it being classified as an Extreme Bushfire Hazard Level (BHL). Identify any proposed design strategies to reduce these threats.</p> <p>Structure Plans (lot layout known) and Subdivision Applications: As for strategic planning proposals but <u>within</u> the subject site the relevant threat levels to consider are the radiant heat levels represented by BAL-FZ and BAL-40 ratings.</p>			
The planning proposal is a development application, consequently the referenced position statement is not applicable to the Element 1 assessment.			

5.4 Assessment Statements for Element 2: Siting and Design

SITING AND DESIGN OF DEVELOPMENT					
Element Intent	To ensure that the siting and design of development minimises the level of bushfire impact. (BPP Note: not building/construction design)				
Proposed Development/Use – Relevant Planning Stage	(Do) Development application other than for a single dwelling, ancillary dwelling or minor development				
Element Compliance Statement	The proposed development/use achieves the intent of this element by being fully compliant with all applicable acceptable solutions.				
Pathway Applied to Provide an Alternative Solution	N/A				
Acceptable Solutions - Assessment Statements					
<p>All details of acceptable solution requirements are established in the Guidelines for Planning in Bushfire Prone Areas, DPLH v1.4 (Guidelines) and apply the guidance established by the Position Statement: 'Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design' (WAPC Nov 2019) and the 'Bushfire Management Plan Guidance for the Dampier Peninsula' (WA Department of Planning, Lands and Heritage, 2021 Rev B) as relevant. These documents are available at https://www.wa.gov.au/government/document-collections/state-planning-policy-37-planning-bushfire-prone-areas.</p>					
Solution Component Check Box Legend	<input checked="" type="checkbox"/> Relevant & met <input checked="" type="checkbox"/> Relevant & not met <input type="checkbox"/> Not relevant				
A2.1 Asset Protection Zone (APZ)	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Applicable:</td> <td style="width: 20%; text-align: center;">Yes</td> <td style="width: 30%;">Compliant:</td> <td style="text-align: center;">Yes</td> </tr> </table>	Applicable:	Yes	Compliant:	Yes
Applicable:	Yes	Compliant:	Yes		
APZ DIMENSIONS – DIFFERENCES IN REQUIREMENTS FOR PLANNING ASSESSMENTS COMPARED TO IMPLEMENTATION					
<p>A key required bushfire protection measure is to reduce the exposure of buildings/infrastructure (as exposed vulnerable elements at risk), to the direct bushfire threats of flame contact, radiant heat and embers and the indirect threat of consequential fires that result from the subsequent ignition of other combustible materials that may be constructed, stored or accumulate in the area surrounding these structures. This reduces the associated risks of damage or loss.</p> <p>This is achieved by separating buildings (and consequential fire fuels as necessary) from areas of classified bushfire prone vegetation. This area of separation surrounding buildings is identified as the Asset Protection Zone (APZ) and consists of no vegetation and/or low threat vegetation or vegetation continually managed to a minimal fuel condition. The required separation distances will vary according to the site specific conditions and local government requirements.</p> <p>The APZ dimensions stated and/or illustrated in this Report can vary dependent on the purpose for which they are being identified.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p><i>Note: Appendix B 'Onsite Vegetation Management' provides further information regarding the different APZ dimensions that can be referenced, their purpose and the specifications of the APZ that are to be established and maintained on the subject lot.</i></p> </div>					
THE 'PLANNING BAL-29' APZ DIMENSIONS					
<p>Purpose: To provide evidence of the development or use proposal's ability to achieve minimum vegetation separation distances. To achieve 'acceptable solution' planning approval for this factor, it must be demonstrated that the minimum separation distances corresponding to a maximum level of radiant transfer to a building of 29 kW/m², either exist or can be implemented (with certain exceptions). These separation distances are the 'Planning BAL-29' APZ dimensions.</p> <p><i>The 'Planning BAL-29' APZ is not necessarily the size of the APZ that must be physically implemented and maintained by a landowner. Rather, its sole purpose is to identify if an acceptable solution for planning approval can be met.</i></p>					

THE 'REQUIRED' APZ DIMENSIONS

Purpose: Establishes the dimensions of the APZ to be physically implemented by the landowner on their lot. These will be the minimum required separation distances from the subject building(s) to surrounding bushfire prone vegetation (identified by type and associated ground slope). These are established by:

- A. The 'BAL Rating APZ' of the subject building(s) when distances are greater than 'B' below (except when 'B' establishes a maximum distance); or
- B. The 'Local Government' APZ' derived from the Firebreak/Hazard Reduction Notice when distances are greater than 'A' above, other than when a maximum distance is established, in which case this will apply; or
- C. A combination of 'A' and 'B'.

Within this Report/Plan it is the 'Planning BAL-29' APZ that will be identified on maps, diagrams and in tables as necessary – unless otherwise stated.

The 'Required' APZ dimension information will be presented in Appendix B1.1 and on the Property Bushfire Management Statement, when required to be included for a development application.

ASSESSMENT AGAINST THE REQUIREMENTS ESTABLISHED BY THE GUIDELINES

APZ Width: The proposed (or a future) habitable building(s) on the lot of the proposed development - or an existing building for a proposed change of use – can be (or is) located within the developable portion of the lot and be surrounded by a 'Planning BAL-29' APZ of the required dimensions (measured from any external wall or supporting post or column to the edge of the classified vegetation), that will ensure their exposure to the potential radiant heat impact of a bushfire does not exceed 29 kW/m².

Restriction on Building Location: It has been identified that the current developable portion of a lot(s) provides for the proposed future (or a future) building/structure location that will result in that building/structure being subject to a BA-40 or BAL-FZ rating. Consequently, it may be considered necessary to impose the condition that a restrictive covenant to the benefit of the local government pursuant to section 129BA of the Transfer of Land Act 1893, is to be placed on the certificate(s) of title of the proposed lot(s) advising of the existence of a restriction on the use of that portion of land (refer to Code F3 of Model Subdivision Conditions Schedule, WAPC June 2021 and Guidelines s5.3.2).

APZ Location: The required dimensions for a 'Planning BAL-29' APZ can be contained solely within the boundaries of the lot(s) on which the proposed (or a future) habitable building(s) - or an existing building(s) for a proposed change of use – is situated.

APZ Location: The required dimensions for a 'Planning BAL-29' APZ can be partly established within the boundaries of the lot(s) on which the proposed (or a future) habitable building(s) - or an existing building(s) for a proposed change of use – is situated. The balance of the APZ would exist on adjoining land that satisfies the exclusion requirements of AS 3959:2018 cl 2.2.3.2 for non-vegetated areas and/or low threat vegetation and/or vegetation managed in a minimal fuel condition.

APZ Location: It can be justified that any adjoining (offsite) land forming part of a 'Planning BAL-29' APZ will:

- If non-vegetated, remain in this condition in perpetuity; and/or
- If vegetated, be low threat vegetation or vegetation managed in a minimal fuel condition in perpetuity.



<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>APZ Management: The area of land (within the lot boundary), that is to make up the required 'Landowner' APZ dimensions (refer to Appendix B, Part B1), can and will be managed in accordance with the requirements of the Guidelines Schedule 1 'Standards for Asset Protection Zones' (refer to Appendix B).</p>
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	<p>Subdivision Staging: There are undeveloped future stages of subdivision, containing bushfire prone vegetation, that have been taken into consideration for their potentially 'temporary' impact on the ability to establish a 'Planning BAL-29' APZ on adjoining developed lots. A staging plan is developed to manage this.</p>
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>Firebreak/Hazard Reduction Notice: Any additional requirements established by the relevant local government's annual notice to install firebreaks and manage fuel loads (issued under s33 of the Bushfires Act 1954), can and will be complied with.</p>
<p>Supporting Assessment Details: Asset protection zones can be contained solely within and external of the boundaries of the subject land. It can be justified that adjoining land can potentially form part of an APZ, meeting s2.2.3.2 exclusion requirements of AS3959-2018.</p> <p>The APZ that will exist, will consist of the following:</p> <ul style="list-style-type: none"> • Roads and unvegetated verges • Footpaths • Parking bays • Any applicable landscaping <p>APZ Management Within the Subject Land:</p> <p>Refer to Figures 3.1b and 3.2a - The exclusion requirements of s2.2.3.2 of AS3959 demonstrates that vegetation that is onsite is within the control of the subject site's landowner and therefore can potentially be removed or modified to mitigate the bushfire risk. It is anticipated that where vegetation will not receive on-going management, classification in accordance with AS3959-2018 will be applied.</p> <p>APZ Management Outside the Lot:</p> <p>The exclusion requirements of s2.2.3.2 of AS3959 can be demonstrated by the construction of the surrounding public road network.</p> <p>APZ Management - General: Where any part of the required APZ dimension is vegetated for the purposes of landscaping, it 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 Shire of Serpentine-Jarrahdale.</p>	
<p>ASSESSMENTS APPLYING THE GUIDANCE ESTABLISHED BY THE WAPC ELEMENT 1 & 2 POSITION STATEMENT (2019)</p>	
<p>Strategic Planning Proposals: "At this planning level there may not be enough detail to demonstrate compliance with this element. The decision-maker may consider this element is satisfied where A1.1 is met."</p> <p>Structure Plans (lot layout known) and Subdivision Applications: "Provided that Element 1 is satisfied, the decision-maker may consider approving lot(s) containing BAL-40 or BAL-FZ under the following scenarios.</p>	
<p>The planning proposal is a development application, consequently the referenced position statement is not applicable to the proposed development.</p>	

5.5 Assessment Statements for Element 3: Vehicular Access

VEHICULAR ACCESS	
Element Intent	To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.
Proposed Development/Use – Relevant Planning Stage	(Do) Development application other than for a single dwelling, ancillary dwelling or minor development
Element Compliance Statement	The proposed development/use achieves the intent of this element by being fully compliant with all applicable acceptable solutions.
Pathway Applied to Provide an Alternative Solution	N/A
Acceptable Solutions - Assessment Statements	
<p>All details of acceptable solution requirements are established in the Guidelines for Planning in Bushfire Prone Areas, DPLH v1.4 (Guidelines) and apply the guidance established by the Position Statement: 'Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design' (WAPC Nov 2019) and the 'Bushfire Management Plan Guidance for the Dampier Peninsula' (WA Department of Planning, Lands and Heritage, 2021 Rev B) as relevant. These documents are available at https://www.wa.gov.au/government/document-collections/state-planning-policy-37-planning-bushfire-prone-areas.</p> <p>The technical construction requirements for access types and components, and for each firefighting water supply component, are also presented in Appendices 2 and 3. The local government will advise the proponent where different requirements are to apply and when any additional specifications such as those for signage and gates are to apply (these are included in the relevant appendix if requested by the local government).</p>	
Solution Component Check Box Legend	<input checked="" type="checkbox"/> Relevant & met <input checked="" type="checkbox"/> Relevant & not met <input type="checkbox"/> Not relevant
A3.1 Public roads	Applicable: Yes Compliant: Yes
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The technical construction requirements of vertical clearance and weight capacity (Guidelines, Table 6) can and will be complied with (Refer also to Appendix C in this BMP).
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>All other applicable technical requirements of trafficable width, gradients and curves, are required to be in "accordance with the class of road as specified in the IPWEA Subdivision Guidelines, Liveable Neighbourhoods, Ausroad Standards and/or any applicable standard in the local government area" (Guidelines, Table 6 and E3.1. Refer also to Appendix C in this BMP).</p> <p>The assessment conducted for the bushfire management plan indicates that it is Likely that the proposed development can and will comply with the requirements.</p> <p>However, the applicable class of road, the associated technical requirements and subsequent proposal compliance, will need to be confirmed with the relevant local government and/or Main Roads WA.</p> <p>or</p> <p>The applicable class(s) of road and technical requirements have been confirmed with the relevant local government/Main Roads WA. These can and will be complied with.</p>
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A traversable verge is available adjacent to classified vegetation (Guidelines, E3.1), as recommended.
Supporting Assessment Details: None Required.	

A3.2a Multiple access routes	Applicable:	Yes	Compliant:	Yes
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> For the lot, two-way public road access is provided in two different directions to at least two different suitable destinations with an all-weather surface.				
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> The two-way access <u>is</u> available at an intersection no greater than 200m from the relevant boundary of each lot, via a no-through road.				
<p>The two-way access is <u>not</u> available at an intersection within 200m from the relevant boundary of each lot. However, the available no-through road satisfies the established exemption for the length limitation in every case. These requirements are:</p> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <ul style="list-style-type: none"> • Demonstration of no alternative access (refer to A3.3 below); • The no-through road travels towards a suitable destination; and • The balance of the no-through road that is greater than 200m from the relevant lot boundary is within a residential built-out area or is potentially subject to radiant heat levels from adjacent bushfire prone vegetation that correspond to the BAL-LOW rating (<12.5 kW/m²). 				
<p>Supporting Assessment Details: Refer to Figure 1.3 - Public Road access is provided for in two different directions to two different destinations via Doley and Orton Roads. Located immediately adjacent to the subject allotment. As such, compliance with this Acceptable Solution is achieved. The technical requirements established by the Guidelines and/or the local government can and will be complied with. These requirements are set out in Appendix C.</p>				
A3.2b Emergency access way	Applicable:	No	Compliant:	N/A
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> The proposed or existing EAW provides a through connection to a public road.				
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> The proposed or existing EAW is less than 500m in length and will be signposted and gated (remaining unlocked) to the specifications stated in the Guidelines and/or required by the relevant local government.				
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> The technical construction requirements for widths, clearances, capacity, gradients and curves (Guidelines, Table 6 and E3.2b. Refer also to Appendix C in this BMP), can and will be complied with.				
<p>Supporting Assessment Details: None Required.</p>				
A3.3 Through-roads	Applicable:	No	Compliant:	N/A
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> A no-through public road is necessary as no alternative road layout exists due to site constraints.				
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> The no-through public road length does not exceed the established maximum of 200m to an intersection providing two-way access (Guidelines, E3.3).				
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> The no-through public road exceeds 200m but satisfies the exemption provisions of A3.2a as demonstrated in A3.2a above.				
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> The public road technical construction requirements (Guidelines, Table 6 and E3.1. Refer also to Appendix C in this BMP), can and will be complied with as established in A3.1 above.				
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> The turnaround area requirements (Guidelines, Figure 24) can and will be complied with.				

Supporting Assessment Details: None Required.			
A3.4a Perimeter roads	Applicable:	No	Compliant: N/A
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	The proposed greenfield or infill development consists of 10 or more lots (including those that are part of a staged subdivision) and therefore should have a perimeter road. This is planned to be installed.		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	<p>The proposed greenfield or infill development consists of 10 or more lots (including those that are part of a staged subdivision). However, it is not required on the established basis of:</p> <ul style="list-style-type: none"> • The vegetation adjoining the proposed lots is classified Class G Grassland; • Lots are zoned rural living or equivalent; • It is demonstrated that it cannot be provided due to site constraints; or • All lots have existing frontage to a public road. 		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	The technical construction requirements of widths, clearances, capacity, gradients and curves (Guidelines, Table 6 and E3.4a) can and will be complied with.		
Supporting Assessment Details: None Required.			
A3.4b Fire service access route	Applicable:	No	Compliant: N/A
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	The FSAR can be installed as a through-route with no dead ends, linked to the internal road system every 500m and is no further than 500m from a public road.		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	The technical construction requirements of widths, clearances, capacity, gradients and curves (Guidelines, Table 6 and E3.4b. Refer also to Appendix C in this BMP), can and will be complied with.		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	The FSAR can and will be signposted. Where gates are required by the relevant local government, the specifications can be complied with.		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	Turnaround areas (to accommodate type 3.4 fire appliances) can and will be installed every 500m on the FSAR.		
Supporting Assessment Details: None Required.			
A3.5 Battle-axe access legs	Applicable:	No	Compliant: N/A
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	A battle-axe leg cannot be avoided due to site constraints.		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	The proposed development is in a reticulated area and the battle-axe access leg length from a public road is no greater than 50m. No technical requirements need to be met.		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	The proposed development is not in a reticulated area. The technical construction requirements for widths, clearances, capacity, gradients and curves (Guidelines, Table 6 and E3.5. Refer also to Appendix C in this BMP), can and will be complied with.		
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="radio"/>	Passing bays can and will be installed every 200m with a minimum length of 20m and a minimum additional trafficable width of 2m.		
Supporting Assessment Details: None Required.			

A3.6 Private driveways	Applicable:	No	Compliant:	N/A
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	The private driveway to the most distant external part of the development site is within a lot serviced by reticulated water, is accessed via a public road with a speed limit of 70 km/hr or less and has a length is no greater than 70m (measured as a hose lay). No technical requirements need to be met.			
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	The technical construction requirements for widths, clearances, capacity, gradients and curves (Guidelines, Table 6 and E3.6. Refer also to Appendix C in this BMP), can and will be complied with.			
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	Passing bays can and will be installed every 200m with a minimum length of 20m and a minimum additional trafficable width of 2m.			
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The turnaround area requirements (Guidelines, Figure 28, and within 30m of the habitable building) can and will be complied with.			
Supporting Assessment Details: None Required.				

5.6 Assessment Statements for Element 4: Water

FIREFIGHTING WATER	
Element Intent	To ensure water is available to enable people, property and infrastructure to be defended from bushfire.
Proposed Development/Use – Relevant Planning Stage	(Do) Development application other than for a single dwelling, ancillary dwelling or minor development
Element Compliance Statement	The proposed development/use achieves the intent of this element by being fully compliant with all applicable acceptable solutions.
Pathway Applied to Provide an Alternative Solution	N/A
Acceptable Solutions - Assessment Statements	
<p>All details of acceptable solution requirements are established in the Guidelines for Planning in Bushfire Prone Areas, DPLH v1.4 (Guidelines) and apply the guidance established by the Position Statement: 'Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design' (WAPC Nov 2019) and the 'Bushfire Management Plan Guidance for the Dampier Peninsula' (WA Department of Planning, Lands and Heritage, 2021 Rev B) as relevant. These documents are available at https://www.wa.gov.au/government/document-collections/state-planning-policy-37-planning-bushfire-prone-areas.</p> <p>The technical construction requirements for access types and components, and for each firefighting water supply component, are also presented in Appendices 2 and 3. The local government will advise the proponent where different requirements are to apply and when any additional specifications such as those for signage and gates are to apply (these are included in the relevant appendix if requested by the local government).</p>	
Solution Component Check Box Legend	<input checked="" type="checkbox"/> Relevant & met <input checked="" type="checkbox"/> Relevant & not met <input type="checkbox"/> Not relevant
A4.1 Identification of future firefighting water supply	Applicable: Yes Compliant: Yes
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	It can be demonstrated that reticulated or sufficient non-reticulated water for firefighting can be provided at the subdivision and/or development application stage in accordance with the specifications of the relevant water supply authority or the requirements of Schedule 2.
<p>Supporting Assessment Details: Refer to Figure 3.1a of this plan. Existing and potential hydrant (fire/water service connection) locations have been indicated in this plan in accordance with the specifications of the relevant water supply authority. In addition, a 200,000 litre rainwater tank is also proposed that could provide an additional firefighting water supply.</p>	
A4.2 Provision of water for firefighting purposes	Applicable: Yes Compliant: Yes
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A reticulated water supply is available to the proposed development. The existing hydrant connection(s) are provided in accordance with the specifications of the relevant water supply authority.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A reticulated water supply will be available to the proposed development. Hydrant connection(s) can and will be provided in accordance with the specifications of the relevant water supply authority.
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A static water supply (tank) for firefighting purposes will be installed on the lot that is additional to any water supply that is required for drinking and other domestic purposes.
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A strategic water supply (tank or tanks) for firefighting purposes will be installed within or adjacent to the proposed development that is additional to any water supply that is required for drinking and other domestic purposes. The required land will be ceded free of cost to the local government and the lot or road reserve where the tank is to be located will be identified on the plan of subdivision.



The strategic static water supply (tank or tanks) will be located no more than 10 minutes travel time from a subject site (at legal road speeds).

The technical requirements (location, number of tanks, volumes, design, construction materials, pipes and fittings), as established by the Guidelines (A4.2, E4 and Schedule 2) and/or the relevant local government, can and will be complied with.

Supporting Assessment Details: A hydrant is located on Doley Road to the north of the Subject Allotment as indicated on Figure 3.1a. It is anticipated that Hydrants will be installed at regular intervals in accordance with the relevant water supply authority as the development of the neighbouring residential area continues.

Refer to information contained in Appendix D for the firefighting water supply specifications and technical requirements.

6 BUSHFIRE PROTECTION MEASURES - RESPONSIBILITY FOR IMPLEMENTATION CHECKLIST

6.1 Developer / Landowner Responsibilities – Prior to Building and Occupancy / Operation

DEVELOPER/LANDOWNER RESPONSIBILITIES – PRIOR TO BUILDING AND OCCUPANCY/OPERATION	
No.	Implementation Actions
1	<p>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 (with the required wording stated by the local government).</p> <p>This will be done pursuant to <i>Section 70A Transfer of Land Act 1893 (as amended) as per 'Factors affecting use and enjoyment of land, notification on title'</i>.</p> <p>This is to notify owners and prospective purchasers of the land that:</p> <ol style="list-style-type: none"> 1. The land is in a designated bushfire prone area as designated by an Order made by the Fire and Emergency Services Commissioner; 2. The land is subject to a Bushfire Management Plan that establishes certain protection measures to manage bushfire risk that are to be implemented and continue to be applied at the owners cost; and 3. That additional planning and building requirements may apply to development on this land.
2	<p>Prior to relevant building work, inform the builder of the existence of this approved Bushfire Management Plan (BMP). The plan identifies that the development site is within a designated bushfire prone area and states the indicative (or determined) BAL rating(s) that may (or will) be applied to buildings/structures. A BAL assessment report may be required to confirm determined ratings and will be required when ratings are indicative. BAL certificates will need to be issued to accompany building applications.</p> <p>The BMP may also establish, as an additional bushfire protection measure, that construction requirements to be applied will be those corresponding to a specified higher BAL rating.</p> <p>Compliance with the Building Code of Australia (Volumes 1 and 2 of the National Construction Code), will require certain bushfire resistant construction requirements be applied to residential buildings in bushfire prone areas (i.e., Class 1, 2 and 3 and associated Class 10a buildings and decks). Other classes of buildings may also be required to comply with these construction when established by the relevant authority or if identified as an additional bushfire protection measure within the BMP.</p> <p>The deemed to satisfy solutions that will meet the relevant bushfire performance requirements are found in AS 3959 – Construction of Building in Bushfire Prone Areas (as amended) and the NASH Standard - Steel Framed Construction in Bushfire Areas (as amended).</p>
3	<p>Prior to occupancy/operation establish the 'Required' Asset Protection Zone (APZ) around habitable buildings (and other structures as required) to satisfy:</p> <ul style="list-style-type: none"> • The minimum required dimensions established in Appendix B1; and • The standards established by the Guidelines DPLH, 2021 v1.4, Schedule 1, or as varied by the local government through their annually issued firebreak / hazard reduction notice when the variations have been endorsed by the WAPC and DFES as per s4.5.3 of the Guidelines. <p>If native vegetation is required to be modified or removed, ensure that approval has been received from the relevant authority (refer to the applicable local government for advice).</p>



4	<p>Prior to operation, the subject lot is to be compliant with current version of the Shire of Serpentine-Jarrahdale Fire Hazard Reduction Notice issued under s33 of the Bushfires Act 1954.</p> <p>This may include standards for asset protection zones that differ from Schedule 1 in the Guidelines DPLH, 2021 v1.4, with the intent to better satisfy local conditions.</p> <p>[Refer to assessments against the Bushfire Protection Criteria the Element 2 'Siting and Design' and the information presented in Appendix B].</p>
---	---

6.2 Landowner / Occupier Responsibilities – Ongoing Management

LANDOWNER/OCCUPIER – ONGOING MANAGEMENT	
No.	Management Actions
1	<p>Maintain the 'Required' Asset Protection Zone (APZ) around habitable buildings (and other structures as required) to satisfy:</p> <ul style="list-style-type: none"> • The minimum required dimensions established in Appendix B1; and • The standards established by the Guidelines DPLH, 2021 v1.4, Schedule 1, or as varied by the local government through their annually issued firebreak / hazard reduction notice when the variations have been endorsed by the WAPC and DFES as per s4.5.3 of the Guidelines.
2	<p>Comply with the the Shire of Serpentine-Jarrahdale Fire Hazard Reduction Notice issued under s33 of the Bush Fires Act 1954. Check the notice annually for any changes.</p>
3	<p>Ensure that builders engaged to construct dwellings/additions and/or other relevant structures on the lot, are aware of the existence of this approved Bushfire Management Plan (BMP). The plan identifies that the development site is within a designated bushfire prone area and states the indicative (or determined) BAL rating(s) that may (or will) be applied to buildings/structures.</p> <p>A BAL assessment report may be required to confirm determined ratings and will be required when ratings are indicative. BAL certificates will need to be issued to accompany building applications.</p> <p>Compliance with the Building Code of Australia (Volumes 1 and 2 of the National Construction Code), will require certain bushfire resistant construction requirements be applied to residential buildings in bushfire prone areas (i.e., Class 1, 2 and 3 and associated Class 10a buildings and decks). The deemed to satisfy solutions that will meet the relevant bushfire performance requirements are found in AS 3959 – Construction of Building in Bushfire Prone Areas (as amended) and the NASH Standard - Steel Framed Construction in Bushfire Areas (as amended).</p> <p>As an additional bushfire protection measure, other classes of buildings may also be required to comply with these construction requirements when established by the relevant authority or if identified as an additional bushfire protection measure within the BMP. The BMP may also establish that construction requirements to be applied will be those corresponding to a specified higher BAL rating. When applicable, these requirements will be identified in Section 5.7.</p>
4	<p>Ensure all future buildings the landowner has responsibility for, are designed and constructed in full compliance with:</p> <ul style="list-style-type: none"> • The bushfire resistant construction requirements of the Building Code of Australia (Volumes 1 and 2 of the National Construction Code), as established by the Building Regulations 2012 (WA Building Act 2011); and • Any additional bushfire protection measures this Bushfire Management Plan has established are to be implemented.

6.3 Local Government Responsibilities – Ongoing Management

LOCAL GOVERNMENT – ONGOING MANAGEMENT	
No.	Management Actions
1	<p>Monitor landowner compliance with the annual Shire of Serpentine-Jarrahdale Fire Hazard Reduction Notice and with any bushfire protection measures that are:</p> <ul style="list-style-type: none"> • Established by this BMP; • Are required to be maintained by the landowner/occupier; and • Are relevant to local government operations.

APPENDIX A: DETAILED BAL ASSESSMENT DATA AND SUPPORTING INFORMATION

A1: BAL Assessment Inputs Common to the Method 1 and Method 2 Procedures

A1.1: FIRE DANGER INDICES (FDI/FDI/GFDI)

When using Method 1 the relevant FDI value required to be applied for each state and region is established by AS 3959:2018, Table 2.1. Each FDI value applied in Tables 2.4 – 2.7 represents both the Forest Fire Danger Index (FFDI) and a deemed equivalent for the Grassland Fire Danger Index (GFDI), as per Table B2 in Appendix B. When using Method 2, the relevant FFDI and GFDI are applied.

The values may be able to be refined within a jurisdiction, where sufficient climatological data is available and in consultation with the relevant authority.

Relevant Jurisdiction:	WA	Region:	Whole State	Method 1	Applied FDI:	80
				Method 2	Applied FFDI:	N/A
					Applied GFDI:	N/A

A1.2: VEGETATION ASSESSMENT AND CLASSIFICATION

Vegetation Types and Classification

In accordance with AS 3959:2018 clauses 2.2.3 and C2.2.3.1, all vegetation types within 100 metres of the 'site' (defined as "the part of the allotment of land on which a building stands or is to be erected"), are identified and classified. Any vegetation more than 100 metres from the site that has influenced the classification of vegetation within 100 metres of the site, is identified and noted. The maximum excess distance is established by AS 3959: 2018 cl 2.2.3.2 and is an additional 100 metres.

Classification is also guided by the Visual Guide for Bushfire Risk Assessment in WA (WA Department of Planning February 2016) and any relevant FPA Australia practice notes.

Modified Vegetation

The vegetation types have been assessed as they will be in their natural mature states, rather than what might be observed on the day. Vegetation destroyed or damaged by a bushfire or other natural disaster has been assessed on its expected re-generated mature state. Modified areas of vegetation can be excluded from classification if they consist of low threat vegetation or vegetation managed in a minimal fuel condition, satisfying AS 3959:2018 s2.2.3.2(f), and there is sufficient justification to reasonable expect that this modified state will exist in perpetuity.

The Influence of Ground Slope

Where significant variation in effective slope exists under a consistent vegetation type, these will be delineated as separate vegetation areas to account for the difference in potential bushfire behaviour, in accordance with AS 3959:2018 clauses 2.2.5 and C2.2.5.

THE INFLUENCE OF VEGETATION GREATER THAN 100 METRES FROM THE SUBJECT SITE





Vegetation area(s) within 100m of the site whose classification has been influenced by the existence of bushfire prone vegetation from 100m – 200m from the site:



None



Assessment Statement: No vegetation types exist close enough, or to a sufficient extent, within the relevant area to influence classification of vegetation within 100 metres of the subject site.



VEGETATION AREA 1							
Classification	N/A						
Types Identified	N/A						
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.						
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A		
Foliage Cover (all layers)	N/A		Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>Note: Photo ID: 1 – Single row of trees/windbreak on adjoining lot.</p> <p>Note: Area 6 can be seen in the background of Photo ID: 1</p>						
Post Development Assumptions:	<p>Proposed Landscaping is scheduled to occur in within this area. Refer to Figure 3.1b and 3.2a and the Addendum contained within this report. To be maintained in accordance with Schedule 1: Standards for Asset Protection Zones as stipulated in the Guidelines for Planning in Bushfire Prone Areas, AS3959-2018 s2.2.3.2 requirements and the Shire of Serpentine-Jarrahdale Fire Hazard Reduction Notice (Firebreak Notice). This is to ensure there is no increase in bushfire risk and does not alter indicative BAL ratings indicated in this plan. Where it is anticipated that sections will not be maintained as mentioned above, these areas will be re-classified to Class C Shrubland in accordance with AS3959-2018 based on the proposed planting schedule indicated in the Landscape Plan prepared by EPCAD Pty Ltd.</p>						
PHOTO ID: 1			PHOTO ID: 2				
PHOTO ID: 3			PHOTO ID: 4				

VEGETATION AREA 1						
Classification	N/A					
Types Identified	N/A					
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.					
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A	
Foliage Cover (all layers)	N/A	Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>Note – Area 4 can be seen in the background of Photo ID: 8</p>					
Post Development Assumptions:	<p>Proposed Landscaping is scheduled to occur in within this area. Refer to Figure 3.1b and 3.2a and the Addendum contained within this report. To be maintained in accordance with Schedule 1: Standards for Asset Protection Zones as stipulated in the Guidelines for Planning in Bushfire Prone Areas, AS3959-2018 s2.2.3.2 requirements and the Shire of Serpentine-Jarrahdale Fire Hazard Reduction Notice (Firebreak Notice). This is to ensure there is no increase in bushfire risk and does not alter indicative BAL ratings indicated in this plan. Where it is anticipated that sections will not be maintained as mentioned above, these areas will be re-classified to Class C Shrubland in accordance with AS3959-2018 based on the proposed planting schedule indicated in the Landscape Plan prepared by EPCAD Pty Ltd.</p>					
PHOTO ID: 5			PHOTO ID: 6			
PHOTO ID: 7			PHOTO ID: 8			



VEGETATION AREA 1						
Classification	N/A					
Types Identified	N/A					
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.					
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A	
Foliage Cover (all layers)	N/A	Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>NOTE: Photo ID: 10 – Single row of trees/windbreak on adjoining lot.</p>					
Post Development Assumptions:	<p>Proposed Landscaping is scheduled to occur in within this area. Refer to Figure 3.1b and 3.2a and the Addendum contained within this report. To be maintained in accordance with Schedule 1: Standards for Asset Protection Zones as stipulated in the Guidelines for Planning in Bushfire Prone Areas, AS3959-2018 s2.2.3.2 requirements and the Shire of Serpentine-Jarrahdale Fire Hazard Reduction Notice (Firebreak Notice). This is to ensure there is no increase in bushfire risk and does not alter indicative BAL ratings indicated in this plan. Where it is anticipated that sections will not be maintained as mentioned above, these areas will be re-classified to Class C Shrubland in accordance with AS3959-2018 based on the proposed planting schedule indicated in the Landscape Plan prepared by EPCAD Pty Ltd.</p>					
						
PHOTO ID: 9			PHOTO ID: 10			
						
PHOTO ID: 11			PHOTO ID: 12			




VEGETATION AREA 1						
Classification	N/A					
Types Identified	N/A					
Exclusion Clause	2.2.3.2 (e) Non-vegetated areas and (f) Low threat vegetation - minimal fuel condition.					
Effective Slope	Measured	N/A		Applied Range (Method 1)	N/A	
Foliage Cover (all layers)	N/A	Shrub/Heath Height	N/A		Tree Height	N/A
Description/Justification:	<p>A combination of established and developing residential area. Maintained private properties and gardens. Gasses maintained to less than 50mm in height. Private driveways, street frontages and roads/hardstand areas cleared of unmanaged vegetation. Hydro-mulch used in developing areas to suppress dust and weed growth.</p> <p>Note – Areas 5 and 6 can be seen in Photo ID: 13</p>					
Post Development Assumptions:	<p>Proposed Landscaping is scheduled to occur in within this area. Refer to Figure 3.1b and 3.2a and the Addendum contained within this report. To be maintained in accordance with Schedule 1: Standards for Asset Protection Zones as stipulated in the Guidelines for Planning in Bushfire Prone Areas, AS3959-2018 s2.2.3.2 requirements and the Shire of Serpentine-Jarrahdale Fire Hazard Reduction Notice (Firebreak Notice). This is to ensure there is no increase in bushfire risk and does not alter indicative BAL ratings indicated in this plan. Where it is anticipated that sections will not be maintained as mentioned above, these areas will be re-classified to Class C Shrubland in accordance with AS3959-2018 based on the proposed planting schedule indicated in the Landscape Plan prepared by EPCAD Pty Ltd.</p>					
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>32°14'8", 115°59'6", 7.4m, 62° 02/11/2022 08:03:02 am</p> </div> <div style="text-align: center;">  <p>32°14'10", 115°59'11", 10.6m, 47° 02/11/2022 08:07:57 am</p> </div> </div>						
PHOTO ID: 13				PHOTO ID: 14		

VEGETATION AREA 2				
Classification	G. GRASSLAND			
Types Identified	Tussock grassland G-22	Tussock grassland G-22	Dense sown pasture G-25	
Exclusion Clause	N/A			
Effective Slope	Measured	flat 0 degrees	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	<p>Assessed as Grassland due to areas of grasses present in paddock/open areas. Currently in an unmanaged state and required to be classified in accordance with AS3959-2018. Foliage cover less than 10%.</p> <p>Note – It is recognised that a firebreak is present along the eastern boundary (on the neighbouring allotment). It is assumed for the purposes of assessment that the firebreak will not be maintained. As such, the area has been classified as a precautionary measure.</p>			
Post Development Assumptions:	Not Applicable.			
				
PHOTO ID: 15		PHOTO ID: 16		

VEGETATION AREA 3						
Classification	A. FOREST					
Types Identified	Open forest A-03			Woodland B-05		
Exclusion Clause	N/A					
Effective Slope	Measured	flat 0 degrees		Applied Range (Method 1)	Upslope or flat 0 degrees	
Foliage Cover (all layers)	>30%	Shrub/Heath Height		>2m	Tree Height	Up to 30m
Description/Justification:	Forest Dominant Area - Mixed species of trees inclusive of Eucalypts. Understorey consists of unmanaged grasses, low shrub and low trees in some sections. Other sections have minimal understorey. Occasional open areas between canopies.					
Post Development Assumptions:	Not Applicable					
						
PHOTO ID: 17			PHOTO ID: 18			

VEGETATION AREA 4				
Classification	G. GRASSLAND			
Types Identified	Tussock grassland G-22	Tussock grassland G-22	Dense sown pasture G-25	
Exclusion Clause	N/A			
Effective Slope	Measured	flat 0 degrees	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	Assessed as Grassland due to areas of grasses present in paddock/open areas. Currently in an unmanaged state and required to be classified in accordance with AS3959-2018. Foliage cover less than 10%.			
Post Development Assumptions:	Not Applicable.			
				
PHOTO ID: 19		PHOTO ID: 20		
				
PHOTO ID: 21		PHOTO ID: 22		

VEGETATION AREA 5							
Classification	A. FOREST						
Types Identified	Open forest A-03			Woodland B-05			
Exclusion Clause	N/A						
Effective Slope	Measured	flat 0 degrees		Applied Range (Method 1)		Upslope or flat 0 degrees	
Foliage Cover (all layers)	>30%	Shrub/Heath Height		>2m	Tree Height		Up to 30m
Description/Justification:	Eucalypt dominant area. Understorey consists of unmanaged grasses, low shrub and low trees.						
Post Development Assumptions:	Not Applicable						
							
PHOTO ID: 23				PHOTO ID: 24			

VEGETATION AREA 6				
Classification	G. GRASSLAND			
Types Identified	Tussock grassland G-22	Tussock grassland G-22	Dense sown pasture G-25	
Exclusion Clause	N/A			
Effective Slope	Measured	flat 0 degrees	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	Assessed as Grassland due to areas of grasses present in paddock/open areas. Currently in an unmanaged state and required to be classified in accordance with AS3959-2018. Foliage cover less than 10%.			
Post Development Assumptions:	Not Applicable.			
 <p style="text-align: right; font-size: small;">-32°14'8", 115°59'7", 8.1m, 43° 02/11/2022 08:02:25 am</p>		 <p style="text-align: right; font-size: small;">-32°14'10", 115°59'11", 6.2m, 359° 02/11/2022 08:07:09 am</p>		
PHOTO ID: 25		PHOTO ID: 26		
 <p style="text-align: right; font-size: small;">-32°14'4", 115°59'11", 2.8m, 272° 02/11/2022 08:15:30 am</p>				
PHOTO ID: 27				

A1.3: EFFECTIVE SLOPE

Measuring

Effective slope refers to the slope “under the classified vegetation which most significantly influences bushfire behaviour (AS 3959:2018, clause B4, CB4). It is not the average slope.

It is described as upslope, flat or downslope when viewed from the exposed element (e.g., building) looking towards the vegetation – and measured in degrees. Ground slope has a direct and significant influence on a bushfire's rate of spread and intensity, which increases when travelling up a slope.

The slope under the vegetation in closest proximity to the exposed element(s), over the distance that will most likely carry the entire depth of the flaming front, will be a significant consideration in the determination of the effective slope. This distance is determined as a function of the potential quasi-steady rate of spread and expected residence time (i.e., the flaming combustion period at a single point on the ground), of a bushfire in the specific vegetation type/landscape scenario.

Slope Variation Within Areas of Vegetation

Where a significant variation in effective slope exists under a consistent vegetation type, these will be delineated as separate vegetation areas to account for the difference in potential bushfire behaviour, in accordance with AS 3959:2018 clauses 2.2.5 and C2.2.5.

Slope Variation Due to Multiple Development Sites

When the effective slope, under a given area of bushfire prone vegetation, will vary significantly relative to multiple proposed development sites (exposed elements), then the effective slopes corresponding to each of the different locations, are separately identified.

The relevant (worst case) effective slope is determined in the direction corresponding to the potential directions of fire spread towards the subject building(s).

Differences in Application of Effective Slope - AS 3959:2018 Method 1 versus Method 2 Procedures

The Method 1 procedure provides five different slope ranges from flat (including all upslopes) to 20 degrees downslope to define the effective slope and bushfire behaviour model calculations apply the highest value in each range (i.e., 0°, 5°, 10°, 15° or 20°).

The Method 2 procedure requires an actual slope (up or down in degrees) to be determined. AS 3959:2018, clause B1 limits the effective slope that can be applied to 30 degrees downslope and 15 degrees upslope. Where any upslope is greater than 15 degrees, then 15 degrees is to be used.

SITE ASSESSMENT DETAILS - EXPLANATION & JUSTIFICATION

The effective slopes determined from the site assessment are recorded in Table 3.2 of this Bushfire Management Plan. When their derivation requires additional explanation and justification, this is provided below.

A1.4: SEPARATION DISTANCE

Measuring

The separation distance is the distance in the horizontal plane between the receiver (building/structure or area of land being considered) and the edge of the classified vegetation (AS 3959:2018, clause 2.2.4)

The relevant parts of a building/structure from which the measurement is taken is the nearest part of an external wall or where a wall does not exist, the supporting posts or columns. Certain parts of buildings are excluded including eaves and roof overhangs.

The edge of the vegetation, for forests and woodlands, will be determined by the unmanaged understorey rather than either the canopy (drip line) or the trunk (AS 3959:2018, clause C2.2.5).

Measured Separation Distance as a Calculation Input

If a separation distance can be measured because the location of the building/structure relative to the edge of the relevant classified vegetation is known, this figure can be entered into the BAL calculation. The result is a determined BAL rating.

Assumed Separation Distance as a Calculation Input

When the building/structure location within the lot is not known, an assumed building location may be applied that would establish the closest positioning of the building/structure relative to the relevant area of vegetation.

The assumed location would be based on a factor that puts a restriction on a building location such as:

- An established setback from the boundary of a lot, such as a residential design code setback or a restrictive covenant; or
- Within an established building envelope.

The resultant BAL rating would be indicative and require later confirmation (via a Compliance Report) of the building/structure actual location relative to the vegetation to establish the determined BAL rating.

Separation Distance as a Calculation Output

With the necessary site specific assessment inputs and using the AS 3959:2018 bushfire modelling equations, the range of separation distances that will correspond to each BAL rating (each of which represents a range of radiant heat flux), can be calculated. This has application for bushfire planning scenarios such as:

- When the separation distance cannot be measured because the exact location of the exposed element (i.e., the building, structure or area), relative to classified vegetation, is yet to be determined.

In this scenario, the required information is the identification of building locations onsite that will correspond to each BAL rating. That is, indicative BAL ratings can be derived for a variety of potential building/structure locations; or

- The separation distance is known for a given building, structure or area (and a determined BAL rating can be derived), but additional information is required regarding the exposure levels (to the transfer of radiant heat from a bushfire), of buildings or persons, that will exist at different points within the subject site.

The calculated range of separation distances corresponding to each BAL rating can be presented in a table and/or illustrated as a BAL Contour Map – whichever is determined to best fit the purpose of the assessment.

For additional information refer to the information boxes in Section 3 'Bushfire Attack Levels (BAL) - Understanding the Results and Section 3.2. 'Interpretation of the BAL Contour Map'.

SITE ASSESSMENT DETAILS - EXPLANATION & JUSTIFICATION

For the subject development/use the applicable separation distances values are derived from calculations applying the assessed site data. They are an output value, not an input value and therefore are not presented or justified in this appendix.

The derived values are presented in Section 3, Table 3.2 and illustrated as a BAL contour map in Figure 3.2a.

APPENDIX B: ADVICE - ONSITE VEGETATION MANAGEMENT - THE APZ

THE ASSET PROTECTION ZONE (APZ) - DESCRIPTION

This is an area surrounding a habitable building containing low threat fire fuel fuels (including vegetation), or vegetation managed in a minimal fuel condition, no fire fuels or any combination. The primary objectives include:

- To ensure the building is sufficiently separated from the bushfire hazard to limit the impact of its direct attack mechanisms. That is, the dimensions of the APZ will, for most site scenarios, remove the potential for direct flame contact on the building, reduce the level of radiant heat to which the building is exposed and ensure some reduction in the level of ember attack (with the level of reduction being dependent on the vegetation types of present);
- To ensure any vegetation retained within the APZ is low threat and/or is managed in a minimum fuel condition and prevents surface fire spreading to the building;
- To ensure other combustible materials that can result in consequential fire (typically ignited by embers) within both the APZ and parts of the building, are eliminated, minimised and/or appropriately located or protected. (Note: The explanatory notes in the Guidelines provide some guidance for achieving this objective and other sources are available. Research shows that consequential fire, ignited by embers, is the primary cause of building loss in past bushfire events); and
- To provide a defensible space for firefighting activities.

B1: Asset Protection Zone (APZ) Dimensions

APZ DIMENSIONS – DIFFERENCES IN REQUIREMENTS FOR PLANNING ASSESSMENTS COMPARED TO IMPLEMENTATION

THE 'PLANNING BAL-29' APZ DIMENSIONS

The 'Planning BAL-29' APZ is not necessarily the size of the APZ that must be physically implemented and maintained by a landowner. Rather, its purpose is to identify if an acceptable solution for planning approval can be met i.e., can a specified minimum separation distance from bushfire prone vegetation exist.

An assessment against the Bushfire Protection Criteria is conducted for planning approval purposes. To satisfy 'A2.1: Asset Protection Zone', it must be demonstrated that certain minimum separation distances between the relevant building/structure and different classes of bushfire prone vegetation, either exist or can be created and will remain in perpetuity. These minimum separation distances determine the 'Planning BAL-29' APZ dimensions.

Dimensions: The minimum dimensions are those that will ensure the potential radiant heat impact on subject buildings does not exceed 29 kW/m². These dimensions will vary dependent on the vegetation classification, the slope of the land they are growing on and certain other factors specific to the subject site.

Note: For certain purposes associated with vulnerable land uses, the 'Planning BAL-29' APZ may be replaced with dimensions corresponding to radiant heat impact levels of 10 kW/m² and 2 kW/m² and calculated using 1200K flame temperature.

Location: The identified 'Planning BAL-29' APZ must not extend past lot boundaries onto land the landowner has no control over either now or potentially at some point in the future. Limited exceptions include:

- When adjoining land is not vegetated (e.g., built out, roads, carparks, drainage, rock, water body etc.);
- When adjoining land currently or, will in the short term, contain low threat vegetation and or vegetation managed in a minimal fuel condition as per AS 3959:2018 cl. 2.2.3.2. It must be reasonable (justifiable) to expect this low threat vegetation and/or level of management will continue to exist or be conducted in perpetuity and require no action from the owner of the subject lot.

Such areas of land include formally managed areas of vegetation (e.g., public open space / recreation areas / services installed in a common section of land). For specific scenarios, evidence of the formal

commitment to manage these areas to a certain standard may be required and would be included in the BMP.

These areas of land can also be part of the required APZ on a neighbouring lot for which the owner of that lot has a recognised responsibility to establish and maintain; and

- When there is a formalised and enforceable capability and responsibility created for the subject lot owner, or any other third party, to manage vegetation on land they do not own in perpetuity. This would be rare, and evidence of the formal authority would be included in the BMP.

The bushfire consultant's 'Supporting Assessment Detail', that is presented in the assessment against the acceptable solution A2.1, will identify and justify how any adjoining land within the 'Planning BAL-29 APZ will meet the APZ standards. Or otherwise, explain how this condition cannot be met.

THE 'BAL RATING' APZ DIMENSIONS

The applicable BAL rating will have been stated in the BAL Assessment Data section of the BAL Assessment Report or BMP (as relevant). The BAL rating can be assessed as 'determined' or 'indicative' or be 'conditional', dependent of the specific conditions associated with the site and the stage of assessment or planning. It is the eventual assessment of the 'Determined' BAL that will establish both the BAL rating that is to apply and its corresponding 'BAL Rating' APZ dimensions.

Dimensions: The minimum dimensions of the 'BAL Rating' APZ to be established and maintained will be those that correspond to the determined BAL rating for the subject building/structure that has accounted for surrounding vegetation types, the slope of the land they are growing on and certain other factors specific to the subject site and surrounding land.

Establishing the 'BAL Rating' APZ will ensure that the potential radiant heat exposure of the building/structure will be limited to the level that the applied construction requirements are designed to resist when that building/structure is required to be constructed to the standard corresponding to the Determined BAL.

Note: For certain purposes associated with vulnerable land uses, the 'BAL Rating' APZ dimensions may be replaced with dimensions corresponding to the specific radiant heat impact levels of 10 kW/m² and 2 kW/m² and calculated using 1200K flame temperature.

Location: The same conditions will apply as for the 'Planning BAL-29' APZ.

THE 'LOCAL GOVERNMENT' APZ DIMENSIONS

Some Local Government's establish the dimensions of the APZ that must be established surrounding buildings in their annual Firebreak/Hazard Reduction Notice. Or for a specific site they may establish a maximum allowable dimension (typically that corresponding to BAL-29). When established, the landowner will need to be comply with these.

THE 'REQUIRED' APZ DIMENSIONS

This is the APZ that is to be established and maintained by the landowner within the subject lot and surrounding the subject building(s). It will be identified on the Property Bushfire Management Statement when it is required to be included in this Report/Plan.

Dimensions: The 'Required APZ' dimensions are the minimum (or maximum when relevant) distances away from the subject building(s) that the APZ must extend. These distances will not necessarily be the same all around the building(s). They can vary and are dependent on the different vegetation types (and their associated ground slope) that can exist around the building(s), and specific local government requirements. The dimensions to implement are determined by:

- A. The 'BAL Rating APZ' of the subject building(s) when distances are greater than 'B' below (except when 'B' establishes a maximum distance); or
- B. The 'Local Government' APZ' derived from the Firebreak/Hazard Reduction Notice when distances are greater than 'A' above, other than when a maximum distance is established, in which case this will apply; or
- C. A combination of 'A' and 'B'.

Location: The same conditions will apply as for the 'Planning BAL-29' APZ.

B1.1: THE APZ DIMENSIONS REQUIRED TO BE IMPLEMENTED BY THE LANDOWNER

DETERMINATION OF THE 'REQUIRED' APZ DIMENSIONS TO BE IMPLEMENTED AND MAINTAINED BY LANDOWNER WITHIN THEIR LOT											
Relevant Buildings(s)	Vegetation Classification [Refer to Fig 3.1]		Minimum Required Separation Distances from Building to Vegetation (metres)								The 'Required' APZ Dimensions [see note]
			Established by the 'BAL Rating' APZ Dimension					Established by the "Local Government" APZ Dimension		N/A	
			Determined Radiant Heat Impact	Stated 'Indicative' or 'Conditional' BAL				Firebreak / Hazard Reduction Notice			
				BAL-29	BAL-19	BAL-12.5	BAL-LOW				
Area	Class										
Career Fire & Rescue Service	1	Excluded cl 2.2.3.2(e & f)			N/A	N/A	N/A	N/A	20		20
	2	(G) Grassland			8	12	17	50	20		20
	3	(A) Forest			21	31	42	100	20		20
	4	(G) Grassland			8	12	17	50	20		20
	5	(A) Forest			21	31	42	100	20		20
	6	(G) Grassland			8	12	17	50	20		20

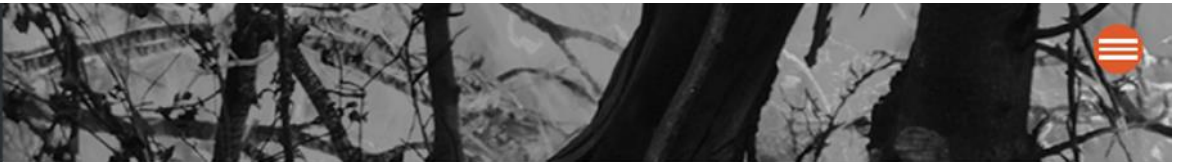
Note: The 'Required' APZ Dimension corresponding to each area of vegetation is the greater of the 'BAL Rating' or the 'Firebreak/Hazard Reduction Notice' APZ dimensions - unless a local government maximum distance(s) is established as a result of their environmental assessment of the subject site. The area of the APZ will also be limited to the subject lot boundary unless otherwise justified in this Report/Plan. Final determination of the dimensions will require that any indicative or conditional BAL becomes a 'Determined' BAL.

Comments: None Required.

B2: The Standards for the APZ as Established by the Guidelines (DPLH, v1.4)

Within the Guidelines (source: <https://www.wa.gov.au/government/document-collections/state-planning-policy-37-planning-bushfire-prone-areas>), the management Standards are established by:

- Schedule 1: Standards for Asset Protection Zones (see extract below) established by the Guidelines; and
- The associated explanatory notes (Guidelines E2) that address (a) managing an asset protection zone (APZ) to a low threat state (b) landscaping and design of an asset protection zone and (c) plant flammability.

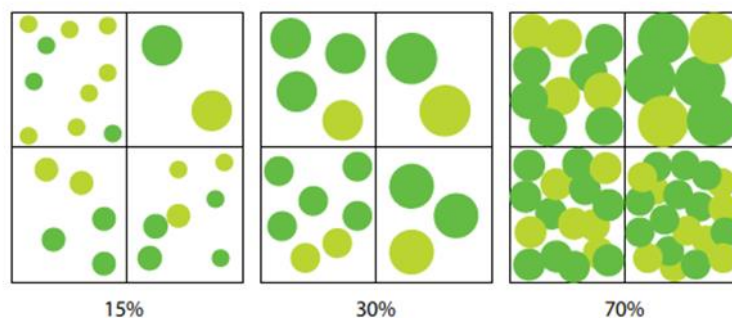


ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Fences within the APZ	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> 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





Shrub* and scrub* (0.5 metres to six metres in height). Shrub and scrub >6 metres in height are to be treated as trees.	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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.
Grass	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

B3: The Standards for the APZ as Established by the Local Government

Refer to the firebreak / hazard reduction notice issued annually (under s33 of the Bushfires Act 1954) by the relevant local government. It may state Standards that vary from those established by the Guidelines and that have been endorsed by the WAPC and DFES as per Section 4.5.3 of the Guidelines.

A copy of the applicable notice is not included here as they are subject to being reviewed and modified prior to issuing each year. Refer to ratepayers notices and/or the local government's website for the current version.

B4: Vegetation and Areas Excluded from Classification - Ensure Continued Exclusion

AS 3959:2018 establishes the methodology for determining a bushfire attack level (BAL). The methodology includes the classification of the subject site's surrounding vegetation according to their 'type' and the application of the corresponding relevant bushfire behaviour models to determine the BAL.

Certain vegetation can be considered as low threat or managed in a minimal fuel condition and can be excluded from classification. Where this has occurred in assessing the site, the extract from AS3959:2018 below states the requirements that must continue to exist for the vegetation on those areas of land to be excluded from classification (including the size of the vegetation area if relevant to the assessment).

15

AS 3959:2018

2.2.3.2 Exclusions—Low threat vegetation and non-vegetated areas

The following vegetation shall be excluded from a BAL assessment:

- (a) Vegetation of any type that is more than 100 m from the site.
- (b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.
- (c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other or of other areas of vegetation being classified vegetation.
- (d) Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.
- (e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.
- (f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks.

NOTES:

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

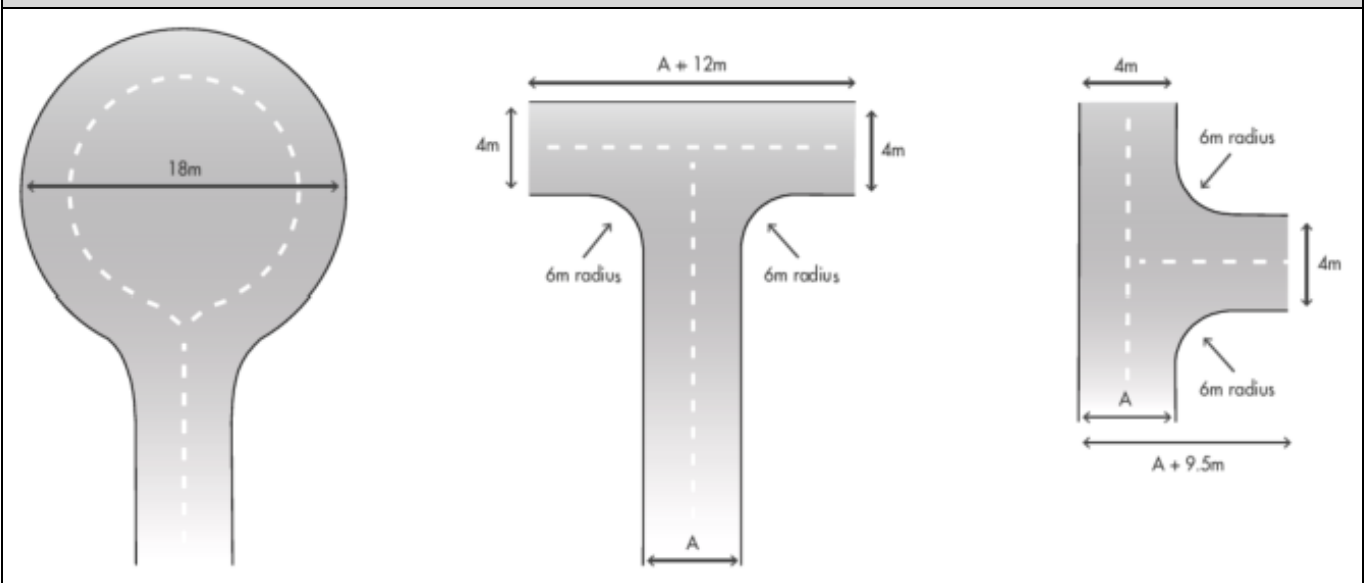
APPENDIX C: TECHNICAL REQUIREMENTS FOR VEHICULAR ACCESS

The design/layout requirements for access are established by the acceptable solutions of the Guidelines (DPLH, 2021 v1.4) Element 3 and vary dependent on the access component, the land use and the presence of 'vulnerable' persons. Consequently, the best reference source are the Guidelines. The technical requirements that are fixed for all components and uses are presented in this appendix.

GUIDELINES TABLE 6, EXPLANATORY NOTES E3.3 & E3.6 AND RELEVANT ACCEPTABLE SOLUTIONS

Technical Component	Vehicular Access Types / Components			
	Public Roads	Emergency Access Way ¹	Fire Service Access Route ¹	Battle-axe and Private Driveways ²
Minimum trafficable surface (m)	In accordance with A3.1	6	6	4
Minimum Horizontal clearance (m)	N/A	6	6	6
Minimum Vertical clearance (m)	4.5			
Minimum weight capacity (t)	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 (m)		8.5		

Turnaround Area Dimensions for No-through Road, Battle-axe Legs and Private Driveways ⁴



Passing Bay Requirements for Battle-axe leg and Private Driveway

When the access component length is greater than the stated maximum, passing bays are required every 200m with a minimum length of 20m and a minimum additional trafficable width of 2m (i.e. the combined trafficable width of the passing bay and constructed private driveway to be a minimum 6m).

Emergency Access Way – Additional Requirements

Provide a through connection to a public road, be no more than 500m in length, must be signposted and if gated, gates must be open the whole trafficable width and remain unlocked.

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% or 7.1 degree) entry and exit angle.

⁴ The turnaround area should be within 30m of the main habitable building.

APPENDIX D: TECHNICAL REQUIREMENTS FOR FIREFIGHTING WATER SUPPLY

D1: Reticulated Areas – Hydrant Supply

The Guidelines state "where a reticulated water supply is existing or proposed, hydrant connection(s) should be provided in accordance with the specifications of the relevant water supply authority."

The main scheme water suppliers / authorities in WA are The Water Corporation, AqWest – Bunbury Water Corporation and Busselton Water Corporation. Various local authority exists in other non-scheme and regional areas. However, most existing fire hydrants are connected to Water Corporation water mains.

Consequently, the hydrant location specifications from The Water Corporation's 'No 63 Water Reticulation Standard' (Ver 3 Rev 15) are provided in the extract below with the key distances relevant to bushfire planning assessments being highlighted. This Standard is deemed to be the baseline criteria for developments and should be applied unless different local water supply authority conditions apply. Other applicable specification will be found in the Standard.

Note: The maximum distance from a hydrant to the rear of a lot/building is generally interpreted as not applicable to large lot sizes where the maximum distance becomes an impractical limitation i.e., typically rural residential areas.

Design Standard DS 63
Water Reticulation Standard



2.2.1.5 Appurtenances

c. Hydrants

Hydrants shall be screw-down hydrant with built-in isolation valve and installed only on DN100 or larger pipes. Hydrants shall be located:

- so that the maximum distance between a hydrant and the rear of a building envelope, (or in the absence of a building envelope the rear of the lot) shall be 120m;
- so that spacing (as measured by hose-run) between hydrants in non-residential or mixed use areas shall be maximized and no greater than 100m;
- so that spacing (as measured by hose-run) between hydrants in residential areas with lots per dwelling <10,000m² shall be maximized and no greater than 200m;
- so that spacing between hydrants (as measured by hose-run) in rural residential areas where minimum lots per dwelling is >10,000 m² (1ha) shall be maximized and no greater than 400m;
- centrally along the frontage of a lot to avoid being under driveways, unless the lot features a frontage 6m or less, in which case it shall be placed to the side opposite the driveway;
- at lots that have the widest frontage in the local area;
- where appropriate at the truncation of road junctions or intersections so that they can serve more than one street and can be readily located;
- on both sides of the major roads at staggered intervals where there are mains on both sides of the road;
- at major intersections on dual multi-lane roads, where two hydrants are to be sited on diagonally opposite corners;
- hydrants should be located at least 20m from traffic calming devices i.e., median slow points or chokers, chicanes, mini traffic circles, and intersection 'pop-outs' to ensure traffic is not impeded;
- in a position not less than 10m from any high voltage main electrical distribution equipment such as transformers and distribution boards, liquefied petroleum gas or other combustible storage;
- directly on top of the main using a tee unless proved to be impractical.

D2: Non-Reticulated Areas – Static Supply

For specified requirements, refer to the Guidelines Element 4: Water – Acceptable Solution A4.2 , Explanatory Notes E4 (that provide water supply establishment detail under the headings of water supply; independent water and power supply; strategic water supplies, alternative water sources and location of water tanks) and the technical requirements established by Schedule 2 (reproduced below).

SCHEDULE 2: WATER SUPPLY DEDICATED FOR BUSHFIRE FIREFIGHTING PURPOSES

2.1 Water supply requirements

Water dedicated for firefighting should be provided in accordance with Table 7 below, and be in addition to water required for drinking purposes.

Table 7: Water supply dedicated for bushfire firefighting purposes

PLANNING APPLICATION	NON-RETICULATED AREAS
Development application	10,000L per habitable building
Structure Plan / Subdivision: Creation of 1 additional lot	10,000L per lot
Structure Plan / Subdivision: Creation of 3 to 24 lots	10,000L tank per lot or 50,000L strategic water tank
Structure Plan / Subdivision: Creation of 25 lots or more	50,000L per 25 lots or part thereof Provided as a strategic water tank(s) or 10,000L tank per lot

2.2 Technical requirements

2.2.1 Construction and design

An above-ground tank and associated stand should be constructed of non-combustible material. The tank may need to comply with AS/NZS 3500.1:2018.

Below ground tanks should have a 200mm diameter access hole to allow tankers or emergency service vehicles to refill direct from the tank, with the outlet location clearly marked at the surface. The tank may need to comply with AS/NZS 3500.1:2018. An inspection opening may double as the access hole provided that the inspection opening meets the requirements of AS/NZS 3500.1:2018. If the tank is required under the BCA as part of fire hydrant installation, then the tank will also need to comply with AS 2419.

Where an outlet for an emergency service vehicle is provided, then an unobstructed, hardened ground surface is to be supplied within four metres of any water supply.

2.2.2 Pipes and fittings

All above-ground, exposed water supply pipes and fittings should be metal. Fittings should be located away from the source of bushfire attack and be in accordance with the applicable section below, unless otherwise specified by the local government.

2.2.2.1 Fittings for above-ground water tanks:

- Commercial land uses: 125mm Storz fitting; or
- Strategic water tanks: 50mm or 100mm (where applicable and adapters are available) male camlock coupling with full flow valve; or
- Standalone water tanks: 50mm male camlock coupling with full flow valve; or
- Combined water tanks: 50mm male camlock coupling with full flow valve or a domestic fitting, being a standard household tap that enables an occupant to access the water supply with domestic hoses or buckets for extinguishing minor fires.

2.2.2.2 Remote outlets

In certain circumstances, it may be beneficial to have the outlet located away from the water supply. In such instances in which a remote outlet is to be used, the applicant should consult the local government and DFES on their proposal.

EXAMPLE CONSTRUCTION AND FITTINGS



Strategic 47,000 Litre Concrete Tank & Protected Fittings



10,000 Litre Concrete Tank

Storz and Camlock Couplings



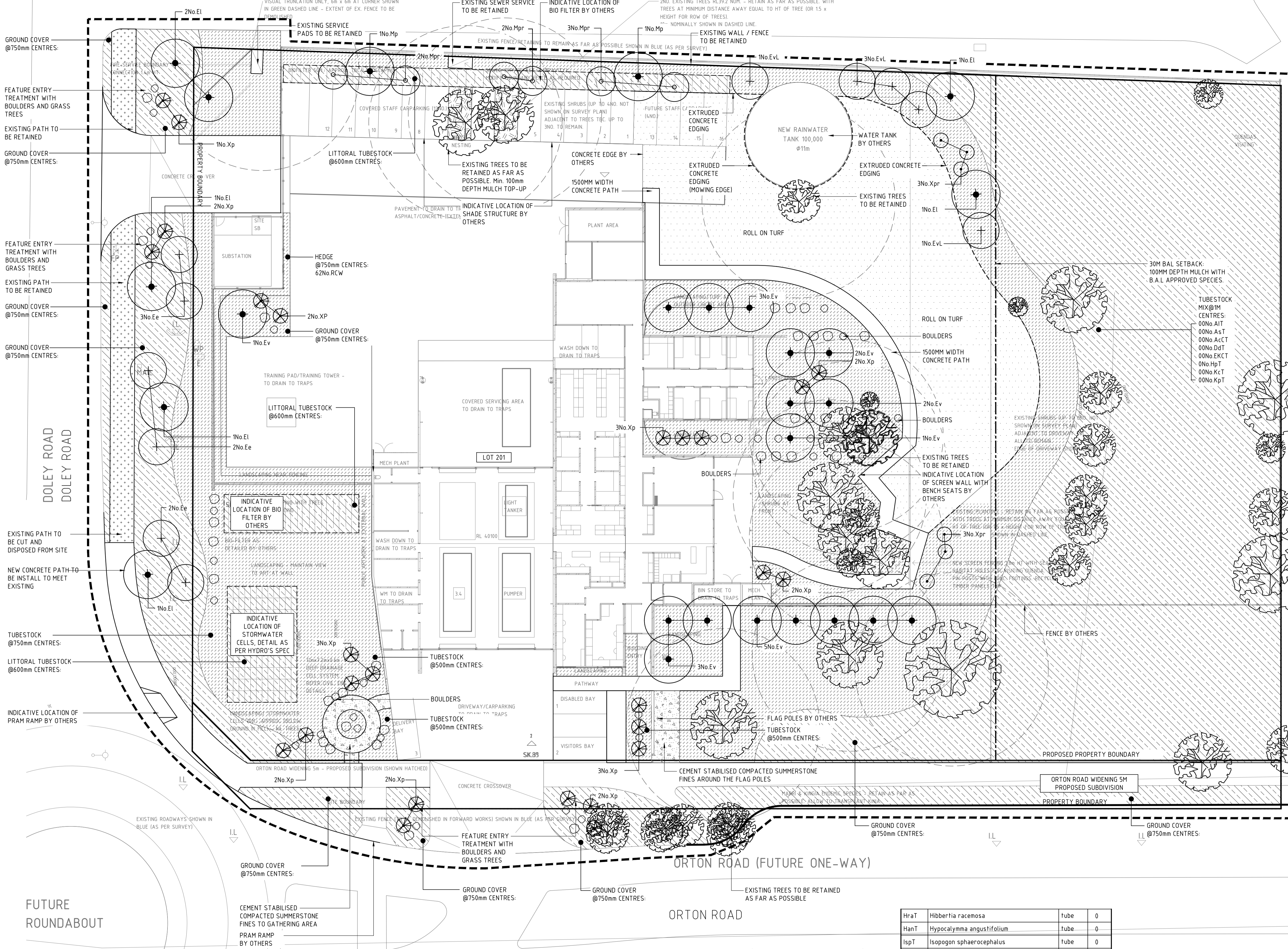
Full Flow 50mm Ball Valve

Full Flow 50mm Gate Valve and Male Camlock

ADDENDUM:

- Landscape Plan – Prepared by EPCAD Pty Ltd

This Page has been intentionally left blank.



LEGEND

- EXTENT OF LANDSCAPE WORKS IN THIS CONTRACT
- LOT BOUNDARY
- BAL SETBACK
- EXISTING PATH TO BE RETAINED
- EXISTING TREES TO BE RETAINED & PROTECTED
- 200 LITRE TREES
- 100 LITRE TREES
- 45 LITRE TREES
- GRASS TREE TRANSPLANTED (NURSERY STABILISED)
- GRASS TREE TRANSPLANTED FROM ORTON ROAD VERGE
- ROOT CONTROL BARRIERS
- IRRIGATED SHRUB / TUBESTOCK PLANTING WITH Min 75mm DEPTH MULCH TOP-UP
- NON-IRRIGATED TUBESTOCK PLANTING (WINTER PLANTING JUN-AUT)
- MULCH ONLY SURFACE (100mm DEPTH)
- IRRIGATED ROLL ON TURF
- CEMENT STABILISED COMPACTED SUMMERSTONE FINES, REFER 4/L02
- EXTRUDED CONCRETE EDGE, REFER 5/L02
- LATERITE BOULDERS SIZE TO VARY (300-800mm DIAMETER), REFER 6/L02

- ### GENERAL NOTES:
- THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL OTHER COMPONENTS OF THE CONTRACT PACKAGE. IN THE EVENT OF CONFLICTS OR CLASHES THE CONTRACTOR MUST NOTIFY THE SUPERINTENDENT.
 - REFER TO ARCHITECTURAL DRAWINGS FOR LEVELS & SETOUT OF PAVING SURROUNDING BUILDINGS.
 - REFER TO CIVIL ENGINEERS AND/OR ARCHITECTURAL DRAWINGS FOR LEVELS & SETOUT OF RETAINING WALLS, SERVICES, DRAINAGE INFRASTRUCTURE AND STRUCTURES.
 - EXISTING TREES TO BE TRIMMED, CUT BACK OR REMOVED AS REQUIRED TO MEET THE STANDARDS FOR ASSET PROTECTION ZONES AS HIGHLIGHTED IN THE BUSHFIRE MANAGEMENT PLAN.
 - ALL TREES WITHIN 1M OF KERB / FOOTPATH / HARD SURFACE TO BE INSTALLED WITH ROOT BARRIER AS SPECIFIED.
 - ALL SCALES ARE AS NOTED TO SUIT A1 PAPER SIZE.
 - FOR ALL ASSOCIATED IRRIGATION DESIGN REFER TO IRRIGATION DOCUMENTATION AND SPECIFICATION.
 - RETAIN OR CAP EXISTING RETICULATION WHERE POSSIBLE ALONG ALL STREETS CAPES.
 - ALL PLANTING TO BE IRRIGATED VIA A FULL AUTOMATIC SYSTEM FROM RAINWATER TANK AND MAINS CONNECTION.

B	ISSUED FOR APPROVAL	KW	24/023	JH
A	ISSUED FOR INFORMATION	KW	19/222	JH
No	AMENDMENT	DWN	DATE	CHKD

EPCAD

EPCAD Pty Ltd
28-30 Mayfair Street
West Perth Western Australia 6005
epcad@epcad.com.au
Tel 08 94814140 Fax 08 94816903

PO Box 1233 West Perth WA 6872
epcad@epcad.com.au
Tel 08 94814140 Fax 08 94816903

Government of Western Australia
Department of Finance
Building Management and Works

PLANT SCHEDULE

TREES (IRRIGATED)	SIZE	QTY
Ee Eucalyptus erythrocorys	100L	0
EI Eucalyptus leucoxyton 'Euky Dwarf'	200L	0
EIE Eucalyptus leucoxyton 'Euky Dwarf'	100L	0
Ev Eucalyptus victrix 'Little Ghost Gum'	200L	0
Mp melaleuca preissiana	200L	0
Mpr melaleuca preissiana	45L	0
Xp Xanthorrhoea preissii	MATURE TRANSPLANT	0

SHRUBS (IRRIGATED)

RCW	Rhaphiolepis indica 'Cosmic White'	200mm	750mm	0
-----	------------------------------------	-------	-------	---

TUBESTOCK MIX (NON-IRRIGATED) @500mm, 750mm & 1000mm CENTRES OR REFER CALLOUT

AIT	Acacia lasiocarpa 'Prostrate Variety'	tube	0
AsT	Acacia saligna 'Prostrate Variety'	tube	0
AcCT	Adenanthos cuneatus 'Coral Carpet'	tube	0
BaT	Banksia ashbyi 'dwarf'	tube	0
BbT	Banksia blechnifolia	tube	0
CaST	Chrysocephalum apiculatum 'Silver Sunburst'	tube	0

DICT

Dampiera linearis 'Cobalt Mound'	tube	0
DdT Dampiera diversifolia	tube	0
EKCT Eremophila 'Kalbarri Carpet'	tube	0
EnT Eremophila nivea x drummondii	tube	0
HpT Hemidra pungens	tube	0
HsT Hibbertia scandens	tube	0
KcT Kennedia coccinea	tube	0
KpT Kennedia prostrata	tube	0
LLCT Lomandra 'Little Con'	tube	0
OaT Olearia axillaris 'Mini'	tube	0
PaT Patersonia occidentalis	tube	0

ApuT	Acacia pulchella	tube	0
AviT	Anigozanthos viridis	tube	0
BniT	Banksia nivea	tube	0
BsqT	Beaufortia squarrosa	tube	0
CaCT	Conostylis aculeata	tube	0
DdeT	Daviesia decurrens	tube	0
EpaT	Eremaea pauciflora	tube	0
GmaT	Gompholobium marginatum	tube	0
GbiT	Grevillea bipinnatifida	tube	0
HsuT	Hakea sulcata	tube	0
HhyT	Hibbertia hypericoides	tube	0

LITTORAL TUBESTOCK MIX (NON-IRRIGATED) @600mm CENTRES OR REFER CALLOUT

Bar	Baumea articulata	tube	0
Bpr	Baumea preissii	tube	0
Cap	Carex appressa	tube	0
Fno	Ficinia nodosa	tube	0
Jkr	Juncus kraussii	tube	0
Jpa	Juncus pallidus	tube	0
Llo	Lepidosperma longitundine	tube	0

PLANT NOTE:
BaT & EnT are to be planted 15m back from roads, footpaths & buildings within shrub mix.

In the event of a size or species being unavailable at time of ordering, the contractor shall seek an alternative substitute and present these to the superintendent for approval.

Min. 600mm mulch strip set back from back of kerb.

Root control barriers to all irrigated trees.

LANDSCAPE

Cardon Career Fire Station
DEPARTMENT OF FIRE AND EMERGENCY SERVICES
169 Dooley Road, Byford 6122

LANDSCAPE PLAN

DRAWN	KW	DESIGNED	KW	REDUCTION
CHECKED	JH	PRINCIPAL		0 2 4m
APPROVED	JH			
SCALE	1:200 @ A1	DATE	December 2022	DRAWING No.
DF PROJ No.	00000	DF FILE No.	2022/00000	L01 A

THIS IS A CADD DRAWING DO NOT AMEND MANUALLY
Ordinary Council Meeting - 15 May 2023
OKA PROJECT NO. LFS1016



Perth (Head Office)
12 Monger Street
Perth WA 6000

T +61 (0)8 9227 9355
F +61 (0)8 9227 5033

www.syrinx.net.au
ABN: 39 092 638 410



CARDUP CAREER FIRE AND RESCUE SERVICE (CFRS) FIRE STATION

ENVIRONMENTAL MANAGEMENT PLAN

January 2023

For Iredale Pedersen Hook Architects



Document Control

Report **22053RPT001**

Version	Date	Prepared by	Approved	Issue Details
1	06.01.23	JK, RT, JF	JK	Draft for comment

Limitations of Report

Syrinx Environmental PL has prepared this report as a professional consultant. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for the use, perusal or otherwise, by parties other than the Client, the Owner and their nominated consulting advisors without the consent of the Owner. No further information can be added without the consent of the Owner, nor does the report contain sufficient information for purposes of other parties or for other uses. The information contained in this report has been prepared in good faith, and accuracy of data at date of issue has been compiled to the best of our knowledge. However, Syrinx Environmental PL is not responsible for changes in conditions that may affect or alter information contained in this report before, during or after the date of issue.

Syrinx Environmental PL accepts site conditions as an indeterminable factor, creating variations that can never be fully defined by investigation. Measurements and values obtained from sampling and testing are indicative within a limited time frame and unless otherwise specified, should not be accepted as actual realities of conditions on site beyond that time frame.

© 2023 Syrinx

Except as provided by the Copyright Act 1968, no part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means without the prior written permission of Syrinx Environmental PL. Enquiries should be directed to the Corporate Intellectual Property Officer.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****TABLE OF CONTENTS**

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	1
1.1 BACKGROUND TO THE EMP	1
1.1.1 Purpose of the EMP	1
2.0 ENVIRONMENTAL CONTEXT	2
2.1 SITE LOCATION AND PLANNING CONTEXT	2
2.2 HISTORIC AND EXISTING LAND USE	3
2.3 LANDFORM AND TOPOGRAPHY	3
2.4 CLIMATE	4
2.4.1 Climate Change	4
2.5 GEOLOGY AND SOILS	5
2.5.1 Acid Sulphate Soils	6
2.5.2 Contamination	7
2.6 HYDROLOGY	7
2.6.1 Surface water flows and flooding	7
2.6.2 Surface water quality	9
2.6.3 Groundwater flows and levels	11
2.6.4 Groundwater quality	12
2.6.5 Potable water	12
2.6.6 Wetlands	12
2.7 FLORA AND VEGETATION	13
2.7.1 Bush Forever Sites	14
2.8 ENVIRONMENTALLY SENSITIVE AREAS	15
2.8.1 Ecological Linkages	15
2.9 FAUNA	15
2.10 HERITAGE	16
2.10.1 Indigenous heritage	16
2.10.2 Non-Indigenous Heritage	17
2.11 UNCERTAINTIES	17
3.0 CFRS FIRE STATION DEVELOPMENT	18
3.1 CONSTRUCTION STAGE	19
3.2 OPERATIONAL STAGE	20
3.2.1 Roads and traffic	20
3.2.2 Site Activities	21
4.0 ENVIRONMENTAL MANAGEMENT	22
4.1 ROLES AND RESPONSIBILITIES	22
4.2 APPROACH AND RATIONALE	22
4.3 STATUTORY REQUIREMENTS	22
4.4 SUMMARY OF KEY MANAGEMENT ISSUES	23

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

4.5	SOIL AND LANDFORM MANAGEMENT	24
4.5.1	Objectives	24
4.5.2	Rationale/Potential Impacts	24
4.5.3	Legislative and other requirements	24
4.5.4	Management actions, targets and evidence	26
4.6	ACID SULPHATE SOILS MANAGEMENT	29
4.6.1	Objectives	29
4.6.2	Rationale/Potential Impacts	29
4.6.3	Legislative and other requirements	29
4.6.4	Management actions, targets and evidence	31
4.7	SPILL PREVENTION	33
4.7.1	Objectives	33
4.7.2	Rationale/Potential Impacts	33
4.7.3	Legislative and other requirements	33
4.7.4	Management actions, targets and evidence	34
4.8	WATER MANAGEMENT (SURFACE, GROUND AND POTABLE WATER)	35
4.8.1	Objectives	35
4.8.2	Rationale/Potential Impacts	35
4.8.3	Surface water impacts	35
4.8.4	Groundwater impacts	36
4.8.5	Legislative and other requirements	36
4.8.6	Management actions, targets and evidence	38
4.9	FLORA AND VEGETATION MANAGEMENT	43
4.9.1	Objectives	43
4.9.2	Rationale/Potential Impacts	43
4.9.3	Legislative and other requirements	43
4.9.4	Management actions	45
4.10	FAUNA MANAGEMENT	50
4.10.1	Objectives	50
4.10.2	Rationale/Potential Impacts	50
4.10.3	Legislative and other requirements	50
4.10.4	Management actions, targets and evidence	52
4.11	HERITAGE MANAGEMENT	55
4.11.1	Objectives	55
4.11.2	Rationale/Potential Impacts	55
4.11.3	Legislative and other requirements	55
4.11.4	Management actions, targets and evidence	57
4.12	FIRE MANAGEMENT	58
4.12.1	Objectives	58
4.12.2	Rationale/Potential Impacts	58
4.12.3	Legislative and other requirements	58
4.12.4	Management actions, triggers, and indicators	59
4.13	WASTE MANAGEMENT	61
4.14	NOISE AND VIBRATION MANAGEMENT	61
4.14.1	Objectives	61
4.14.2	Rationale	61

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

4.14.3	Legislative and other requirements	61
4.14.4	Management actions, targets and evidence	63
4.15	AIR QUALITY MANAGEMENT	66
4.15.1	Objectives	66
4.15.2	Rationale/Potential Impacts	66
4.15.3	Legislative and other requirements	66
4.15.4	Management actions, targets and evidence	67
4.16	ACCESS MANAGEMENT (INCLUDES TRAFFIC AND PUBLIC SAFETY)	68
4.16.1	Objectives	68
4.16.2	Rationale	68
4.16.3	Legislative and other requirements	68
4.16.4	Management actions, targets and evidence	69
5.0	INCIDENT MANAGEMENT	71
5.1.1	Objectives	71
5.1.2	Scope	71
5.1.3	Legal and other requirements	71
5.1.4	Management actions, targets and evidence	73
6.0	REPORTING	74
7.0	TRAINING AND AWARENESS	74
8.0	MONITORING, MANAGEMENT REVIEW AND REVISION	74
8.1.1	Monitoring, management review and revision	74
	REFERENCES	76
	APPENDICES	78

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****LIST OF TABLES**

Table 1. Development Features	18
Table 2. Key legislation that applies specific criteria for soil and landform management	24
Table 3. Key management actions for soil and landform management	26
Table 4. Key legislation that applies specific criteria to acid sulphate soil management	30
Table 5. Key Management Actions for ASS / PASS management	31
Table 6. Key legislation that applies specific criteria to spill management and prevention.	33
Table 7. Key management actions for spill prevention and management	34
Table 8. Key legislation related to surface and groundwater management.	36
Table 9. Key management actions for surface and groundwater management	38
Table 10. Key legislation that applies to flora and vegetation management.	44
Table 11. Key management actions for flora and vegetation management.	45
Table 12. Key legislation that applies to fauna management.	51
Table 13. Key management actions for Fauna Management.	52
Table 14. Key legislation that applies to heritage management.	55
Table 15. Key management actions for heritage management,	57
Table 16. Key legislative requirements for fire management.	58
Table 17. Key management actions for fire management.	59
Table 18. Key legislative requirements for noise and vibration management.	61
Table 19. Key management actions for noise management.	63
Table 20 Key management actions for vibration management.	64
Table 21. Key legislation that applies to air quality management.	66
Table 22. Key management actions for fire management.	67
Table 23. Key legislative requirements for traffic and public safety.	68
Table 24. Key management actions for access management.	69
Table 25. Key legislation that applies specific criteria to incident management.	72
Table 26. Key management actions for incident management.	73

LIST OF FIGURES

Figure 1. CFRS Site Location	2
Figure 2. The Site and surrounding areas elevation	4

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Figure 3. Differences in annual mean sea surface temperatures and temperatures over land in the Australian Region (CSIRO, 2022).	5
Figure 4. Soil Landscape Units and the Acid Sulphate Soils Risk Mapping for the Project Area	6
Figure 5. Wetlands, waterways, and floodplain areas in relation to the Site	8
Figure 6. Modelled 1% AEP depth of inundation (DoW 2008) – Site shown in white	8
Figure 7. Upper Serpentine Catchment (DWER, 2018 and 2017)	9
Figure 8. Upper Serpentine River N and P fractions, concentrations, flows in 2018 (DWER 2018)	10
Figure 9. Upper Serpentine River N and P concentrations, loads, flows 2004-2018 (DWER 2018)	10
Figure 10. Modelled groundwater levels for the site and the immediate surrounds (DoW, 2008)	11
Figure 11. Vegetation Complexes, Bush Forever Sites, Regional Ecological Linkages and the ESA Boundary	13
Figure 12. Registered and Other Aboriginal Heritage Sites in proximity to the Site.	17

LIST OF APPENDICES

APPENDIX 1 Management Actions	79
APPENDIX 2 Guildford Vegetation Listing	80
APPENDIX 3 Waste Management Plan	85

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****EXECUTIVE SUMMARY**

This Environmental Management Plan (EMP) has been prepared to support the Development Application for the Cardup Career Fire and Rescue Service (CFRS) Fire Station (or “the Site”). The EMP identifies key environmental values, impacts and management measures for implementation during the design, construction and operational phases of the Cardup CFRS facility and its associated operational activities.

Potential environmental impacts to the key environmental values listed below were identified with respect to the project as a whole:

- Underlying soils and geomorphology;
- Hydrology of the area, wetlands and drainage; and
- Native flora and fauna, including that of the adjacent reserves.

This EMP details environmental context, management guidelines, strategies, and actions created to avoid and/or minimise environmental impacts to the values listed above and includes:

- Environmental context for the Site to provide a rationale for protection of the environmental values and develop targeted management strategies;
- An outline of statutory requirements, environmental commitments and Shire policies and guidelines that must be met as part of the environment management of the Site;
- An outline of the roles and responsibilities of DFES, facility staff and the construction contractor;
- Outline of environmental impacts that pose risk to environmental values as a result of construction and operation of the Site;
- Presentation of environmental objectives and management actions required to protect the environmental values; and
- Outline of the key management actions to maintain compliance with statutory requirements, environmental commitments and Shire policies and guidelines.

The key management actions relevant to the Site are presented in full as Appendix 1 and detailed in this EMP. Objective based actions have largely been chosen for this EMP due to the difficulty in determining measurable environmental outcomes from the identified potential environmental impacts. Given the scale of environmental impact possibly arising from the site’s construction and operation and the likely resources available, it is more appropriate to monitor the effectiveness of the actions as opposed to setting trigger/threshold values for impacts not readily able to be measured/articulated. Where possible outcome-based management actions have been implemented in accordance with EPA EMP guidance.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Upon construction of the Site, this EMP shall be reviewed and updated according to its eventual final state and operations.

Monitoring and evaluation of the EMP performance shall be instituted by DFES and the Site management with the EMP to be updated accordingly. Any necessary amendments shall be made to the environmental management actions to ensure that best management practices are always implemented. In addition, the EMP shall undergo a detailed review every three (3) years or when significant change to site infrastructure or operational activities occur.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN**1.0 INTRODUCTION****1.1 BACKGROUND TO THE EMP**

The Shire of Serpentine Jarrahdale (the Shire) is experiencing a period of rapid urban growth to meet the demand of the residential housing market. The current development is in a densifying urban area within the Shire and requires the built infrastructure and services to meet the increased population needs. In a response to rapid urbanisation and the increase in population, the State government is building a new Career Fire and Rescue Service (CFRS) Fire Station at Cardup to support Department of Fire and Emergency Services (DFES) to maintain rapid and efficient emergency response times in the Shire and the surrounding areas.

This document, an Environmental Management Plan (EMP), has been prepared to support the development application (DA) for the Cardup CFRS station (the Site or the Development).

The Shire and WA State government has a mandate to enable the development of a well-designed building and associated infrastructure that establishes environmentally sound, socially responsible, and sustainable operations to meet the demands of the community and relevant regulatory frameworks.

1.1.1 Purpose of the EMP

The purpose of this EMP is to identify impacts to the environmental and social values of the Site and the surrounding areas and outline appropriate management measures so that the identified impacts to the environment and social values of the Site are acceptable or mitigated to an acceptable level. The scope of this EMP covers the design, construction, and operational phases of the Cardup CFRS.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

2.0 ENVIRONMENTAL CONTEXT

2.1 SITE LOCATION AND PLANNING CONTEXT

The proposed CFRS development area (the Site) is located in the Shire of Serpentine Jarrahdale Local Government Areas (LGA) approximately 45 km southeast of Perth Central Business District (CBD).

The Site (Lot 201) has a total area of 8,626 m² and is positioned on the northeast side of the Doley and Orton Roads intersection, south of Yandra Street and west of Lot 9007 (Figure 1).

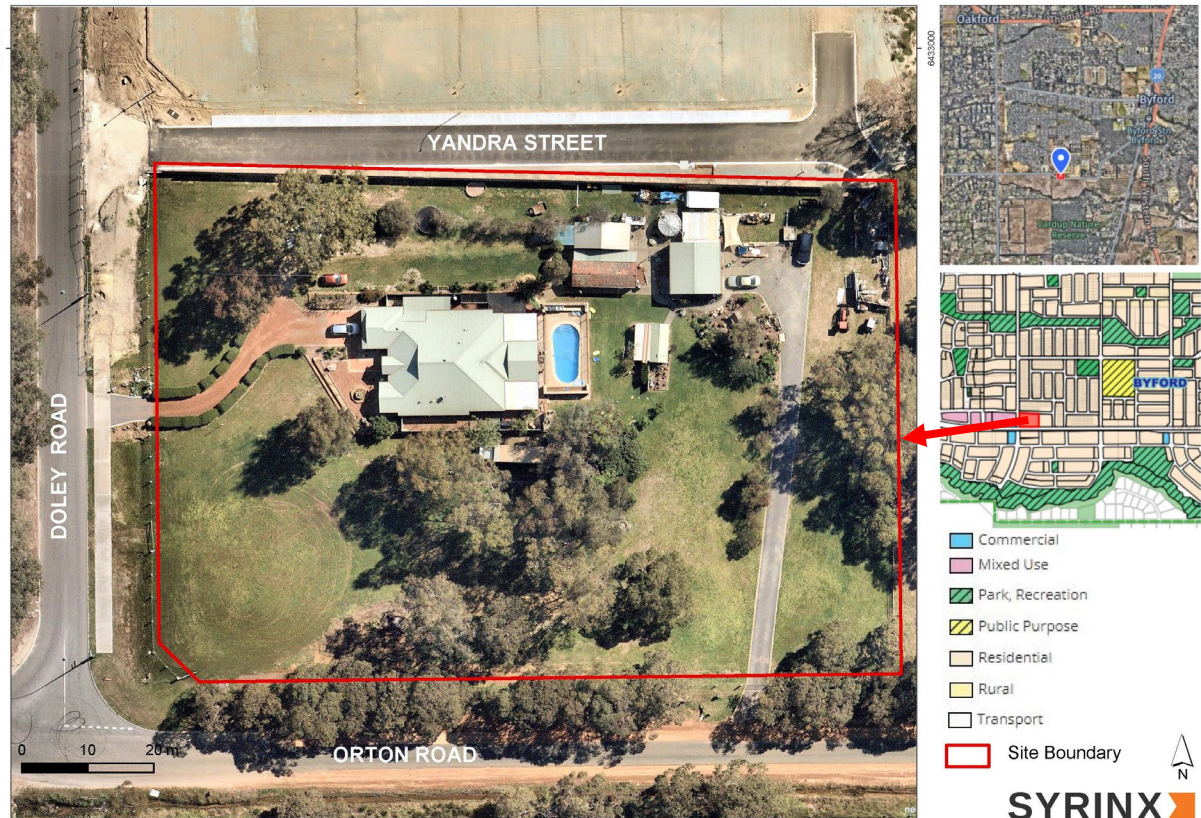


Figure 1. CFRS Site Location

To the north and east the Site is surrounded by residential development. To the west and south is cleared undeveloped land which is set aside for the future residential and a small number of mixed-use development lots.

Prior to the Development, the Site was occupied by a vacant single storey residential building (Figure 1), with a swimming pool located on the eastern portion of the Site. To the northeast were a number of small buildings/sheds/garages and the parking area. The remainder of the Site was covered by grass and several mature trees.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****2.2 HISTORIC AND EXISTING LAND USE**

The Site is currently zoned 'Urban' under the Metropolitan Region Scheme (MRS) and 'Urban Development' in the Shire of Serpentine Jarrahdale's (SSJ) Town Planning Scheme No. 2. Prior to the development the site accommodated a residential property and a number of sheds.

The review of historical aerial photography on the Landgate map viewer indicates that while the Site was cleared prior of 1953 the existing residence was not built until 2005 (Aurora, 2022) with some of the sheds at the back of the property built earlier between 1985 – 2003.

Given the long-term clearing of vegetation (clearing in Byford area started during the 1920s) the soils are highly unlikely to contain a native seed bank and the soil microbiota would likely be very different to the natural bushland areas despite the apparent lack of land cultivation.

The Site is surrounded by residential properties to the north and east and vacant land to the west and south.

Visually, the Site does not offer high amenity, however, the trees on site, particularly the remnant Marri provide a sense of place in the surrounding cleared landscape.

2.3 LANDFORM AND TOPOGRAPHY

The landform of the Site and the immediate surrounds is low lying/flat (Pinjarra Plain) to very gently sloping towards local creeks/waterways. The landform is primarily of alluvial origin, formed by the creeks which are tributaries to the Canning River. As such, the Site is located on the floodplain of these watercourses.

The topography of the Site is very gently sloping to flat at approximately 1%, and the elevation varies between 39 meters Australian Height Datum (m AHD) at the western boundary to 40 m AHD at the eastern boundary. The overall land surface area is sloping towards west to northwest and the Beenyup Brook Drain (Figure 2).

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

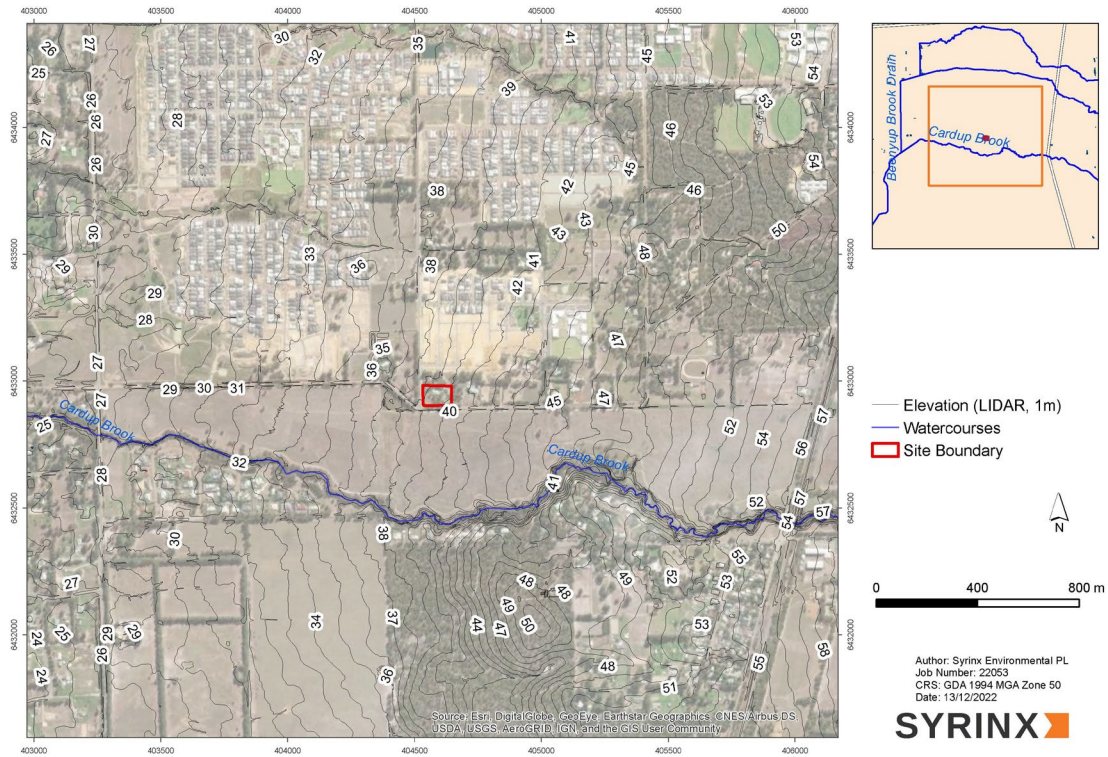


Figure 2. The Site and surrounding areas elevation

2.4 CLIMATE

The Site experiences a Mediterranean climate pattern, typically characterised by wet winter months (June to August), and dry summer (December to February). The closest long-term data for climate that relate to the area are available from Jandakot Airport station 18.5 km in a NW direction from the Site and Cardup weather station 3 km in a SE direction from the Site.

The average annual temperature is 24.6 °C and annual rainfall is approximately 858.7 mm.

2.4.1 Climate Change

The threats caused by climate change, including droughts, extreme rainfall (such as the recent rainfall 2021 – 22 in the eastern states), bushfires and heatwaves are having widespread impacts on Australia’s agricultural industry, economy, and society.

The significant and lasting change to weather patterns based on statistical analysis of yearly, decadal, or longer periods of data is collectively termed as the climate change. The report on the State of the Climate 2022 (Commonwealth Scientific and Industrial Organisation [CSIRO], 2022) indicates a drying trend across Australia (Figure 3). The southwest region had the most sustained large-scale change in observed rainfall since widespread observations became available in the late 1880s. The trend is particularly strong for the period from May to July with rainfall since 1970 around 19 % less than the average from 1900–69. Over the full April to October season the decline over the same period is around 15 %. Since 2000, this decline has increased to around 27 %, despite relatively high cool season rainfall during 2021 (CSIRO, 2022).

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

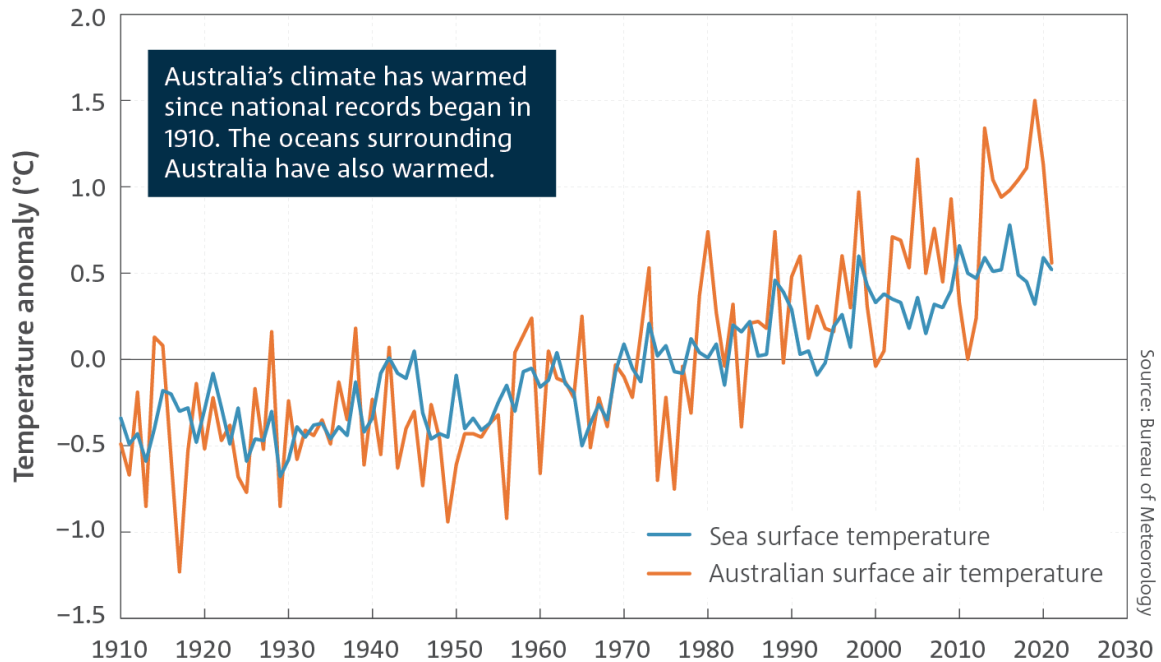


Figure 3. Differences in annual mean sea surface temperatures and temperatures over land in the Australian Region (CSIRO, 2022).

The continued drying, especially during winter and spring periods affect growth and reproduction of many plant species. As a result, this can influence not only the survival of specific plant species but also a number of invertebrates and fauna dependant on the seed, nectar or other resources. Ingress of weeds which have a short lifespan that can adapt to short rainfall season may out-compete the native flora and cause permanent change to the biodiversity.

The length of the fire seasons has also increased and an increase in the number of dangerous fire weather days is also expected to continue into the future due to the increased number of high temperature days.

Acknowledging climate change as an environmental factor that can negatively affect the environmental management of the Site is the first step in determining an appropriate management framework. It also allows for an identification of opportunities to contribute to reversing localised negative impacts of climate change.

2.5 GEOLOGY AND SOILS

The surface geology mapping (Jordan, 1986) shows that the Site and the immediate surrounds are underlain by clayey sand of alluvial origin over sedimentary rocks. Soil landscape mapping (Department of Primary Industries and Regional Development [DPIRD], 2017, Figure 4) describes the soils of the Site as deep acidic mottled yellow duplex comprising shallow pale sand to sandy loam over very gravelly clay that are moderately to well drained. A recent geotechnical investigation for the Site by ATC Williams (2022) found the soil profile generally consists of 0.1-0.2 m of topsoil, underlain by 0.5-1.0 m of grey Bassendean Sand (silty sand), underlain by brown Guildford Clay (clayey sand) thereafter, correlating with surface geology and soil landscape mapping.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

While soil permeability might be moderate, the soil properties at the Site are heavily influenced by the waterlogging caused by flat topography. Due to this, the soils are termed to be 'reactive' and can shrink or swell considerably which can affect the building design and maintenance. Soil testing by ATC (2022) as part of the geotechnical investigation estimates likely seasonal soil movement of approximately 4.5 mm assuming a minimum of 0.65 m of nonreactive sandy cover (sand with less than 5% fines) is maintained across the proposed building footprint. Although no soil permeability testing was undertaken, the ATC investigation report states that the site soils in their current state are not suitable for stormwater disposal via conventional soak wells and recommends drainage of the upper sand layer via subsoil drains to mitigate soil shrink:swell movement.

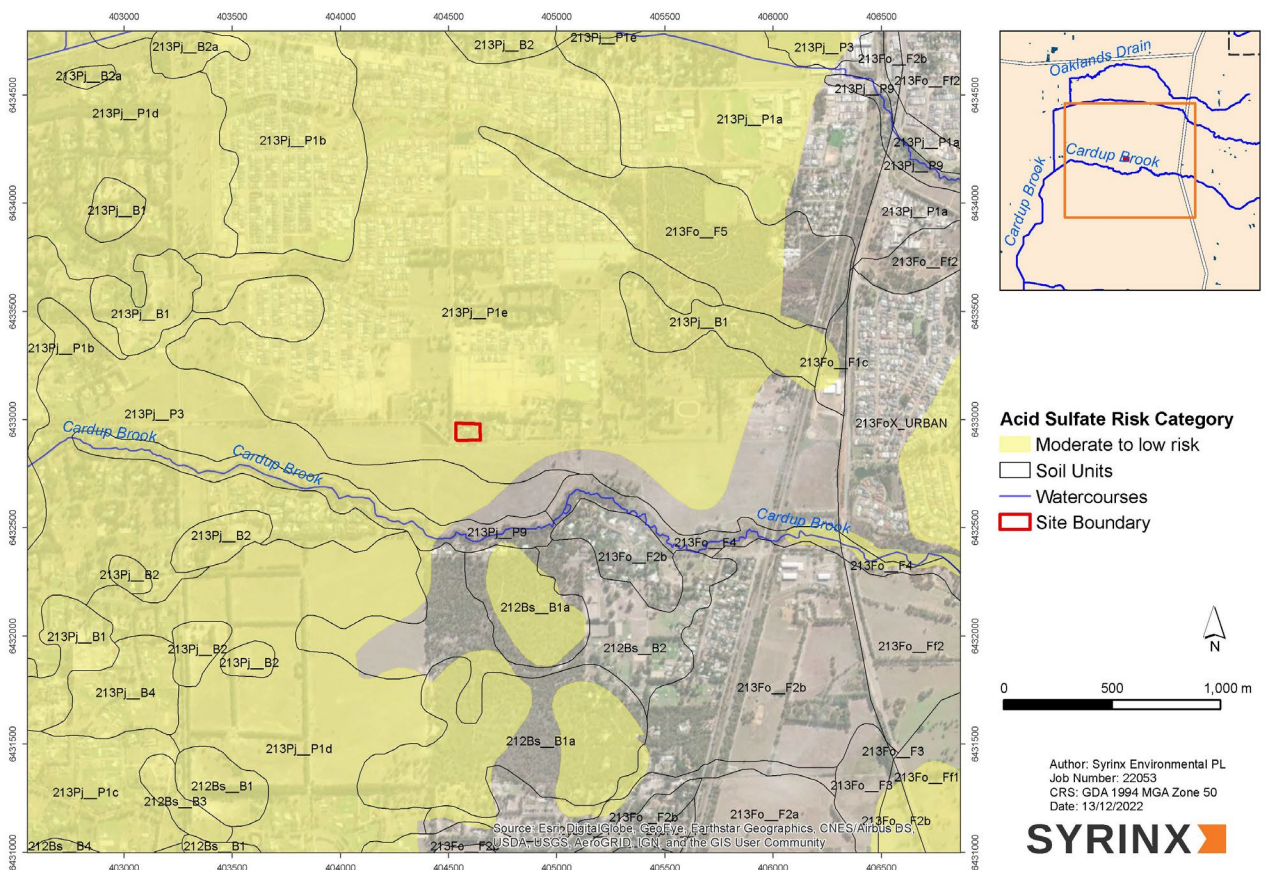


Figure 4. Soil Landscape Units and the Acid Sulphate Soils Risk Mapping for the Project Area

2.5.1 Acid Sulphate Soils

Acid Sulphate Soils (ASS) are naturally occurring soils containing iron sulphide minerals (most commonly pyrite) formed under saturated anoxic conditions. In an undisturbed state below the water table, these soils are benign and non-acidic. However, if the soils are exposed to oxygen through activities such as drainage, excavation or dewatering, the sulphides may react with oxygen to form sulphuric acid. ASS can be present in the form of:

- Potential Acid Sulphate Soils (PASS) – soil that contains unoxidized iron sulphides. When exposed to oxygen through drainage or disturbance, these soils produce sulphuric acid; and

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

- Actual Acid Sulphate Soils (AASS) – PASS that has been exposed to oxygen and water and has generated acidity.

Current mapping by the Department of Water and Environmental Regulation (DWER) indicates that the risk of ASS occurring within 3 m of natural soil surface of the project area is moderate to low and is associated with the palusplain wetland (Figure 5).

No ASS testing was conducted for the Site as under current planning, excavations for the removal of existing site infrastructure are unlikely to go past 0.5 meters below ground level (m bgl).

2.5.2 Contamination

Examination of the Contaminated Soils Database (DWER, 2022a) shows that no contaminated sites occur within or adjacent to the Site. The presence of contaminated soils within the Site is unknown.

The nearest contaminated site is located within a section of the Mercury Terrace Road reserve, located 1.8 km northwest of the Site. To summarise the contaminated site, following remediation, hydrocarbons (such as from transformer oil), remain present in soil beneath a pad-mounted transformer. The Site is not likely to be impacted by this contamination due to distance and the regional groundwater flow direction.

2.6 HYDROLOGY

2.6.1 Surface water flows and flooding

There are no surface water bodies at the Site, and the surface water runoff (rainfall) is currently infiltrated on-site or drained via a road swale/drain network to the west and south of the Site boundary. Given the flat topography (~1% grade) and sandy upper/clayey lower soil profile (refer Section 2.5), most rainfall events will soak in and perch on the clayey soil layer, before being evapotranspired or gradually flowing west as groundwater. Very high intensity and very high volume events will exceed the infiltration capacity of the sandy upper soil layer, and runoff to the west into the road drainage network. This stormwater is conveyed eventually to Cardup Brook located south of the Site (Figure 5).

The mapped 1% Annual Exceedance Probability (AEP) floodplain area (DWER 2018) and 1% AEP floodplain Development Control Area (DCA) (DWER 2018) are shown in Figure 5. The DCA delineates land that may be affected by 1% AEP flooding and therefore subject to development controls. The figure appears to show that the site is located some 300 m outside the 1% AEP DCA; however, the abrupt end of the shapes along Hopkinson Road indicates the Site may be beyond the limit of the mapping, or subject to a different regional 1% AEP flood model.

Regional flood modelling undertaken as part of the *Byford townsite drainage and water management plan* (Department of Water [DoW] 2008) shows the site is within the shallow (< 0.15 m depth) inundation zone for the 1% AEP event (Figure 6). The Byford DWMP thus recommends a number of control measures to be implemented on-site in response to flooding, detailed in Section 4.8.

The surface water regime and site geology (Section 2.5) indicate that whilst there is potential for on-site infiltration in the upper soil layers, design provisions must be made for waterlogging and regional flooding. This is detailed in Section 4.8.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

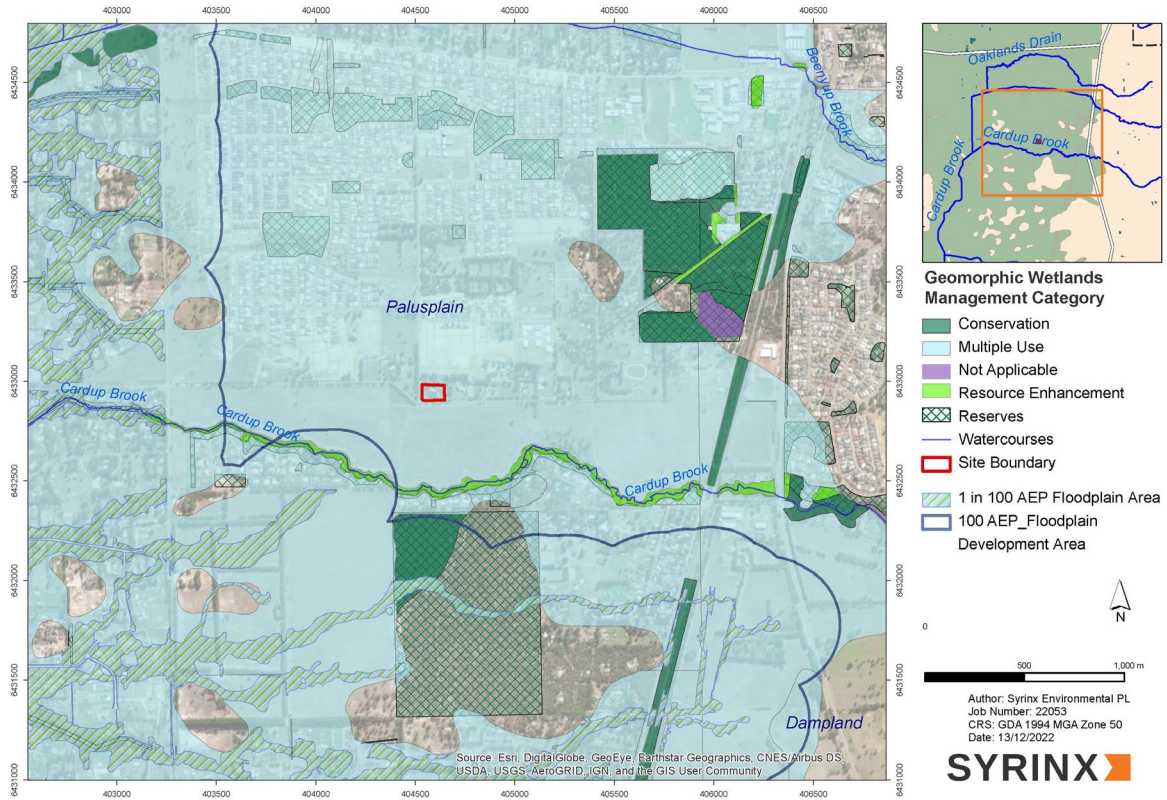


Figure 5. Wetlands, waterways, and floodplain areas in relation to the Site

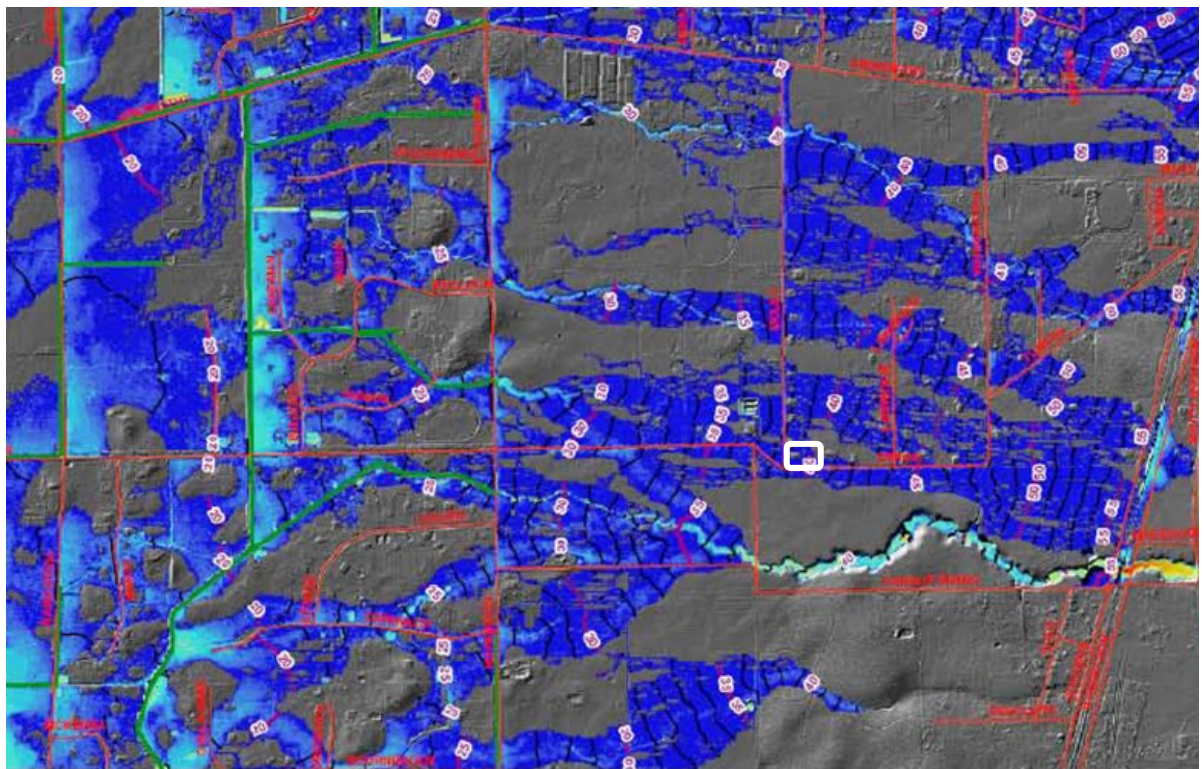


Figure 6. Modelled 1% AEP depth of inundation (DoW 2008) – Site shown in white

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

2.6.2 Surface water quality

The creeks, brooks and man-made drains surrounding the Site form part of the Upper Serpentine River Catchment (Figure 7). This catchment experiences elevated nutrient inputs from animal wastes and fertiliser use, which are unable to be adequately treated due to the clearing of vegetation and the presence of soils with low phosphorous binding capacity throughout the catchment. The excess nutrients leach to groundwater, which is intercepted by creeks, brooks and drains discharging to the Serpentine River.

DWER (2018) report significant annual exceedances of the Australian and New Zealand Environment and Conservation Council (ANZECC) Total Nitrogen (TN) and Total Phosphorous (TP) trigger values during the high rainfall winter months; however, annual median concentrations are generally below trigger values (Figure 8 and Figure 9). Annual median pH was between the upper and lower ANZECC trigger values. The annual median Total Suspended Solids (TSS) was classified as low, and Dissolved Organic Carbon (DOC) classified as high, under the Statewide River Water Quality Assessment (SWRWQA) bands.

No surface water quality monitoring has been carried out on or immediately adjacent to the Site. As such the baseline surface water quality is not known, and pre-development monitoring will be required. The DWER (2018) data indicates that stormwater runoff entrains a high proportion of the annual nutrient load, and therefore emphasises the importance of capturing and treating runoff prior to discharge from site. This is detailed in Section 4.8.

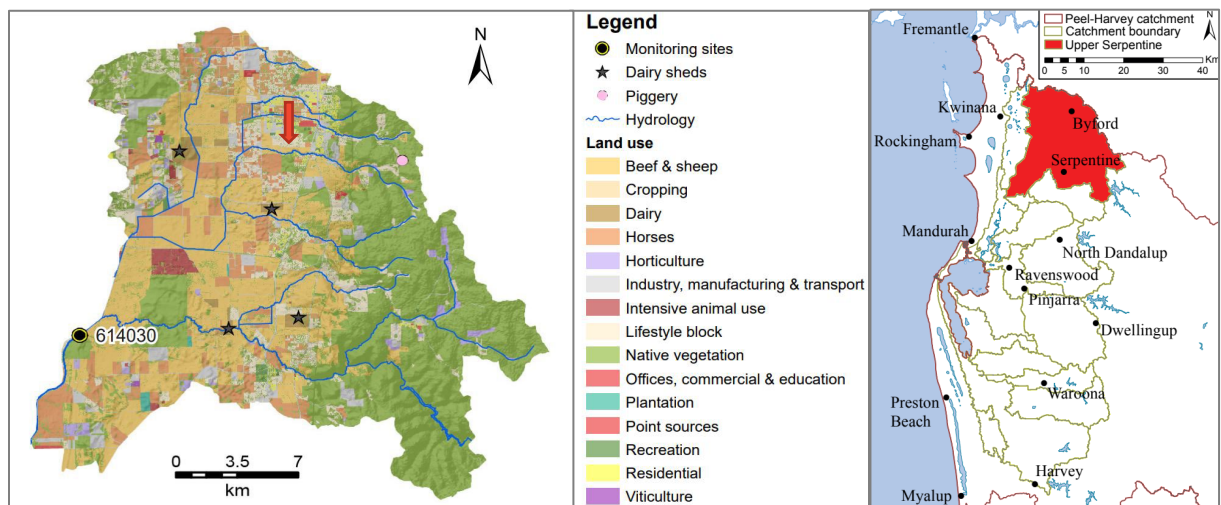


Figure 7. Upper Serpentine Catchment (DWER, 2018 and 2017)

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

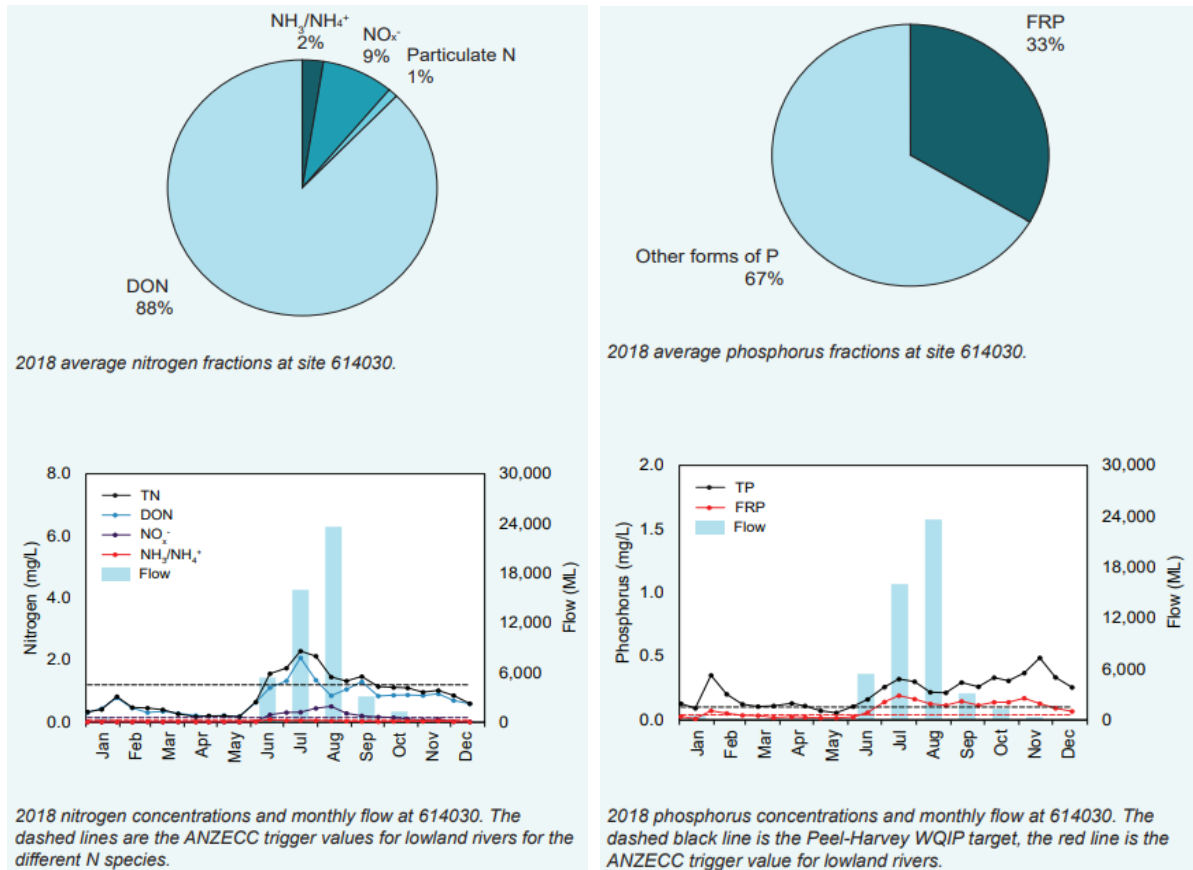


Figure 8. Upper Serpentine River N and P fractions, concentrations, flows in 2018 (DWER 2018)

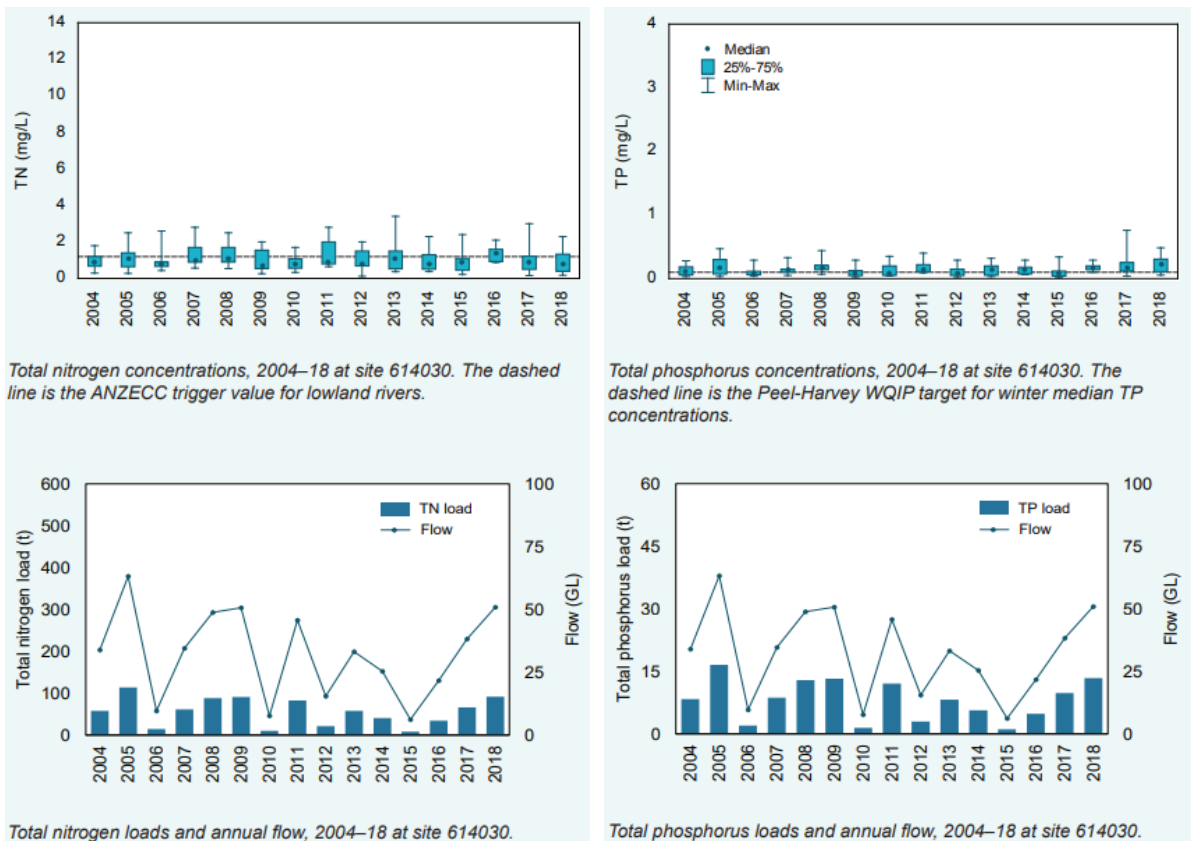


Figure 9. Upper Serpentine River N and P concentrations, loads, flows 2004-2018 (DWER 2018)

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

2.6.3 Groundwater flows and levels

The Site and the immediate surrounds overly a Superficial Aquifer which is comprised of sandy and/or gravelly layers within local shallow fluvial deposits or sandy lenses within the Guildford Formation. The Superficial aquifer within Guildford Formation is generally variable and discontinuous. As such the groundwater levels can vary within close distances from the site.

The regional groundwater flow across the Superficial Aquifer is in the westerly/north-westerly direction.

No on-site groundwater records are available. The Perth Groundwater Map (DWER, 2022b) does not extend over the Site. Based on the regional groundwater levels mapping, estimated groundwater levels are at 39 m AHD, which is within 1 m bgl for the entire site. However, during the 2022 geotechnical investigation, which was conducted in November (high groundwater season), groundwater was not intercepted in any soil sampling locations, which extended to 2.5 m bgl; although the soils were moist throughout much of the profile (ATC, 2022).

The modelled groundwater levels using 2007 data for the Byford area (Figure 10; DoW, 2008) indicate that the maximum groundwater levels on site are between 34 – 35 m AHD which translates to 5 m bgl. However, this is modelled data and due to variability of sand and clay lenses in the wider region the groundwater conditions may be significantly different for the Site and are likely between 2 – 5 m bgl.

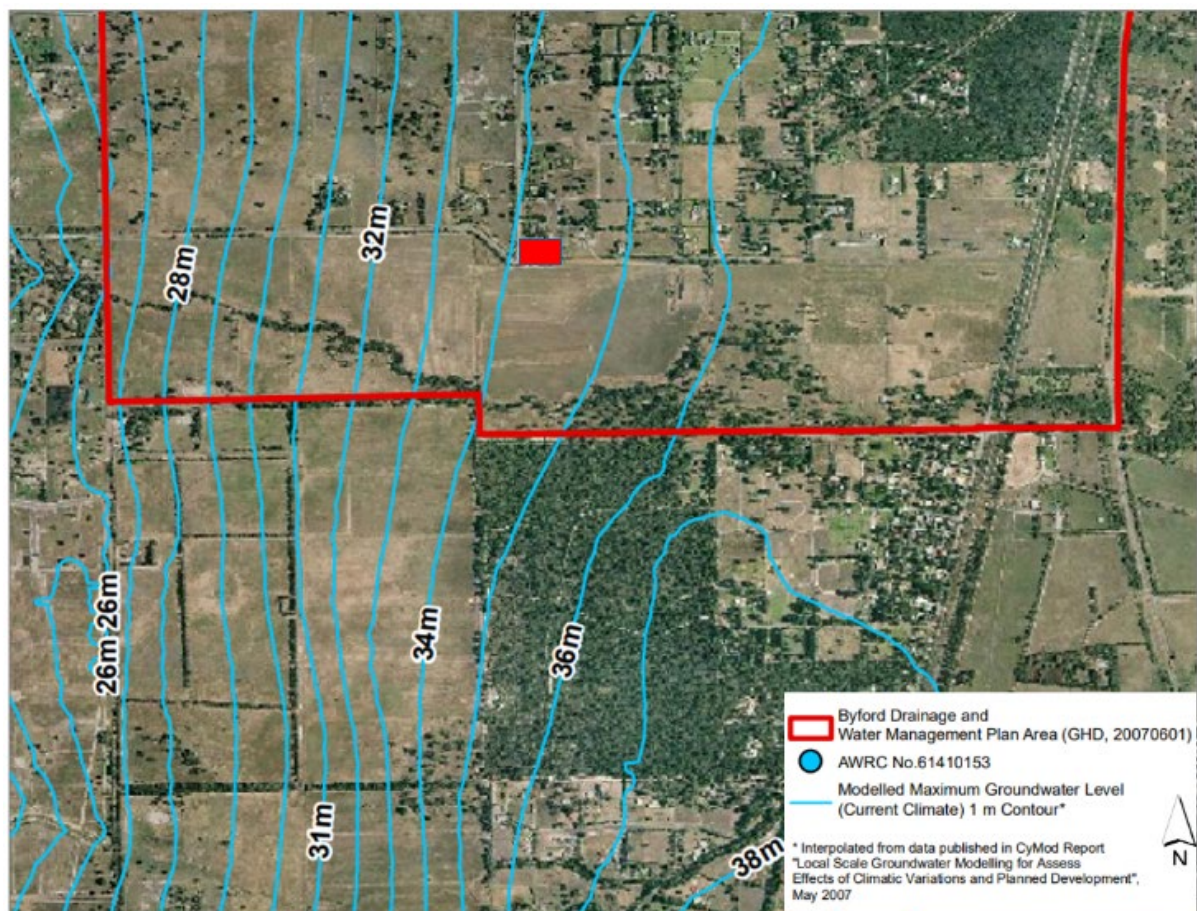


Figure 10. Modelled groundwater levels for the site and the immediate surrounds (DoW, 2008)

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

The recharge of the Superficial Aquifer is by rainfall infiltration directly to the water table. The discharge occurs generally in the wet season (Winter – Spring) into brooks and numerous constructed drains.

The DWER manages groundwater use within a series of areas and sub-areas, while surface water is managed within basins and catchments. There are separate allocation areas for the superficial and deep confined aquifers. Allocations within each area ensure water usage is sustainable. The DWER issues licences to take water under Section 5C of the Rights in Water and Irrigation Act 1914.

There is currently no groundwater allocation plan for the Serpentine Groundwater area and allocation limits are quite old, calculated using analytical methods which do not include future climate scenarios.

2.6.4 Groundwater quality

No groundwater quality monitoring has been carried out on or immediately adjacent to the Site. As such the baseline groundwater quality is not known, and pre-development monitoring will be required.

2.6.5 Potable water

Water use in the Shire is below the Water Corporation target of 110kL per person by 2030. The Water Corporation's water use by suburb calculator also indicates that water use across Shire suburbs (where available) is also under the target of 110kL, except for the suburb of Serpentine (Water Corporation, 2019).

Water use on-site is expected to increase post development, with the change from the existing single residential dwelling to the proposed commercial facility. The new facility will include living arrangements for up to 12 personnel (kitchen, dormitories, toilets, laundry, etc.) and support operational requirements including training, cleaning, equipment wash down and servicing, and landscape irrigation. Climate change will also increase pressure on local water resources; hence, the potential for harnessing stormwater for reuse and implementing other water efficiency measures should be explored to secure the Site's water future.

2.6.6 Wetlands

The Geomorphic Wetlands of the Swan Coastal Plain (SCP) dataset (Department of Biodiversity, Conservation and Attractions [DBCA], 2019) displays the location, boundary, geomorphic classification (wetland type) and management category of wetlands on the SCP. Wetland management categories are based on ecological, hydrological, and geomorphological significance and take into account the degree of disturbance that has occurred. The management categories include Conservation Category, Resource Enhancement and Multiple Use wetlands.

The DBCA (2019) dataset shows that the Site and the immediate surrounds are located on a palusplain wetland (seasonally waterlogged flat). Wetland Unique Feature Identifier (UFI) 15797, Armadale Palusplain is categorised as a 'Multiple Use' management category wetland, indicating that the wetland has few important ecological attributes and functions remaining. The management objective of this type of wetland is generally associated with the best practice catchment planning through development drainage and landscaping design. This wetland is not identified as having international importance (i.e., Ramsar Wetland), and is not listed on the Directory of Important Wetlands in Australia (Department of Climate Change, Energy, the Environment and Water [DCCEEW], 2022).

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Forestdale Lake and Thomsons Lake which are Ramsar Wetlands are located 9 km and 16 km northwest of the Site, respectively. The Peel-Yalgorup system, also a Ramsar Wetland is located 62 km southwest of the Site.

As the Site is within the catchment of the Peel-Yalgorup system, in accordance with the State Planning Policy (SPP) No. 2.1 Peel-Harvey Coastal Plain Catchment (noting that this will be replaced by a revised SPP No. 2.9 Planning for Water) and the Bindjareb Djilba (Peel-Harvey Estuary) Protection Plan, development has to consider water sensitive urban design principles including measures to ensure protection of groundwater and surface water quality (Aurora, 2022).

2.7 FLORA AND VEGETATION

The regional vegetation complex mapping for the region (Heddle *et al.*, 1980) places the Site within Guilford vegetation complex (Figure 11). This complex is characterised by a mixture of open forest to tall open forest of *Corymbia calophylla* (Marri) - *Eucalyptus wandoo* (Wandoo) - *Eucalyptus marginata* (Jarrah) and woodland of *Eucalyptus wandoo* (Wandoo) (with rare occurrences of *Eucalyptus lane-polei* (Salmon White Gum)). Minor components include *Eucalyptus rudis* (Flooded Gum) - *Melaleuca raphiophylla* (Swamp Paperbark) generally along watercourses and seasonally inundated wetlands.

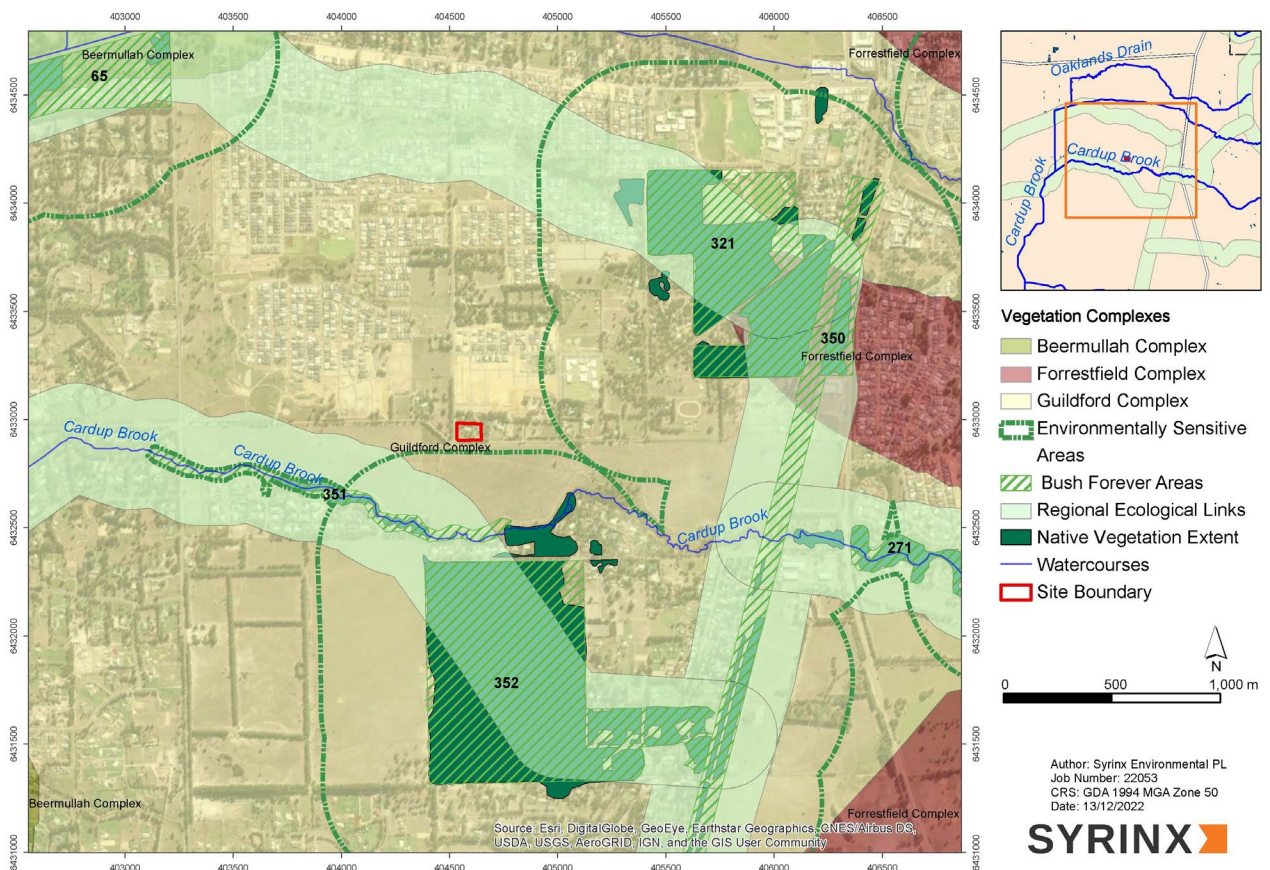


Figure 11. Vegetation Complexes, Bush Forever Sites, Regional Ecological Linkages and the ESA Boundary

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

As at 2018, approximately 5% of the original extent of Guilford complex vegetation remain on the SCP with 14 % of this located within the Shire of Serpentine-Jarrahdale (Government of Western Australia, 2019). Given only 0.33% of the complex is secured in the conservation reserves on the SCP, the need to protect and expand current vegetation extent is of high importance.

No occurrences of intact native vegetation communities were observed at the Site in the recent flora survey (Aurora, 2022). The Site has been landscaped with the trees and shrubs that are not indigenous to site amongst lawns and weed species which are located closer to the residence. Due to the absence of any intact native vegetation communities within the Site, no Threatened or Priority Ecological communities (TECs and PECs) or Threatened or Priority flora are found.

Within the Site itself, two Marri trees were recorded and one native to surrounds *Eucalyptus rudis*. All other mature trees were non-native species such as *Eucalyptus camaldulensis* and *Eucalyptus cladocalyx* (Aurora, 2022). Other species recorded on site include ornamental tall shrubs *Melaleuca nesophila* and Grevillea species amongst other non-native shrubs and herbs. A single large **Schinus terebinthifolia* (Brazilian Pepper Tree) is found in the central portion of the Site.

At the southern boundary of the Site a row of Marri trees with few remnant *Kingia australis*, *Xanthorrhoea preissii* and a very low number of native herbs and shrubs (*Verticordia plumosa* amongst them) is found. This remnant was likely a part of the Threatened *Corymbia calophylla* - *Kingia australis* woodlands on heavy soils TEC community of the Swan Coastal Plain which would have grown on site historically.

Significant flora taxa were not identified in database searches as occurring on the Site or during the survey and are considered highly unlikely to occur due to the extensive and historic vegetation clearing, and the presence of introduced weed species (Aurora, 2022).

Weeds were present across the Site; however, no Declared Pest flora nor Weeds of National Significance were recorded. The highest percentage weed cover was attributed to grasses. The remnant vegetation along Orton Road boundary contained a bulb weed **Watsonia meriana* var. *bulbillifera* (Bugle Lily), **Oxalis* spp., **Romulea rosea* (Guildford Grass) and **Ehrharta longiflora* (Annual Veldt) as dominant species.

2.7.1 Bush Forever Sites

The Site is not a part of a Bush Forever (BF) or a Conservation Reserve site. However, the Site is adjacent to Cardup Brook Bushland (BF Site 351) approximately 400 m southwest of the Site and the Cardup Nature Reserve and Adjacent Bushland, Cardup (BF Site 352) located 560 m south of the property boundary.

Although relatively well separated from the BF areas, the activities on Site can directly impact Cardup Brook via unmanaged drainage (current information suggests that the drain to the south of the property is linked to the Cardup Brook via Hopkinson Road Drain).

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****2.8 ENVIRONMENTALLY SENSITIVE AREAS**

Environmentally Sensitive Areas (ESAs) are prescribed under the Environmental Protection (Clearing of Native Vegetation) Regulations (Environmental Protection Agency [EPA], 2004) and have been identified to protect native vegetation values of areas surrounding significant, threatened, or scheduled flora, vegetation communities or ecosystems. Exemptions contained in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* for low impact land clearing do not apply in ESAs, and a native vegetation clearing permit is required. ESAs are associated with areas of significant vegetation, conservation significant flora and high value wetlands which may have land clearing constraints to prevent incremental degradation.

Buffered ESA mapping (DWER, 2021) indicates that the Site is not part of an ESA. The nearest ESAs are 59 m south and 330 m east of the Site. The ESAs appear related to the Bush Forever classification and the presence of TECs and conservation category wetlands (CCWs) (Aurora, 2022).

While outside of the ESA boundary, best practice measures should be taken to avoid impact to the ESA.

2.8.1 Ecological Linkages

Vegetation (particularly remnant vegetation) offering a contiguous linkage between larger patches of remnant vegetation that were determined to be of regional significance either through BF or Perth Metropolitan Region (PMR) scheme are termed as regional ecological linkages.

Regional ecological linkage, identified as Greenway linkage ID no. 68, is located 200 m southwest of the Site boundary (Figure 11) and incorporates remnant patches of vegetation along Cardup Brook (BF sites) and forms a steppingstone or a link between the Darling Scarp and coastal vegetation.

While the linkage is located outside the Site boundary, the Site forms a vital buffer supporting the link's ecological function and resilience (e.g., by maintaining hydrogeological attributes of the buffer).

2.9 FAUNA

Due to lack of vegetation cover, the fauna assemblage of the site is limited. Quenda (also known as the Southern Brown Bandicoot (*Isoodon obesulus fusciventer*), a Priority 4 listed species, were sighted during the Site inspection in September 2022 (Aurora, 2022). The landowner confirmed there is a small population that live between properties near the north-east corner of the Site.

Four species of birds were observed during the site inspection (Aurora, 2022), these were:

- *Eolophus roseicapilla* (Galah);
- *Gymnorhina tibicen* (Magpie);
- *Ocyphaps lophotes* (Crested Pigeon); and
- *Phylidonyris novaehollandiae* (New Holland Honeyeater).

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Evidence of foraging by *Calyptorhynchus banksii naso* (Forest Red-tailed Black Cockatoo) was noted by Aurora (2022). This species is listed as Vulnerable under the Commonwealth legislation and Threatened (Vulnerable) under State legislation. Syrinx have observed this species foraging on the Marri trees along Orton Road on 29th November 2022 during our Site visit. Aurora have recorded that the property owners have observed this species feeding in the same location on many occasions in the past.

Many of the mature trees present within the Site have a diameter at breast height of greater than 50 cm which classifies them as potential habitat trees for black cockatoos. However, none of these trees possessed any hollows and therefore do not constitute breeding habitat. No evidence of roosting (such as scats, feathers, and scratchings) was noted within the Site at the time of the inspection. European bees were observed near the eastern boundary of the Site (Aurora, 2022).

Due to the absence of intact native vegetation communities and the very limited fauna habitat present, the Site is only likely to be used by fauna species which are able to persist within degraded habitats, mostly mobile fauna such as birds. The Marri trees within the Site, along with other non-native species (such as fruit trees) may provide some foraging resources for black cockatoos. Without improving the existing habitat, Quenda may persist within the Site only for a short time if the adjacent properties to the east and south remain undeveloped.

No feral/introduced fauna were recorded at the Site, however, given the proximity of the urban development, presence of rats, mice, domestic cats, dogs, rabbits and foxes is possible.

2.10 HERITAGE

2.10.1 Indigenous heritage

There are no existing registered Aboriginal Heritage Sites within or directly adjacent to the Site (Figure 12). The nearest Registered Aboriginal Site (the place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*,) is Byford Archaeological Survey 004 (Site 23917) 700 m southwest of the Site on the southern bank of Cardup Brook. This site is significant for artefact scatter findings.

The Cardup (Other Heritage Place 3310) 360 m to the southwest is found on the northern floodplain of Cardup Brook and is known for artefact scatter and as a campground. The Cardup Brook (Other Heritage Place 16108), like many other waterways on the SCP, has a mythological significance. Both sites appear as "Stored data/Not a Site" on the DPLH (2022) database search meaning both sites were assessed as not meeting Section 5 of the Act offering them less protection.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

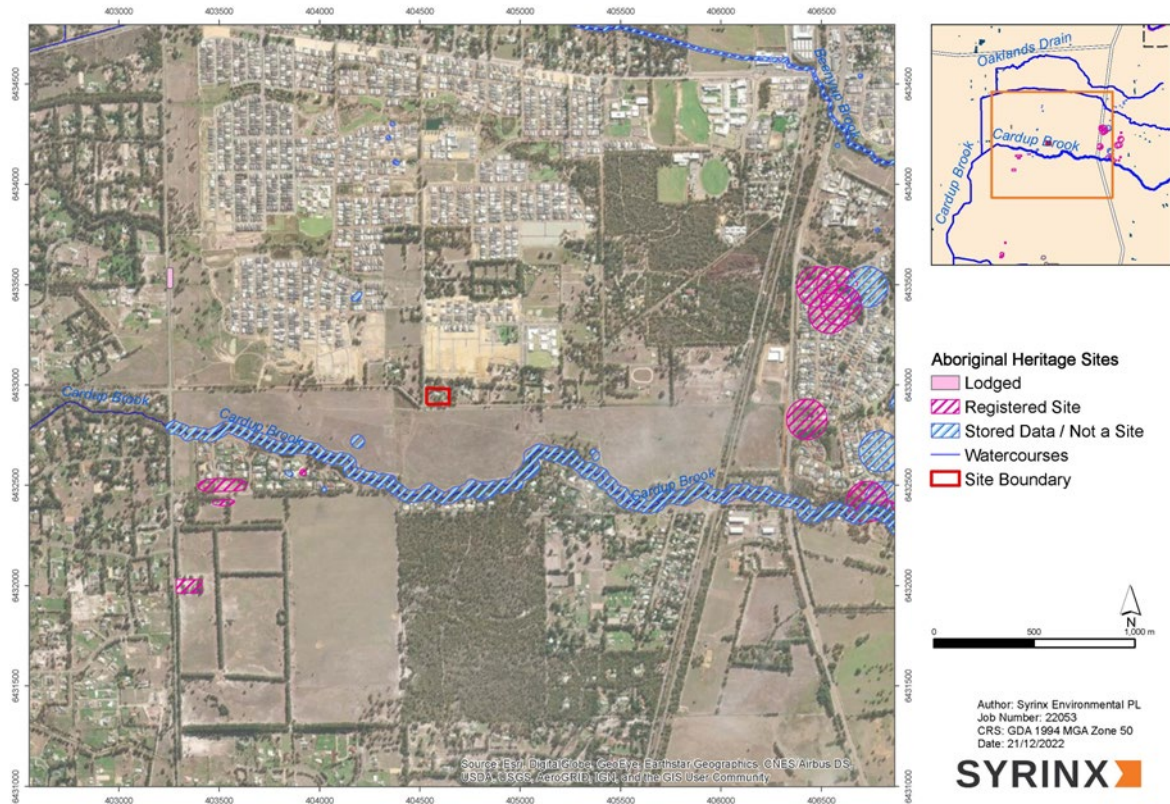


Figure 12. Registered and Other Aboriginal Heritage Sites in proximity to the Site.

2.10.2 Non-Indigenous Heritage

Heritage in Western Australia is protected under the *Heritage Act 2016*, administered by the Department of Planning, Lands and Heritage. The Heritage Council maintains the State Register of Heritage Places, an extensive list of places which should be conserved for future generations.

A search of the State Register of Heritage Places was undertaken for the project area. No registered places of heritage value are present within or adjacent to the Site.

2.11 UNCERTAINTIES

A summary of the uncertainties present at the Site is presented below:

- Presence of ASS/PASS within the Site;
- Status of soil and groundwater quality from a contamination perspective;
- In-situ soil permeability;
- Regional 1% AEP flood mapping; and
- Seasonal groundwater levels.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Once these uncertainties are addressed, additional management actions can be added to the plan. It is recommended to fill these knowledge gaps in the short term (prior to detailed design phase) to allow for optimisation of design response. These gaps must be addressed prior to start of construction works.

3.0 CFRS FIRE STATION DEVELOPMENT

The CFRS development is currently proposed to consist of a single storey development with the following elements detailed in Table 1. Note, the approximate size of features is current at the time of writing and subject to minor changes during design phase.

Table 1. Development Features

Feature	Approximate Size (m²)	Purpose
Offices, study	40	Provide workspace for office workers
Equipment room (comms/switchboard)	10.2	Essential DFES services
Living Areas (Dormitories, Kitchen/Dining, Gym, Bike Store, Toilets, locker room)	193.9	Provide onsite living quarters for firefighting personnel
Covered courtyard and multipurpose space	87.4	Versatile activity area for multiple activities e.g. award presentations, group training activities
Operational Space (Store/workshop, hose room, breathing apparatus storage room, drying and washing room, clean in and out space)	72.8	Provides space for essential DFES services
Waste disposal area	9.7	Store waste before removal by the Shire or waste contractor
Covered servicing bay	146	Area to service firefighting vehicles and equipment

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Feature	Approximate Size (m²)	Purpose
Unenclosed appliance bay	255	Area to service firefighting vehicles and equipment
Wash down area	40	Area to service firefighting equipment
Training pad and tower	239	Training area to run fire fighting drills and education campaigns
Carpark	187	For staff and visitor parking
Driveway and crossovers	953	For vehicular access, egress and movement around site
Vegetated biofilters and swale (to be determined (TBD) in design phase)	330	Biological stormwater treatment and flood detention
Vegetated landscape areas (incl. biofilters, swale)	5,780	Aesthetic, sense of place and ecological restoration

3.1 CONSTRUCTION STAGE

Siteworks for development is anticipated to comprise clearing of existing vegetation, stripping and/or addition of topsoil, bulk earthworks including cut to fill of existing ground and minor filling (< 0.5 m depth), trenching and installation of services (< 1 m depth), trenching and installation of drainage pipes, pits and channels (< 1 m depth), pavement installation, single-storey building construction, and landscape works including biofilter and swale construction, irrigation installation and planting.

Significant existing vegetation and existing soils and topography are proposed to be retained to contribute to providing a sense of place and meeting sustainability objectives, particularly when considering stormwater management. The remnant Threatened *Corymbia calophylla* - *Kingia australis* woodlands species along the southern boundary are of particular importance for retention, and the site presents a good opportunity for expansion of the dwindling Guildford Complex vegetation community (see Section 2.7). Other than the remnant woodland, the Site contains limited vegetation that may be typically considered suitable for retention in a commercial development. The proposed building and pavement areas and levels requiring bulk filling affect the ability to retain vegetation. As such, the design and construction of the development should seek to optimise longevity of the built form and its operation, by marrying the apparently divergent project requirements as best possible.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

To achieve the required clearance to groundwater perched on the Guildford Clay and the regional 1% AEP flood levels (DoW 2008), and to prevent subsurface ponding and soil waterlogging to achieve the desired site classification 'S' according to AS2870 (ATC 2022), earthworks are likely to involve filling of the Site beneath the proposed building footprint (approx. 1,000 m²) and potentially in the southwest corner if underground storage forms part of the drainage design (up to approx. 150 m², subject to future design phase), regrading of the subsurface clay layer and installation of subsoil drainage. The imported fill material should be a free draining clean sand with fines content less than 5% and permeability greater than 5 m/day to avoid negatively impacting site drainage.

Finished surface levels will need to accommodate the interface with existing roads, drainage and lots adjacent. Orton Road at the southern site boundary is proposed to be upgraded, including road widening and the addition of a drainage swale to the median. Design details including levels are yet to be received; however, are not expected to effect significant change, as the design should be in accordance with the Byford DWMP and associated modelled 1% AEP flood levels.

The existing sewer at the northwest corner of site is approx. 2 m bgl, and given the site naturally falls at ~ 1% in this direction, it is not envisaged to influence finished surface levels. The sewer is expected to require the deepest trenching on-site at approx. 1 – 1.5 m. Given the geotechnical investigation did not encounter groundwater in any test locations to 2.5 m depth, and the risk of encountering ASS within 3 m of soil surface is moderate to low (see Section 2.5), interception of groundwater and PASS/ASS management is not expected during construction.

It is anticipated that finished surface levels will be dictated by either the fill required for AS2870 site classification 'S' or the minimum level required to ensure adequate separation from the Guildford Clay and theoretical perched groundwater levels.

Following bulk earthworks and service installation, the CFRS building, surrounding pavements and landscape will be constructed. These elements will generally involve above ground works and some shallow trenching (< 0.5 m) for footings, irrigation pipes and advanced trees. Vegetated biofilters (TBD design phase) will involve installation of planting, biofiltration, and drainage media layers, as well as connecting pits and pipework. Vegetated landscape areas will require a period of establishment maintenance, typically 2 – 3 years following Practical Completion.

3.2 OPERATIONAL STAGE

3.2.1 Roads and traffic

The Site is well connected to the regional road network with the adjacent Abernethy Road providing the main connection for vehicular access to the Site. Abernethy Road provides a connection to the Byford Town Centre and South Western Highway to the east and Thomas Road, via Nicholson Road, to the west. The section of Abernethy Road adjacent to the is currently being upgraded by the Shire of Serpentine Jarrahdale to a dual carriageway road with a roundabout at the future Sansimeon Boulevard intersection.

Access to the development is proposed via the extension of Sansimeon Boulevard from the Abernethy Road roundabout to the existing Marri Park development on the northern boundary of Lot 1. The extension of Sansimeon Boulevard through the development will provide the main local distribution of

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

traffic within the development. Two additional intersections with Abernethy Road are also proposed to provide access to the development and service the commercial area.

The internal road network will be required to be in accordance with the current Liveable Neighbourhoods, Shire of Serpentine Jarrahdale standards and IPWEA Subdivision Guidelines. Roadworks will generally consist of kerbed and asphalted pavement. A network of dual use and pedestrian footpaths will also be required to facilitate pedestrian movement throughout the development.

3.2.2 Site Activities

Normal operating activities at the Site are as follows:

- Domestic activities associated with approximately 12 firefighters occupying the living quarters (sleeping, cooking, socialising etc.);
- Office work and other associated light activities;
- Cleaning of equipment post firefighting activities;
- Training activities involving firefighting equipment and vehicles;
- Maintenance activities associated with firefighting equipment and vehicles;
- Storage and deployment of firefighting equipment and vehicles; and
- General site upkeep including building and landscape maintenance.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.0 ENVIRONMENTAL MANAGEMENT**

This section outlines the objectives for protection of particular environmental values, rationale outlining key impacts and the need for management, summary of legislative and other legal requirements, an outline of specific targets/thresholds (where available) and a list of management actions targeted to manage the specific impacts.

The actions outlined in this EMP are generally “objective based” or “management based” and outline the desired ongoing and future environmental status of the Site based on minimising potential environmental impacts to the Site. Where possible, “outcome based” objectives have also been used where specific trigger and threshold criteria are available e.g. water quality guidelines for stormwater discharge from the Site.

4.1 ROLES AND RESPONSIBILITIES

Overall responsibility for the implementation of this EMP falls with DFES and the Cardup CFRS site management. Adaptive management should be implemented to ensure that the EMPs management measures remain relevant to the Sites future infrastructure and operations.

Site management will be responsible for best determining how to execute the actions detailed in this EMP. The actions and objectives presented in this EMP are generally designed to be completed by experienced staff members with some knowledge of environmental management and associated key concepts.

4.2 APPROACH AND RATIONALE

Objective based actions have largely been chosen for this EMP due to the difficulty in determining measurable environmental outcomes from the identified potential environmental impacts. Given the scale of environmental impact possibly arising from the site’s construction and operation and the likely resources available, it is more appropriate to monitor the effectiveness of the actions as opposed to setting trigger/threshold values for impacts not readily able to be measured/articulated. Where possible outcome-based management actions have been implemented in accordance with EPA EMP guidance.

4.3 STATUTORY REQUIREMENTS

The Development will be completed in accordance with, and all works are to comply with, the relevant environmental legislation, regulations, Australian Standards and codes of practices administered by relevant State and Federal Government agencies. The Acts, standards and codes of practice, their applications to the project works and the responsible Government department are referred to in each section of this EMP.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.4 SUMMARY OF KEY MANAGEMENT ISSUES**

The following environmental impacts are expected and/or possible because of the development construction and operation:

- Physical disturbance to landform and other environmental values – removal of topsoil and addition of fill generating altered landscape and dust during construction;
- Disturbance of Potential Acid Sulphate Soils – can cause lowering of soil pH and result in heavy metal release, adversely affecting groundwater, flora and fauna;
- Failure in spill management causing contamination of groundwater and surface water by hydrocarbons and or other hazardous chemicals (e.g. firefighting chemicals, herbicides used for weed control, oils, lubricants, litter such as plastic, paper etc.);
- Clearing of vegetation and flora thus reducing biodiversity and contributing to negative urban heat island effects;
- Weeds, diseases and pathogens affecting vegetation thus reducing biodiversity and contributing to negative urban heat island effects;;
- Destruction of fauna habitat (e.g., through fragmentation, nest disturbance, depletion of food resources, noise, dust and light, and pest fauna);
- Fire damage – changing climatic conditions, the proximity of the vegetated areas to the roads and the vastness of cleared grassed floodplain pose a risk of fire;
- Flood damage – inadequate volumetric detention and/or flow reduction capacity on-site can inundate and erode infrastructure and landscape on-site and downstream of site;
- Climate change (extreme weather events such as flooding, heat waves and drought);
- Impact to traffic flows and public safety;
- Lack of awareness and education regarding environmental values and the various impacts that can cause loss or damage to those values;
- Loss of cultural values (e.g., via reduction or diversion of surface and groundwater or introduction of contaminants to Cardup Creek);
- Noise pollution and other public disturbances; and.
- Loss of sense of place – due to the choice of non-indigenous flora and trees for landscaping.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.5 SOIL AND LANDFORM MANAGEMENT****4.5.1 Objectives**

The existing topography and soil profile once supported endemic flora and fauna communities, and as such should be retained as much as possible to facilitate future ecological restoration. The objective is to employ a 'light-touch' design approach to minimise bulk earthworks and work with in-situ soils as far as practicable; whilst allowing for sound construction and drainage of built forms.

4.5.2 Rationale/Potential Impacts

The rationale for soils management and potential impacts of improper management at the Site are as follows:

- Minimising disturbance of the in-situ soil profile will allow effective re-establishment of endemic vegetation communities and fauna habitat;
- Damage to soil structure may lead to a decline in soil quality and negatively impact vegetation establishment and long-term upkeep (and in turn water treatment effectiveness in biological treatment systems);
- Bulk filling is expensive and can create additional environmental risks (erosion, dust, noise, etc.), so bulk fill where required for buildings only;
- Buildings, infrastructure, and landscape elements should maintain appropriate clearance to groundwater levels; and
- Soil erosion may undermine site infrastructure or contaminate surface water draining to surrounding water bodies or properties.

4.5.3 Legislative and other requirements

Legislative and other requirements for the management of soils and landforms at the Site are presented Table 2

Table 2. Key legislation that applies specific criteria for soil and landform management

Reference	Relevant Condition	Limit/Requirement
<i>Soil and Land Conservation Act 1988</i>	Manages the conservation of soil and land resources and the mitigation of the effects of erosion.	Conservation of soil and land resources and manages erosion.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Reference	Relevant Condition	Limit/Requirement
<i>Byford townsite drainage and water management plan (DoW 2008)</i>	Section 6 Stormwater management strategy Section 7 Groundwater management strategy	Finished floor levels to be min. 0.5 m above 1% AEP flood level, and 1.2 m above maximum groundwater level. Finished bioretention basin level to be at or above controlled groundwater level.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.5.4 Management actions, targets and evidence

Legislative and other requirements for the management of soils and landforms at the Site are presented in **Error! Not a valid bookmark self-reference.** below

Table 3. Key management actions for soil and landform management

Ref.	Soil and Landform Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
1.1	Minimise bulk earthworks areas, volumes, depths. Restrict filling to that required for built form only.	Design phase	<ul style="list-style-type: none"> Construction management plan. Design drawings, specifications. 	Terpkos	<ul style="list-style-type: none"> Balanced cut to fill (< 500 m³ imported fill). No adverse impact on remnant vegetation due to erosion or earthworks. Meet Byford DWMP surface water and groundwater clearance targets.
1.2	Building design to be sympathetic to topography and in-situ soil behaviour.	Design phase	Design drawings, specifications	IPH	
1.3	Landscape design and levels to be sympathetic to topography, with planting mixes to suit soil profile and water regime.	Design phase	Design drawings, specifications	EPCAD	
1.4	A habitable floor level of minimum 0.5 m above the regional 1% AEP flood level to ensure adequate flood protection of buildings and assets	Design phase	Design drawings, specifications	Terpkos	
1.5	A habitable floor level of minimum 1.2 m above the maximum groundwater level (perched or controlled) to ensure adequate protection of buildings	Design phase	Design drawings, specifications	Terpkos	

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Soil and Landform Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
1.6	<p>Biofilter and swale invert levels (alternatively, drainage pit and underground storage invert levels) either:</p> <ul style="list-style-type: none"> at or above controlled groundwater level; or minimum 0.3 m above maximum groundwater level. 	Design phase	Design drawings, specifications	Terpkos	
1.7	<p>Excavation activities are required to maintain a minimum clearance of 0.5 m between the excavation floor and groundwater level. The pre-development groundwater monitoring results will establish seasonal groundwater level patterns to inform the construction program, and ongoing groundwater monitoring will ensure safe distance from prevailing groundwater levels (see section 4.8). If groundwater is encountered during construction, works shall cease and the Superintendent shall be notified immediately.</p>	Design and construction phases	Construction management plan	Construction Contractor	No groundwater observations during construction phase
1.8	<p>Where excavation for removal of existing infrastructure (swimming pool, soakwells, leach drains, tree roots, etc.) penetrates the clayey sand, backfill shall be with similar clayey sand to prevent sub-surface ponding (ATC 2022).</p>	Construction phase	<ul style="list-style-type: none"> Construction management plan. Finished level survey of sub-surface clayey sand. 	Construction Contractor	Compliance with requirements. No visible waterlogging.
1.9	<p>Where excavation or bulk earthworks exposes or penetrates the surface of the clayey sand, the clayey sand shall be suitably mounded or graded to ensure it is free-draining, if not already (ATC 2022).</p>	Construction phase	<ul style="list-style-type: none"> Construction management plan. Finished level survey of sub-surface clayey sand. 	Construction Contractor	Compliance with requirements. No visible waterlogging.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Ref.	Soil and Landform Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
1.10	Prepare an Erosion and Sediment Control Plan for the construction phase to ensure protection of site infrastructure and the downstream environment.	Prior to construction phase	Erosion and Sediment Control Plan and monitoring reports.	Construction Contractor	<ul style="list-style-type: none"> • Meet Byford DWMP pollutant reduction targets. • No damage to site infrastructure due to erosion • Regular observations of minimal soil and soil matter within site surface drains

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.6 ACID SULPHATE SOILS MANAGEMENT****4.6.1 Objectives**

Acidity within groundwater or soil has the potential to adversely affect subsurface structures, for example sewer, drains or building foundations. It may also leach into wetlands or other nearby surface water bodies, adversely affecting the habitat. The objective is to minimise the potential environmental impacts due to the disturbance of Actual Acid Sulphate Soils (AASS) or Potential Acid Sulphate Soils (PASS).

4.6.2 Rationale/Potential Impacts

Rationale or potential impacts of AASS to the Site are as follows:

- Exposure and oxidisation of PASS;
- Mobilisation of aluminium, iron and manganese from soils as a result of increased acidity from disturbance of PASS;
- Corrosion of foundations and structures due to inappropriately managed disturbance of PASS; and
- Release of sulphuric acid and metals resulting in the deterioration of soil and water quality and impacts to flora, fauna, and infrastructure.

No ASS testing was conducted for the Site as under current planning, excavations of the ground resulting from the removal of existing site infrastructure are unlikely to go past 0.5 m bgs.

4.6.3 Legislative and other requirements

State and Commonwealth legislation and guidelines that applies to the management of ASS/PASS for the Site is presented in Table 4.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****Table 4. Key legislation that applies specific criteria to acid sulphate soil management**

Reference	Relevant Condition	Limit/Requirement
<i>Contaminated Sites Act 2003</i> and associate regulations	Provides for the identification, recording, management and remediation of contaminated sites	Reporting of potential new contaminated sites where applicable Approval of Acid Sulfate Soil Management Plan
<i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>	Regulations to prevent the release of contaminants into the environment	Prevent and / or report any unauthorised discharges
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of environmental harm and conserving, preserving, protecting,	Approval to undertake an assessed proposal, with conditions
<i>DWER Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes & Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes</i>	Provides guidance on how to appropriately investigate and manage risks associated with ASS	NA

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.6.4 Management actions, targets and evidence

The management actions for ASS/PASS management are presented in Table 5 below.

Table 5. Key Management Actions for ASS / PASS management

Ref.	ASS / PASS management	Timing	Reporting/Evidence	Responsible Party	Management Targets
2.1	Samples should be collected from the clay geological layer at the Site and tested for relevant ASS parameters (see <i>DWER Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes</i>).	Before construction	Laboratory analytical results ASS site investigation report	<ul style="list-style-type: none"> IPH TERPKOS 	Not applicable
2.2	<p>If ASS or PASS is identified during excavation activities and is required to be disturbed, the Site will require the preparation of site specific management plans as follows:</p> <ul style="list-style-type: none"> ASS management plan; and ASS groundwater management plan. <p>Both management plans are required to follow guidelines provided by DWER and include details of the following:</p> <ul style="list-style-type: none"> Results of the investigation; Extent and scope of the disturbance activities; and <p>ASS/PASS management details including excavation, handling, storage, neutralisation, and disposal.</p>	Before construction	<ul style="list-style-type: none"> ASS mgmt. plan; and ASS groundwater mgmt. plan. 	All involved in design and construction	If identified ASS/PASS not disturbed and potential impacts under Section 2.5.1 mitigated
2.3	All fill that is to be used at the Site shall not be sourced from an ASS/PASS moderate or high risk area	Before construction	Construction management plan with ASS/PASS elements	All involved in design and construction	No ASS/PASS soils introduced to the Site

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	ASS / PASS management	Timing	Reporting/Evidence	Responsible Party	Management Targets
2.4	<p>An ASS Groundwater Management Plan is required to support any application for a Construction Dewatering License from DWER. It should provide the following:</p> <ul style="list-style-type: none"> • Detailed estimates of location of groundwater extraction; • Extent of the influence of extraction; and • Treatment and disposal of potentially contaminated groundwater. <p>Existing or purpose built monitoring wells should be used to confirm that there is no sign of impact on the groundwater ecosystems.</p>	Before construction	As determined by the ASS groundwater management plan	All involved in design and construction	Groundwater impacts minimised as per requirements of ASS groundwater management plan

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.7 SPILL PREVENTION****4.7.1 Objectives**

The objective is to minimise the potential for spills and lessen the environmental impacts should spills occur. Preventing potential impacts as a result of spills includes preventing contamination of soils and water from the uncontrolled releases of chemicals (e.g., firefighting foam and lubricants), fuels or sanitary water.

4.7.2 Rationale/Potential Impacts

Rationale or potential impacts of improper spill prevention measures at the Site are as follows:

- Spills of any variety have the potential to cause harm to human health, contaminate soil and water, affect surrounding vegetation, and may also leach into the surrounding water systems, adversely affecting the water quality and habitat.

4.7.3 Legislative and other requirements

Conditions of State and Commonwealth legislation that apply specific criteria to spill prevention is presented in Table 6.

Table 6. Key legislation that applies specific criteria to spill management and prevention.

Reference	Relevant Condition	Limit/Requirement
<i>Dangerous Goods Safety Act 2004</i> and associated regulations	Provides for the safe storage, handling, and transport of dangerous goods	Dangerous Goods Licenses
<i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>	Provides for the identification, recording, management, and remediation of contaminated sites	Prevent and / or report any unauthorised discharges
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of environmental harm and conserving, preserving, protecting, enhancing, and managing the environment	Approval to undertake an assessed proposal, with conditions

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.7.4 Management actions, targets and evidence

The Management actions for spill management are presented in Table 7 below.

Table 7. Key management actions for spill prevention and management

Ref.	ASS / PASS management	Timing	Reporting/Evidence	Responsible Party	Management Targets
3.1	Preparation of an onsite incident response manual that includes spill management placed in an easily accessible location for all personnel	Start of operations	Incident response manual	<ul style="list-style-type: none"> DFES Site mgmt. 	<ul style="list-style-type: none"> Staff adherence to spill response manual Spills that occur are controlled with no material entering into stormwater drains Spills are cleaned up promptly Limited spills resulting from human error
3.2	Training of staff in spill response measures and equipment	Ongoing	Training records	<ul style="list-style-type: none"> DFES Site mgmt. 	
3.4	All hazardous chemicals are to be stored within dedicated storage areas with adequate secondary containment	Ongoing	Inspection records Site logs	<ul style="list-style-type: none"> DFES Site mgmt. 	
3.5	PFAS chemicals or chemicals containing PFAS are restricted at the Site. New chemical introductions shall be reviewed for the presence of PFAS	Ongoing	<ul style="list-style-type: none"> Inspection records Material Safety Data Sheets 	<ul style="list-style-type: none"> DFES Site mgmt. 	No PFAS chemicals observed at site during regular inspections
3.6	Provide adequate spill containment equipment (e.g., spill kits) around bulk storage areas	Ongoing	Inspection records Purchase records	<ul style="list-style-type: none"> DFES Site mgmt. 	Spills that occur are controlled with no material entering into stormwater drains
3.7	Regular inspections of storage vessels and equipment on-site to confirm that there are no leaks and that all taps are adequately closed off after use and at the end of each day	Every two weeks	Inspection records	<ul style="list-style-type: none"> Site mgmt. 	No spills resulting from storage vessel/equipment failure
3.8	Vehicles (Fire trucks) to be serviced and refuelled within the workshop and service bays only	Ongoing	Operations manual	<ul style="list-style-type: none"> Site mgmt. 	No observations of cleaning/servicing outside of allowed areas

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.8 WATER MANAGEMENT (SURFACE, GROUND AND POTABLE WATER)****4.8.1 Objectives**

The objective is to minimise the impact that the Site will have on groundwater and surface water quality and quantity, aquatic and terrestrial habitats, and potable water demand, and, where possible, improve them. This includes the ongoing management of groundwater quality, and minimisation of contamination, erosion and damage to vegetation and fauna from dewatering procedures if dewatering is required during construction.

Specific objectives are as follows:

- Adhere to the Byford townsite drainage and water management plan (DoW 2008);
- Maintain compliance with water quality parameters (TN, TP, TSS, GP);
- Surface water post development flows should remain the same as pre-development; up to and including 1% Annual Exceedance Probability (AEP) event;
- Water sensitive design and best management practices form the basis of minor event surface water quantity management (i.e., up to and including 63.2% AEP event);
- Development must ensure environmental flows in watercourses and wetlands are maintained (e.g. they do not dry out due to groundwater abstraction and/or lowering groundwater levels);
- Pre-development Hydraulic Grade Line (HGL) along Cardup Brook to be preserved;
- Appliances to have minimum 5-star WELS water rating; and
- Alternative water supply strategies recommended.

4.8.2 Rationale/Potential Impacts**4.8.3 Surface water impacts**

Surface drainage can have a number of potential impacts, including:

- Loss or reduction of flows to receiving watercourses;
- Adverse changes to the water quality and metal concentrations of soil water and nearby water systems;
- Deterioration of the ecosystem and nearby water systems;
- Runoff from the project area and access tracks has the potential to cause flooding, erosion, and sedimentation in sensitive areas of bushland as well as on roads and adjacent properties;
- Temporary diversion of drains or watercourses leads to adverse impact on local flora and fauna, typically for loss of 'environmental flows' necessary to support them;

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

- Costs associated with minimising impacts and repairing disturbed areas; and
- Generation of ASS.

4.8.4 Groundwater impacts

Dewatering can have a number of impacts on groundwater including:

- Temporary lowering of the groundwater table;
- Changes in water quality and availability in adjacent areas; and
- Contamination by hydrocarbons or hazardous liquids as a result of spills in the project area.

The Southwest Australia wetland subset of the Australia and New Zealand Environment Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Water Quality, Guidelines for Fresh and Marine Waters (ANNZECC, 2000) have been used to develop the nutrient and metal trigger levels for the groundwater quality for the life of the development.

4.8.5 Legislative and other requirements

Local, State and Commonwealth legislation and management plans that applies to the management of surface water and dewatering on the project is presented in Table 8.

Table 8. Key legislation related to surface and groundwater management.

Reference	Relevant Condition	Limit/Requirement
<i>Byford townsite drainage and water management plan (DoW 2008)</i>	Section 5 Urban water use Section 6 Stormwater management strategy Section 7 Groundwater management strategy Section 9 Implementation	5-star fittings in buildings Consider alternative water supplies Pollutant reduction (TN, TP, TSS, gross pollutants) Surface water flows to match predevelopment Floor level to be 0.5 m higher than 1% AEP flood level and 1.2 m higher than groundwater level Environmental flows and water quality monitored, maintained
<i>Integrated water management strategy (SSJ 2019)</i>	Opportunity 4' proposes a water harvesting location in Cardup Bk just south of site. This emphasizes the importance of maintaining (ideally improving) water quality downstream of site.	Not applicable

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Reference	Relevant Condition	Limit/Requirement
<i>Water Quality, Guidelines for Fresh and Marine Waters (ANNZECC, 2000)</i>	Provides nutrient, metal and other contaminant trigger levels for groundwater quality	As per guidelines
<i>Conservation and Land Management Act 1984</i>	Provides for the use, protection and management of certain public lands and waters and the establishment of responsible authorities.	Permission to undertake activities impacting on DBCA managed lands and compliance with management plans.
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of environmental harm and conserving, preserving, protecting, enhancing and managing the environment.	Approval to undertake an assessed proposal, with conditions.
<i>Rights in Water and Irrigation Act 1914</i>	Provides for the regulation, management, use and protection of water resources and irrigation schemes. Rights and licences to take water; permit to obstruct or interfere with a watercourse or wetland, including its bed or banks.	Licence to take groundwater (abstraction during construction phase).
<i>Waterways Conservation Act 1976</i>	Management and conservation of water related land and environment.	Drainage requirements.
<i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i>	Defines the metropolitan water, sewerage and drainage control area and establishes method of control.	Ensure that development does not endanger water supply areas.
<i>Soil and Land Conservation Act 1988</i>	Manages the conservation of soil and land resources and the mitigation of the effects of erosion.	Conservation of soil and land resources and manages erosion.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.8.6 Management actions, targets and evidence

The Management actions for Surface and Groundwater Management are presented in Table 9 below.

Table 9. Key management actions for surface and groundwater management

Ref.	Management Actions – Surface and Groundwater Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
4.1	Install a minimum of three groundwater monitoring wells at the Site and complete groundwater monitoring events aligned with AS/NZG 5667.11:1998 to establish baseline groundwater conditions at the Site	Minimum 2 years prior to construction. Minimum twice annually in Spring (groundwater high) and Autumn (groundwater low).	Baseline seasonal groundwater quality and levels established for the Site. Surveyed locations and levels of bores.	<ul style="list-style-type: none"> DFES Site mgmt. 	<ul style="list-style-type: none"> Comply with Byford DWMP monitoring requirements Establish reliable baseline groundwater quality, levels and trends across site during Spring (high groundwater) and Autumn (low groundwater)
4.2	Groundwater monitoring wells should be installed at the following locations: <ul style="list-style-type: none"> One hydro-geologically upgradient from the operations building; One hydro-geologically downgradient from the operations buildings; and One within the wash down bay area. 	Minimum 2 years prior to construction.			

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions – Surface and Groundwater Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
4.3	<p>Increase the nutrient adsorption capacity of the in-situ landscape via revegetation (including deep-rooted species and trees) and soil improvement (e.g. high phosphorous retention index (PRI)). In line with the Byford townsite DWMP (DoW 2008), pollutant reduction targets to be achieved are as follows (as compared with a development that does not actively manage water quality):</p> <ul style="list-style-type: none"> at least 60% reduction of total phosphorous (TP); and at least 45% reduction of total nitrogen (TN). 	<p>Construction and operation phase. Monitoring minimum twice annually in Spring (groundwater high) and Autumn (groundwater low).</p>	<p>Soil material testing and specification. Annual groundwater monitoring report</p>	<ul style="list-style-type: none"> Construction contractor DFES Site mgmt. 	<ul style="list-style-type: none"> Meet Byford DWMP pollutant reduction targets Comply with Byford DWMP design requirements
4.4	<p>Institute an annual groundwater monitoring program that consists of groundwater monitoring well sampling and reporting. The program at a minimum should consist of the following analysis regime:</p> <ul style="list-style-type: none"> Physical parameters (water level, pH, salinity, turbidity, temperature, conductivity, Chemical Oxygen Demand, Biological Oxygen Demand); Total Recoverable Hydrocarbons (TRH) (to check for any changes due to vehicles and site operation); Heavy metals (arsenic, mercury, lead, nickel, copper, zinc, and cadmium); Nutrients (NO_x; ammonia (NH₄); total nitrogen (TN); filterable reactive phosphorus (FRP); and Total phosphorus (TP), chloride: sulphate ratio (to indicate any change from the baseline levels that may suggest that there has been sulphate released due to the oxidation of ASS). 	<p>Construction and operation phases. Minimum twice annually in Spring (groundwater high) and Autumn (groundwater low).</p>	<p>Annual groundwater monitoring report</p>	<ul style="list-style-type: none"> DFES Site mgmt. 	<ul style="list-style-type: none"> Groundwater quality remains or improves over the life cycle of the Site No adverse impacts (onsite and offsite) from groundwater quality at the Site Negative impacts to groundwater are captured early with appropriate remedial actions taken

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

<p>4.5</p>	<p>In line with the Byford townsite DWMP (DoW 2008), design and construct a biological treatment system (biofilter and swale) to achieve the following. Alternatively, a structural treatment system (treatment pits and underground storage) may be implemented.</p> <ul style="list-style-type: none"> • Maintain pre-development flow rates discharging from site (7 L/s in 20% AEP event, 22 L/s in 1% AEP event), by providing sufficient volumetric detention (130 m³ in 20% AEP event, 298 m³ in 1% AEP event) and appropriate conveyance on-site; • Biofilter to be a minimum of 2% impervious catchment area, and large enough to capture the first flush event (63.2% AEP – 1 hr) unless modelled treatment performance is sufficient (see below targets); • As compared to a development that does not actively manage water quality, achieve pollutant reduction targets of at least: <ul style="list-style-type: none"> ○ 80% of TSS ○ 60% of TP ○ 45% of TN ○ 70% of gross pollutants • [OPTIONAL] To achieve maximum Green Star points, achieve stretch goals for pollutant reduction targets, which are most feasibly achieved with a biological treatment system, as follows: 	<p>Design phase.</p> <p>Minimum twice annually monitoring in operation phase during Autumn and Winter (high rainfall events) (see item 4.7)</p>	<p>Design drawings, specifications. Surface water monitoring program report.</p>	<ul style="list-style-type: none"> • IPH • Terpkos • DFES 	<ul style="list-style-type: none"> • Meet Byford DWMP pollutant reduction targets • Comply with Byford DWMP design requirements • Surface water quality remains or improves over the life cycle of the Site • No adverse impacts (onsite and offsite) from surface water flows and quality at the Site • Negative impacts to surface water are captured early with appropriate remedial actions taken
------------	---	---	--	--	--

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions – Surface and Groundwater Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
	<ul style="list-style-type: none"> ○ 90% of TSS ○ 70% of TP ○ 60% of TN ○ 95% of gross pollutants ○ 90% of petroleum hydrocarbons; and ○ 98% of free oils 				
4.6	Optimise the size and function of the biological treatment system (alternatively, the structural treatment system), by tailoring the treatment to the pollutant profile of each sub-catchment.	Design phase	Design drawings, specifications	<ul style="list-style-type: none"> • IPH • Terpkos 	Maximise design efficiency
4.7	Prepare and undertake treatment system commissioning, including pre- and post-treatment testing to ensure pollutant reduction targets are met.	End of construction phase, prior to handover.	<ul style="list-style-type: none"> • Meeting minutes • System commissioning report • Status Report 	<ul style="list-style-type: none"> • Construction Contractor • DFES 	Ensure as-constructed assets achieve design intent and performance targets
4.8	For sub-catchments subject to heavy contamination not suited to biological treatment (e.g. covered servicing area, decontamination area), capture and treat runoff in oily water separator system (or similar) and connect to sewer.	Design phase	<ul style="list-style-type: none"> • Meeting minutes • System commissioning report • Status Report 	HDA	<ul style="list-style-type: none"> • Meet Byford DWMP pollutant reduction targets • Surface water quality remains or improves over the life cycle of the Site • No adverse impacts (onsite and offsite) from

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions – Surface and Groundwater Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
4.9	Institute an annual surface water monitoring program that consists of surface water sampling and reporting. Pollutant reduction targets to be achieved in line with the Byford townsite DWMP (DoW 2008) – see item 4.6 above.	Minimum twice annually monitoring in operation phase during Autumn and Winter (high rainfall events) (see item 4.7)	Surface water monitoring program report	DFES, Management	surface water flows and quality at the Site
4.10	Prepare an Erosion and Sediment Control Plan for the construction phase to ensure protection of the site flora, fauna and soil, and the downstream environment.	Prior to construction phase.	Erosion and Sediment Control Plan and monitoring reports.	Contractor	Meet Byford DWMP pollutant reduction targets. Regular observations of minimal soil and soil matter within site surface drains
4.11	Minimise scheme water demand for external and internal use by harvesting stormwater at its highest level of use, as follows. Note, Green Star ratings allocate one (1) point for every 10% reduction in potable water use. <ul style="list-style-type: none"> Rainwater off rooves for internal reuse (toilet flushing, etc.), irrigation and operations Treated stormwater off carparks, footpaths, etc. for irrigation and operations 	Design phase	Design drawings, specifications. Water bills indicating reduction in water usage.	DFES, Management	Reduce scheme water use as far as practicable
4.12	Reduce internal potable water use by implementing high-water efficiency appliances and tapware (minimum 5 star WELS rating).	Design phase	Design drawings, specifications. Water bills indicating reduction in water usage.	DFES, Management	Reduce scheme water use as far as practicable

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.9 FLORA AND VEGETATION MANAGEMENT****4.9.1 Objectives**

- Retain, protect and minimise disturbance to the existing native vegetation on Site and along Orton Road;
- Control the spread of weeds and diseases such as dieback and canker;
- Use locally endemic flora for landscaping and revegetation particularly along Orton Road (to provide resilience to existing vegetation); and
- Species typical of the Guilford Complex should be used.

4.9.2 Rationale/Potential Impacts

Removal of flora and vegetation can have a significant impact to biodiversity, urban heat island effect and groundwater management. The Shire's vision for the biodiversity within their boundaries is to "*Retain, protect and manage a connected network of over 5800 hectares of natural areas throughout the Shire so that these areas are found to be healthy and resilient in 2050* (Ironbark Environmental, 2008). The flora and vegetation management alongside management actions for other environmental values will contribute to reaching this vision for the Shire particularly as Guilford complex vegetation is poorly reserved both regionally and locally.

The construction and operation stages of the development will have impact on vegetation as follows:

- Loss of a number of trees including Marri trees and Kingia along Orton Road to facilitate access to the development;
- Potential damage to vegetation (temporary or permanent) due to unauthorised vehicle and plant movement or storage of materials;
- Spread of weeds and pathogens like dieback can occur as a result of poor hygiene or introduced to the Site via construction fill material;
- Erosion as a result of poor management of soils and water on site (e.g., flushing of water hoses over bare earth, leaving exposed piles of soil open to weed growth);
- Loss of plant function (photosynthesis) due to dust cover, litter or altered light regime; and
- Loss of plants because of drought or flooding.

4.9.3 Legislative and other requirements

State and Commonwealth legislation that applies to the management of flora and vegetation on the project are presented in Table 10.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****Table 10. Key legislation that applies to flora and vegetation management.**

Reference	Relevant Condition	Limit/Requirement
<i>Biosecurity and Agriculture Management Act 2007</i>	Provides for the management, control and prevention of spread of declared pests within Western Australia.	Control of declared plants.
<i>Conservation and Land Management Act 1984</i>	Provides for the use, protection and management of certain public lands and waters and the establishment of responsible authorities.	Permission to undertake activities impacting on DBCA managed properties and compliance with management plans.
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Provides for the protection of matters of national environmental significance (MNES).	Approval, with conditions, for activities likely to have a significant impact on any matter of national environmental significance.
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of environmental harm and conserving, preserving, protecting, enhancing, and managing the environment.	Approval to undertake an assessed proposal, with conditions.
<i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i>	Manages the clearing of native vegetation within the state to ensure it is managed appropriately and is not excessive.	Approval to clear native vegetation on State land with conditions.
<i>Biodiversity Conservation Act 2016</i>	Provides for the conservation and protection of Western Australia's biodiversity.	Licence to take protected flora and fauna, consent to take rare or endangered flora.
<i>Agriculture and Related Resources Protection Act 1976</i>	Protects agriculture from threatening influences, including weeds. Provides a list of declared plants (weeds) that require controlling.	Control of declared plants.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.9.4 Management actions

Management actions for Flora and Vegetation Management at the Site is presented in Table 11 below.

Table 11. Key management actions for flora and vegetation management.

Ref.	Revegetation	Timing	Reporting/Evidence	Responsible Party	Management Targets
5.1	Salvage <i>Kingia australis</i> plants that will be affected by construction of access road to Orton Road and reuse on site (choose visible range perhaps at the intersection with Dooley Road to retain sense of place)	During site development	Photographs of new location for salvaged <i>Kingia australis</i> plants	<ul style="list-style-type: none"> • IPH • DFES 	<i>Kingia australis</i> plants remain at the Site
5.2	Increase resilience of the existing Marri trees and support threatened fauna by planting a second row of Marri trees as a minimum or clumps of marri trees alongside existing trees.	During site development	Photographs of newly planted Marri trees	<ul style="list-style-type: none"> • IPH • DFES 	New Marri trees grow to establishment/maturity
5.3	Use exclusively local native species wherever possible. List of suitable species is provided in Appendix 3	Post construction, Ongoing	<ul style="list-style-type: none"> • Revegetation plan • Planting plan • Site logs • Monitoring reports • Meeting minutes • Photographs 	<ul style="list-style-type: none"> • DFES • Site mgmt. 	Revegetation Plan is prepared and implemented.
5.4	Plant in accordance with the hydrological conditions (e.g. species in the biofilter are different to drier / higher elevations on site) using plants that are indigenous to the site and the surrounds.				
5.5	Avoid using weedy species such as the native <i>Acacia saligna</i> , <i>Eucalyptus camaldulensis</i> and the eastern states species like <i>*Callistemon</i> sp., <i>*Corymbia citriodora</i> etc.				
5.6	Monitor and plant growth and diversity of any revegetated areas and adjust future revegetation efforts to improve success.				
5.7	Consider introducing native food (bush tucker) and medicinal plants to the Site				

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

	Management Actions for DROUGHT	Timing	Reporting/Evidence	Responsible Party	Management Targets
5.8	Revegetate during winter (high rainfall season) to enable the establishment of new seedlings during cooler months when the plants are less likely to dehydrate.	Ongoing	Vegetation and landscaping maintenance plan	<ul style="list-style-type: none"> DFES Site mgmt. 	<ul style="list-style-type: none"> Year on year downward trend in irrigation water usage Limited plant replacements required to replace dead plants
5.9	In the short term, irrigate planted stock during summer to ensure establishment. Use waterwise design and fittings.				
5.10	Utilise mulching (use coarse, fire retardant and weed free mulch) in landscaped areas				
5.11	Select species that are able to adapt to drying conditions that are native to site.				
	Management Actions - Weed Control	Timing	Reporting/Evidence	Responsible Party	Management Targets
5.12	Remove or prune back non native vegetation such as Brazilian Pepper tree.	During site development	<ul style="list-style-type: none"> Photos of removed Brazilian pepper tree Report indicating herbicide has been used to treat Brazillian pepper tree stump 	<ul style="list-style-type: none"> IPH DFES 	<ul style="list-style-type: none"> Noxious weeds are identified, removed and disposed of appropriately Noxious weeds are eliminated or minimised A long-term Weed Management Plan is prepared and implemented Surfactants not used as a part of weed control
5.13	Where necessary (e.g. for removing the Brazilian Pepper Tree), apply herbicide according to the recommended rate and using the appropriate marker dye.	During site development			
5.14	When undertaking weed spraying measures, avoid spraying in windy, very hot, wet or dusty conditions. Spray only when rain is not expected within 3 days of the spray application.	Ongoing	<ul style="list-style-type: none"> Spray logs Weed control checklist 	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	
5.15	Ensure that weeds are sprayed at the correct time, usually when they are growing strongly, and before seed set.				
5.16	Ensure staff and contractors minimise disturbance to vegetation when accessing landscaped areas during maintenance activities to reduce the establishment and spread of weeds.	Ongoing	Landscape maintenance planning	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

5.17	Continue to measure the percentage cover of weeds annually as an indicator of vegetation health and the assessment of weed control efforts.				
5.18	Consider the use of photo monitoring locations for each garden bed / verge. The monitoring photos can be used as a key performance indicator annually to assess the effectiveness of ongoing weed control.	Ongoing	Photos	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	
5.19	Implement the revegetation program following weed control where required.	Ongoing	<ul style="list-style-type: none"> Meeting minutes Photos Revised revegetation program plan 	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	
5.20	Restrict the use of surfactants for weed control.	Ongoing	Herbicide purchase records	<ul style="list-style-type: none"> DFES Site mgmt.. All staff 	
5.21	Apply manual weed control to minimise use of chemicals and damage to revegetated plants: i.e. hand weed around plants if the weeds are growing close to or intertwined with the plant.	Ongoing	Landscape maintenance planning	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	
5.22	Maintain lawn areas to prevent spread of lawn into vegetated garden beds. Use lawn mower catcher adjacent to garden beds for the same reason.				
	Plant disease	Timing	Reporting/Evidence	Responsible Party	
For Dieback:					
5.23	Ensure all personnel conducting work on site are familiar and trained in the dieback hygiene protocols (Green Card minimum standard).	Ongoing	Landscape maintenance planning	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	No observations of dieback made at the Site
5.24	Ensure all vehicles and equipment used in the area are clean prior to site entry. During operational stages of development, vehicles should be cleaned in the designated wash down area	Ongoing	Staff training and awareness records	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

5.25	Ensure that the contractors and the CFRS Fire Station staff practice dieback hygiene procedures when working in the landscaped areas.	Ongoing			
5.26	Undertake dieback assessment and mapping if an area is suspected of containing dieback in the future.	Ongoing			
5.27	For Marri Canker:				
	Cut and dispose affected trees or branches and dispose off site. (Where only branches are removed, tree may grow for many years without showing additional symptoms).	Ongoing	<ul style="list-style-type: none"> Vegetation maintenance plan Staff training and awareness records 	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	No observations of dieback made at the Site
	Use clean equipment to cut the branches and clean between each tree and after all pruning is completed. Use 75% ethanol or methylated spirits for this task.				
	Cover any wounded areas with the suitable wound paint to prevent infection of the newly cut surfaces.				
	Avoid pruning during wet weather.				
	Always prune least affected trees first before moving to trees that have a greater level of damage.				
5.28	For Honey Fungus:				
	Do not touch or move plants with signs of disease and contact Department of Agriculture Pest and Disease Information Service immediately for guidance on management Free call 1800 084 881.	Ongoing	<ul style="list-style-type: none"> Vegetation maintenance plan Staff training and awareness records 	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	No observations of Honey Fungus made at the Site
5.29	For Myrtle Rust:				
	Do not touch or move plants with signs of disease and contact Department of Agriculture Pest and Disease Information Service immediately for guidance on management Free call 1800 084 881.	Ongoing	<ul style="list-style-type: none"> Vegetation maintenance plan Staff training and awareness records 	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	No observations of Myrtle Rust made at the site
	If possible, email a photograph and details of the plant location to info@agric.wa.gov.au .				

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

	Do not take a sample to send to the Pest and Disease Information Service. Cutting off a piece of the diseased plant could dislodge the spores and accelerate the local spread of myrtle rust.				
	Immediately wash any clothes/ PPE and skin that may have come in contact with spores.				
5.30	Use drip irrigation rather than sprinkler irrigation for native plants. Avoid overwatering.				
5.31	Maintain fence around the site to prevent and control unauthorised access which can spread the disease.				

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.10 FAUNA MANAGEMENT****4.10.1 Objectives**

- Retain, protect, and minimise disturbance to the existing native vegetation on Site and along Orton Road particularly Marri trees.
- Increase habitat value on site by planting Marri Trees and other local species that can support Threatened Forest Red Tailed Cockatoo, Quenda, birds and lizards.
- Provide areas where birds can access water (e.g. Bird waterer (e.g. <https://www.victoriapark.wa.gov.au/Around-town/Environment/Bird-waterers>), bird bath or similar) within gardens away from the road. Maintain water to avoid mosquito breeding.

4.10.2 Rationale/Potential Impacts

While the Site is almost entirely cleared of native vegetation and currently the fauna habitat is poor, the loss of some of the large trees and shrubs will affect a number of smaller birds and invertebrates that may have used the area occasionally. The loss of a number of Marri trees along Orton Road will affect food availability for the Threatened Forest Red tailed Black Cockatoo and the noise and vibration during the development will likely have impact on the number of smaller animals that may reside on site such as lizards.

Quenda will also likely be affected and possibly move away from the area during construction. Post construction the impacts are likely to lessen and some fauna will likely return to the Site, provided appropriate habitat is created for their survival. The size of the property and the nature of the development allows opportunities for habitat creation for many fauna, which should be demonstrated as part of the sustainable development.

The construction and operation stages of the Development will have impact on fauna as follows:

- Loss of habitat and food resources – e.g., a number of trees including Marri trees along Orton Road will have a direct impact on the food resource availability to Forest Red tailed Black Cockatoo and clearing of trees and shrubs (many of which are not native will impact smaller birds);
- Noise and light will affect movement of Quenda and a number of small lizards and or snakes in the area;
- Open excavations, pits, pipework and construction materials will provide traps for some fauna;
- Operation of the station can create issues in terms of lighting or inappropriate food and other waste disposal (e.g. composting) that could create habitat for vermin; and
- Any areas where water can stagnate can provide habitat for mosquitoes.

4.10.3 Legislative and other requirements

State and Commonwealth legislation that applies to the management of fauna on the project are

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

presented in Table 12.

Table 12. Key legislation that applies to fauna management.

Reference	Relevant Condition	Limit/Requirement
<i>Biodiversity Conservation Act 2016</i>	Provides for the conservation and protection of Western Australia's biodiversity.	License to take protected flora and fauna, consent to take rare or endangered flora
<i>Environmental Protection Act 1986</i>	Preventing, controlling and abating environmental harm and conserving, preserving, protecting, enhancing and managing the environment.	Approval to undertake an assessed proposal.
<i>Conservation and Land Management Act 1945</i>	Provides for the use, protection and management of certain public lands and waters and the establishment of responsible authorities.	License/permit to undertake activities impacting on DWER managed properties and compliance with management plans
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Provides for the protection of MNES.	Approval required for activities likely to have a significant impact on any matter of national environmental significance.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.10.4 Management actions, targets and evidence

The Management actions for fauna management are presented in Table 13 below.

Table 13. Key management actions for Fauna Management.

Ref.	Management Actions - Fauna	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.1	Ensure appropriate measures are taken during construction to protect fauna. This includes covering any open excavations and areas where fauna may reside and checking then each day prior to start of works.	Before construction	<ul style="list-style-type: none"> Incident reports Fauna observations 	IPH	<ul style="list-style-type: none"> No/minimal observations of fauna loss Minimal damage to existing fauna habitat or suitable replacement habitat created
9.2	Ensure staff are educated on the impact's construction works and later operation of the building can have on fauna and how best to avoid and or minimise these impacts.	Ongoing	<ul style="list-style-type: none"> Staff training and awareness records 	<ul style="list-style-type: none"> DFES Site mgmt. 	
9.3	Complete training for all staff regarding fauna present at the Site and appropriate behaviours when encountering fauna				
9.4	Ensure all trees and vegetation scheduled for removal are checked for presence of fauna and nests prior to clearing. Organise fauna translocation (preferably local to the site) if required.	Before construction	Vegetation maintenance plan	IPH	
9.5	Use flora that provide food, roosting and breeding habitat for local native fauna such as Forest Red Tailed Black-Cockatoo and Quanda for landscaping and future revegetation efforts.	Before construction	<ul style="list-style-type: none"> Vegetation maintenance plan Forest Red Tailed Black-Cockatoo and Quanda counts for reporting to DBCA 	IPH	No/minimal observations of fauna loss

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions - Fauna	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.6	Consider an artificial nesting box or the Black Cockatoos.	During site development And operations	<ul style="list-style-type: none"> Photo of nesting box 	<ul style="list-style-type: none"> IPH DFES 	Nesting box usage by Black Cockatoos
9.7	Retain logs (especially if hollow) larger dead branches, sticks and some leaf litter as fauna habitat for ground dwellers within landscaped areas that are 5 - 10 m away from the building and access pathway interface.	During site development and operations	<ul style="list-style-type: none"> Photos of logs retained 	<ul style="list-style-type: none"> IPH EPCAD DFES 	<ul style="list-style-type: none"> No/minimal observations of fauna loss Minimal damage to existing fauna habitat or suitable replacement habitat created
9.8	Carry out timely weed control.	During site development and operations according to weed management plan	Weed management plan	All staff	<ul style="list-style-type: none"> Noxious weeds are identified, removed and disposed of appropriately Noxious weeds are eliminated or minimised
9.	Ensure pest species such as mice, rats, foxes, mosquitoes are managed in accordance with the best management practices. Control of rats and mice will support the control of feral predators such as domestic cats.	During site development and operations according to pest management plan	Pest management plan	<ul style="list-style-type: none"> IPH DFES Site mgmt. 	<ul style="list-style-type: none"> No fauna deaths due to pest species No observations of feral predators at the Site Minimal observations of pest species
9.11	Ensure that the fencing is dog proof.	During site development and operations	Pest management plan Inspection logs	<ul style="list-style-type: none"> IPH DFES Site mgmt. 	<ul style="list-style-type: none"> No fauna deaths due to dogs

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions - Fauna	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.12	<p>Implement management actions outlined in the Shire of Serpentine Jarrahdale Mosquito control guidelines:</p> <ul style="list-style-type: none"> Cover up: Wear long, loose-fitting, light colored clothing, covering as much of the body as you can. Repel: When outdoors and mosquitoes are present, apply insect repellent containing DEET (diethyltoluamide) or picaridin evenly to exposed skin. Clean up: Simple changes around your home/business can reduce mosquito breeding. Remove, empty or cover water-holding containers. 	During site development and operations	Pest management plan	<ul style="list-style-type: none"> IPH DFES Site mgmt. 	Minimisation of mosquito born viruses affecting staff and adjacent residents
9.13	Remove any containers with stagnant water that is close to the development and change water in any water baths and or bird waterers regularly.	During site development and operations			
9.14	Cover rainwater, stormwater and septic tank openings, wells, or other large water containers with mosquito-proof mesh.	During site development and operations			

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.11 HERITAGE MANAGEMENT****4.11.1 Objectives**

- Protect and minimise disturbance to the existing landform and water flows including groundwater and stormwater;
- Maintain healthy vegetation and water quality; and
- Provide opportunities for sharing and incorporating Traditional Ecological Knowledge and cultural practices in maintenance of natural resources including fire management.

4.11.2 Rationale/Potential Impacts

Given the site setting it is generally unlikely that the activity will harm Aboriginal or European Heritage. However, given that artefacts were found close to the Cardup Brook, it is possible that some artefacts may be present at the Site. The discovery of any artefacts during development stages will need to comply with the requirements of the *Aboriginal Heritage Act 1972*, which details specific responsibilities related to the management and protection of heritage sites.

Other potential impacts on heritage include:

- Localise alterations in groundwater distribution and surface water drainage patterns resulting in a reduction of integrity of mythological values, particularly with regard to perceived effects on the Waugal;
- Reduced “sense of place” arising from changes in hydrological regimes through localised alterations in groundwater distribution and surface water drainage patterns; and
- Reduced “sense of place” arising from changes in native vegetation.

4.11.3 Legislative and other requirements

State and Commonwealth legislation that applies to the management of heritage issues at the Site are presented in Table 14.

Table 14. Key legislation that applies to heritage management.

Document Reference	Relevant Condition	Limit/Requirement
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i> (Commonwealth)	Protects areas and objects of significance to Aboriginal people	Protects areas and objects of significance to Aboriginal people
<i>Native Title Act 1993</i> (Commonwealth)	Recognises and protects Native Title and provides for land use agreements where Native Title exists	Native Title assessment over any land that is required for development

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Document Reference	Relevant Condition	Limit/Requirement
<i>Aboriginal Heritage Act 1972</i>	Preservation of places and objects customarily used by the original inhabitants of Australia	Consent to disturb Aboriginal sites under Section 18 of the Act
<i>Heritage Act 2016</i>	Conservation of places having significance to	Approval to disturb, damage or demolish heritage sites

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.11.4 Management actions, targets and evidence

The Management actions for fauna management are presented in Table 15 below.

Table 15. Key management actions for heritage management,

Ref.	Management Actions - Heritage	Timing	Reporting/Evidence	Responsible Party	Management Targets
7.1	Promote local native flora that have Aboriginal cultural significance.	Ongoing	Vegetation management plan	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Vegetation management plan that includes that have Aboriginal cultural significance
7.2	Enable demonstration of cultural burn practices within the Cardup CFRS operational area	Once every 2 years	<ul style="list-style-type: none"> Meeting minutes Photos Pamphlets or other information presented to the public 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Cultural burn practice demonstration held within prescribed time periods
7.3	Institute 'Welcome to the Country' for site visitors and as part of site induction procedures	Ongoing	<ul style="list-style-type: none"> Meeting minutes Induction material 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Not applicable

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.12 FIRE MANAGEMENT****4.12.1 Objectives**

- To minimise the risk of fire and to be able to respond effectively should a fire occur during construction and operational phases of the Development; and
- Prevent loss of biodiversity through inappropriate fire regimes.

4.12.2 Rationale/Potential Impacts

Rationale/Potential impacts from fire include:

- Harm to human health and damage/destruction of property;
- Loss, degradation or fragmentation of habitat; and
- Increased occurrence of weeds and other impacts on flora and fauna.

4.12.3 Legislative and other requirements

Local authority, FESA and DBCA fire management requirements will be complied with where relevant. This includes consideration of the following legislation presented in Table 16.

Table 16. Key legislative requirements for fire management.

Document Reference	Relevant Condition	Limit/Requirement
<i>Bush Fires Act 1954</i>	Provides for fire management and the control of fire in rural areas.	Compliance with the Act to manage fire risk and control.
<i>Conservation and Land Management Act 1984</i>	Provides for the use, protection and management of certain public lands and waters and the establishment of responsible authorities.	Permission to undertake activities impacting on DBCA managed properties and compliance with management plans.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.12.4 Management actions, triggers, and indicators

The Management actions for Fire Management are presented in Table 17 below.

Table 17. Key management actions for fire management.

Ref.	Management Actions - Fire	Timing	Reporting/Evidence	Responsible Party	Management Targets
8.1	Implement a weed management programme to control weeds in the natural areas.	Ongoing	Weed Management Plan	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	<ul style="list-style-type: none"> Weeds that pose a fire risk are identified, removed and disposed of appropriately Weeds that pose a fire risk are eliminated or minimised
8.2	Maintain fences around the development to prevent and control public access thus reducing the potential for ignition.	<ul style="list-style-type: none"> Pre-construction Ongoing 	<ul style="list-style-type: none"> Site security planning Design documents 	<ul style="list-style-type: none"> IPH DFES 	<ul style="list-style-type: none"> No unauthorised access from the public maintained
8.3	Apply only coarse / chunky mulch or composted wood chips in landscaped areas as this form of mulch is less likely to ignite due to large particle size or avoid mulching altogether. Use of gravel is also appropriate for the site. All areas that are regularly inundated in winter should be mulch free (e.g. biofilter).	Ongoing	<ul style="list-style-type: none"> Vegetation management plan Landscape design 	<ul style="list-style-type: none"> EPCAD DFES, Site Mgmt 	<ul style="list-style-type: none"> No fires or other ignition events at the Site Fuel load is reduced or eliminated
8.4	Prepare a Bush Fire Emergency Response Plan for the Building once constructed. Review this plan every three (3) years.	After construction	<ul style="list-style-type: none"> Bush Fire Emergency Response Plan Evidence of review completed every 3 years 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	<ul style="list-style-type: none"> Bush Fire Emergency Response Plan is reviewed
8.5	Prune vegetation within the 20m buffer from the development. This includes pruning of lower (below 2 m) branches and thinning out the shrub layer so it does not form a continuous dense cover.	Ongoing	<ul style="list-style-type: none"> Vegetation management plan Landscape design 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Fuel load present at the Site is reduced or eliminated

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions - Fire	Timing	Reporting/Evidence	Responsible Party	Management Targets
8.6	Remove any dead vegetation and excess leaf litter within 20 m of the building and dispose off site at a suitable SoSJ composting facility.	Ongoing	<ul style="list-style-type: none"> Vegetation management plan Landscape design 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Fuel load present at the Site is reduced or eliminated
8.7	Perform cultural patch burning of the landscaped areas if appropriate (e.g. if mulched with gravel and the species are tolerant of fire).	Ongoing			
8.8	Use low growing fire-retardant species that are locally native and suited to the habitat closer to the building (e.g., <i>Conostylis aculeata</i> , <i>Patersonia occidentalis</i>).	Ongoing			
8.9	Revegetate burnt areas if the plants are damaged beyond repair.	Ongoing			

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.13 WASTE MANAGEMENT**

Environmental management issues associated with waste management shall be managed as per the Waste Management Plan (WMP) for the Site. The WMP has been included in this EMP as Appendix 3.

4.14 NOISE AND VIBRATION MANAGEMENT**4.14.1 Objectives**

To minimise the impacts of construction noise and vibration on occupants of the adjacent and surrounding area and to comply with all relevant statutory guidelines and acceptable standards.

4.14.2 Rationale

Potential impacts of noise and vibration during construction and site operations include:

- Increased noise and vibration impacts to sensitive receivers;
- Increased noise impacts to sensitive receivers due to increased construction traffic and traffic diversions;
- Increased noise impacts from training exercises involving loud fire fighting equipment (e.g. 'jaws of life');
- Displacement of fauna due to noise and vibration emissions; and
- Damage to adjacent properties due to vibration emissions.

4.14.3 Legislative and other requirements

State and Commonwealth legislation that applies to the management of noise and vibration on the project are presented in Table 18.

Table 18. Key legislative requirements for noise and vibration management.

Reference	Relevant Condition	Limit/Requirement
<i>Environmental Protection (Noise) Regulations 1997</i>	Regulations that set noise limits for industry and methods for assessing and controlling noise.	Approval of out of hours noise management required.
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of environmental harm and conserving, preserving, protecting, enhancing and managing the environment.	Approval to undertake an assessed proposal, with conditions.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Reference	Relevant Condition	Limit/Requirement
<i>Australian Standard 2436-2010</i>	Standards that provide methods for assessing and controlling noise and vibration.	Control of noise and vibration.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.14.4 Management actions, targets and evidence

The Management actions for Noise and Vibration Management are presented in Table 19 and Table 20 below.

Table 19. Key management actions for noise management.

Ref.	Management Actions – Noise Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.1	All machines, equipment, plant and vehicles proposed for the Site shall be of types complying with Worksafe Western Australia requirements for noise abatement. The operation of such machines, equipment, plant and vehicles shall be certified to be within the limits of the Environmental Protection (Noise) Regulations 1997	Ongoing	Equipment certifications for all applicable equipment	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Compliance with Worksafe Western Australia requirements for noise abatement
9.2	Maintain and do not modify acoustic treatments on vehicles or machinery, i.e.: do not remove mufflers, and carry out regular inspections of the machinery to ensure treatments are in place	Twice yearly inspections	No evidence of acoustic treatment modification Inspection log	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Minimal to no noise complaints from the public
9.3	Undertake construction activities within the standard construction hours (7am and 7pm Monday to Saturday)	During construction	Construction management plan	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	
9.4	Place any static equipment that generates noise (e.g. generators and compressors) will be located as far as practicable from nearby noise sensitive receivers	Design phase	Building infrastructure design	<ul style="list-style-type: none"> IPH 	
9.5	Selection of machinery and operational practices will be undertaken to produce the lowest practical level of noise and vibration. All machinery where practical will be fitted with exhaust mufflers	Ongoing	<ul style="list-style-type: none"> Building infrastructure design Construction management plan 	<ul style="list-style-type: none"> IPH DFES 	

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions – Noise Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.6	Include education on the importance of minimisation of noise and vibration during construction and methods for minimising noise and vibration impacts in the site induction.	Ongoing	Training records Induction material	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	
9.7	Early consultation conducted with community stakeholders on the likely impact of activities likely to cause disruption	Ongoing	<ul style="list-style-type: none"> Stakeholder engagement material (presentations, pamphlets etc.) Meeting minutes 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	
9.8	In areas where noise exceeds the specified levels, prominent warning signs shall be displayed and hearing protection shall be provided to all onsite workers	Ongoing	<ul style="list-style-type: none"> Signage Photos PPE available 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	No noise complaints from the public and staff

Table 20 Key management actions for vibration management.

Ref.	Management Actions – Vibration Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.9	Provide adequate and ongoing communications with adjacent residents regarding the timing of works, type of works and possible times of high impact	<ul style="list-style-type: none"> Pre construction During operations 	<ul style="list-style-type: none"> Stakeholder engagement material (presentations, pamphlets etc.) Meeting minutes 	<ul style="list-style-type: none"> IPH TERPKOS EPCAD 	No vibration complaints from the public
9.10	Ensure that vehicles and equipment are appropriately sized to satisfactorily undertake the work	<ul style="list-style-type: none"> Pre construction During operations 	Construction management plan	<ul style="list-style-type: none"> IPH TERPKOS EPCAD 	
9.11	Unload, store, and manoeuvre construction materials as far as possible from buildings that may be susceptible to vibration damage	Construction		<ul style="list-style-type: none"> IPH TERPKO EPCAD 	

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Ref.	Management Actions – Vibration Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.12	Vibration complaints will be addressed within 24 hours unless otherwise explained to the complainant.	Ongoing	Incident reporting log including correction action undertaken	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Complaints addressed within 24 hours unless otherwise explained to the complainant.
9.13	A combined register (noise and vibration) including date and time of all incidents and complaints must be maintained The register must also include how the issue was rectified.	Ongoing and reviewed annually	Incident register that includes noise and vibration	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Correct and up to date incident register that is reviewed annually

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.15 AIR QUALITY MANAGEMENT****4.15.1 Objectives**

To minimise impacts on local air quality and protect the surrounding land users such that emissions will not adversely impact upon their welfare and amenity or cause health problems. This is to be carried out by implementing air pollution mitigation strategies that involve limiting/eliminating harmful emissions and reducing the sites contribution to climate change by limiting Greenhouse Gas emissions (GHG) arising from normal operations and incidents (refrigerant gas leaks etc.).

4.15.2 Rationale/Potential Impacts

Potential impacts include:

- GHG and ozone depleting substances arising from equipment leaks which contribute to climate change;
- Reduced air quality and impacts on human health from elevated dust levels and particulate/ gaseous emissions during construction;
- Nuisance dust or odour emissions
- Dust deposition on flora and vegetation.

Dust management actions are covered under a separate dust management plan and thus are not included in this document.

4.15.3 Legislative and other requirements

State and Commonwealth legislation that apply to the management of air quality on the project is presented in Table 21.

Table 21. Key legislation that applies to air quality management.

Reference	Relevant Condition	Limit/Requirement
<i>Environmental Protection Act 1986</i>	Prevention, control and abatement of environmental harm and conserving, preserving, protecting, enhancing, and managing the environment	Approval to undertake an assessed proposal, with conditions
<i>Ozone Protection and Synthetic Greenhouse Gas Management Act 1989</i>	Protect the environment by reducing emissions of ozone depleting substances and synthetic greenhouse gases	Promote responsible management and handling of ozone depleting substances and synthetic greenhouse gases to minimize their impact on the atmosphere.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.15.4 Management actions, targets and evidence

The Management actions for Air Quality Management other than dust management actions are presented in Table 22 below.

Table 22. Key management actions for fire management.

Ref.	Management Actions – Air Quality	Timing	Reporting/Evidence	Responsible Party	Management Targets
10.1	Promote responsible refrigerant use at the Site by engaging appropriate refrigerant management contractors that meet WA and National certification and licensing requirements	Ongoing	<ul style="list-style-type: none"> Contractor management procedure ensuring contractors hold required certifications/licenses 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> Meet WA and National certification and licensing requirements for contractor engagement Limiting GHG emissions from the Site
10.2	Ensure that flammable refrigerants are not stored and used at the Site	Ongoing	<ul style="list-style-type: none"> No equipment present utilising flammable refrigerants 	<ul style="list-style-type: none"> DFES Site Mgmt 	No incidents related to flammable refrigerants
10.3	Ensure that low Global Warming Potential (GWP) CO ₂ eq refrigerant gas is used at the Site	Ongoing	<ul style="list-style-type: none"> Purchase or maintenance orders indicating the type of refrigerant gas used 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> No refrigerant leaks of high GWP refrigerant gas Limiting GHG emissions from the Site
10.4	In the event of a refrigerant gas leak, ensure that the leak is rectified by a certified/licensed contractor before recharging air conditioning equipment. This is to prevent ongoing leaks of refrigerant	Ongoing	<ul style="list-style-type: none"> No ongoing refrigerant gas topups Stable or reducing trend in refrigerant gas top ups 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> No ongoing leaks of refrigerant gas Limiting GHG emissions from the Site
10.5	Do not charge refrigeration and air conditioning equipment with a higher global warming potential (GWP) refrigerant than the equipment was designed to use (the design refrigerant).	Ongoing	<ul style="list-style-type: none"> Purchase or maintenance orders indicating the type of refrigerant gas used 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> Limiting GHG emissions from the Site Maintain refrigerant equipment integrity

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****4.16 ACCESS MANAGEMENT (INCLUDES TRAFFIC AND PUBLIC SAFETY)****4.16.1 Objectives**

To ensure the traffic created by and related to the Site is effectively managed and impacts on local residents, businesses and road users are minimised.

To ensure traffic is managed in such a way as to minimise the potential for accidents and other safety risks.

4.16.2 Rationale

The increased traffic from construction activities will result in some short-term adverse impacts and because local residents may have limited experience of such traffic conditions, an increased risk of incident.

4.16.3 Legislative and other requirements

State and Commonwealth legislation that apply to the management of traffic and public safety on the project are presented in Table 23.

Table 23. Key legislative requirements for traffic and public safety.

Reference	Relevant Condition	Limit/Requirement
<i>Local Government Act 1995</i>	Provides for the closure or partial closure of local government roads and thoroughfares for repairs, maintenance and other requirements.	Approval for partial or full closure of local government roads required.
<i>Main Roads Act 1930</i>	Provides for the management, construction, maintenance and repair of roads.	Approval for partial or full closure of roads required. Approval for oversize vehicles required.
<i>WorkSafe Occupational Safety and Health Regulations 1996</i>	Provides for workplace safety requirements, plant design and general duties applying to plant, hazardous substances and performance of high risk work.	Minimum requirements for specific hazards, work and administrative practices in relation to work safety and health.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

4.16.4 Management actions, targets and evidence

The Management actions for Access Management are presented in Table 24 below.

Table 24. Key management actions for access management.

Ref.	Management Actions – Access Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
11.1	In areas where the construction traffic intersects with existing roads traffic management measures will be agreed with the Shire to minimise the localised short term impacts	During construction	<ul style="list-style-type: none"> Traffic management plan Construction management plan 	<ul style="list-style-type: none"> Construction Contractor 	<ul style="list-style-type: none"> Traffic management measures implemented No traffic incidents resulting from site construction
11.2	Public notification of construction activities, will be given prior to commencement of works in each area	During construction	<ul style="list-style-type: none"> Copy of public notification 		Public notification complete
11.3	Appropriate approvals or permits will be obtained (including Shire and Main Roads WA)	During construction	Traffic management plan		All required approvals obtained
11.4	Road access shall be maintained in the project area via signed detours and/or single lane access	During construction	Traffic management plan		Access signage installed
11.5	When construction work is being undertaken within or adjacent to designated road reserves, road signs will be located on local and main roads	During construction	<ul style="list-style-type: none"> Traffic management plan Construction management plan 		Access signage installed
11.6	Any material spilled from haulage vehicles leaving the project area will be cleaned up as soon as possible. Appropriate signage will be used/erected during this cleanup process.	During construction	Construction management plan		Access signage installed Spills cleaned up within 24 hours

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Ref.	Management Actions – Access Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
11.7	Where there is any risk of public injury such as open trenches etc., the construction area will be fenced or otherwise cordoned off	During construction	Construction management plan		Fencing installed
11.8	Machinery and plant will be kept in locked compounds when the construction area is not in use	During construction	Construction management plan	<ul style="list-style-type: none"> • DFES • IPH 	Fencing installed and machines secured
11.9	Spoil and mulch heaps shall be no higher than 1.2 m	During construction	Construction management plan	<ul style="list-style-type: none"> • DFES • IPH 	No evidence of soil erosion arising from soil and mulch heaps
11.10	Advisory warning boards shall be placed on fenced construction zones and compounds. The warning boards shall state the nature of the hazard and give a staffed contact telephone number for emergencies.	During construction	Construction management plan	<ul style="list-style-type: none"> • DFES • IPH 	Access signage installed
11.11	Where there is any risk of public injury such as open trenches etc., the construction area will be fenced or otherwise cordoned off	During construction	Construction management plan	<ul style="list-style-type: none"> • DFES • IPH 	Fencing installed

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****5.0 INCIDENT MANAGEMENT****5.1.1 Objectives**

Site management will ensure any incident that may have a negative impact on the surrounding environment or community is appropriately reported, managed, and rectified.

Following an incident, appropriate management measures will be implemented to prevent such incidents reoccurring.

5.1.2 Scope

For the purpose of this EMP, an incident is defined as any exceedance of environmental limits, criteria, standards, specification requirements or laws and or any environmental occurrence that threatens the safety of an individual or an individual is injured through an environmental condition.

Contingency procedures and management strategies shall be in place to prevent the occurrence of controllable incidents and to reduce impacts on people, property or the environment should an incident occur. Management measures shall also be implemented to prevent the reoccurrence of such incidents.

Reporting an environmental incident will include:

- Reporting of the incident in an incident log;
- Time limits for incident reporting;
- Structure and content of incident reports;
- Assessment of the significance of each incident;
- Discontinuation of the work which gave rise to the incident until a suitable management measure has been implemented;
- Reporting incidents to regulatory authorities and stakeholders; and
- Remediation/mitigation of impacts.

This incident management procedure does not supersede any DFES environmental and safety incident reporting management procedure(s) already in place.

5.1.3 Legal and other requirements

Conditions of State and Commonwealth legislation that apply specific criteria to the management of incidents on the project is presented in Table 25.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****Table 25. Key legislation that applies specific criteria to incident management.**

Document Reference	Relevant Condition	Limit/Requirement
<i>Biodiversity Conservation Act 2016</i>	Provides for the conservation and protection of Western Australia's biodiversity.	License to take protected flora and fauna, consent to take rare or endangered flora
<i>Environmental Protection Act 1986</i>	Preventing, controlling and abating environmental harm and conserving, preserving, protecting, enhancing and managing the environment.	Approval to undertake an assessed proposal.
<i>Conservation and Land Management Act 1984</i>	Provides for the use, protection and management of certain public lands and waters and the establishment of responsible authorities.	License/permit to undertake activities impacting on DWER managed properties and compliance with management plans
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Provides for the protection of MNES.	Approval required for activities likely to have a significant impact on any matter of national environmental significance.

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

5.1.4 Management actions, targets and evidence

The incident management measures that shall be put in place by site management are presented in Table 26 below.

Table 26. Key management actions for incident management.

Ref.	Management Actions – Incident Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
12.1	Provide and advertise a telephone number for public reporting of incidents for the duration of the construction works;	During construction	<ul style="list-style-type: none"> • Proof of advertisement 	<ul style="list-style-type: none"> • Construction contractor 	Not applicable
12.2	Undertake daily examinations of the Site during construction so that any incidents are identified as quickly as possible;	Daily during construction	<ul style="list-style-type: none"> • Site log • Incident reports 	Construction contractor	No ongoing/unidentified environmental incidents
12.3	In the event of an environmental incident, an Environmental Incident Report shall be prepared which shall include; <ul style="list-style-type: none"> • A description of the incident and potential root causes; • Corrective actions undertaken; and • Preventative actions undertaken to prevent a recurrence of the incident. 	Within 48 hours of the incident	Incident reports	<ul style="list-style-type: none"> • DFES • Site mgmt. • All staff 	Clear and concise ENV incident reports
12.4	The Environmental Incident Report will be provided to the Shire and DFES management within 48 hours of the incident occurring.	Within 48 hours of the incident	Shire acknowledgement of incident report	<ul style="list-style-type: none"> • DFES • Site mgmt. • All staff 	On-time submissions of ENV incident reports
12.5	The corrective strategies that were implemented will be assessed to determine whether successful mitigation had occurred;	3 months after the incident	<ul style="list-style-type: none"> • Incident report review • Meeting minutes 	<ul style="list-style-type: none"> • DFES • Site mgmt. • All staff 	<ul style="list-style-type: none"> • No recurrence of incidents • Elimination/mitigation of the root causes that led to the incident in the first instance
12.6	Annual environmental incident review to identity trends, isolated reoccurrences and potential for improvement	Annual	Meeting minutes Action log/tracker	<ul style="list-style-type: none"> • DFES • Site mgmt. 	<ul style="list-style-type: none"> • No recurrence of incidents • Elimination/mitigation of the root causes that led to the incident in the first instance

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN**6.0 REPORTING**

Currently during this pre development phase there has been no advice regarding regular reporting requirements for the Site (e.g., water quality or noise monitoring reports submitted to the Shire or DWER etc.).

This EMP shall be updated if specific reporting instructions are given to the Site and its management.

7.0 TRAINING AND AWARENESS

All relevant personnel will be required to complete an induction that includes information on environmental issues and impacts. The induction will be conducted prior to the personnel commencing work and will include:

- Information on the environment at the Site, historical use, cultural significant and surrounding area;
- General overview of this EMP;
- Requirements for emergency response, incidents and accidents;
- Summary of the content of the management procedures; and
- Requirements for communications.

Records of personnel attendance at the induction shall be kept on record for auditing purposes.

8.0 MONITORING, MANAGEMENT REVIEW AND REVISION**8.1.1 Monitoring, management review and revision**

There must be a continuous review of the EMP to ensure that environmental objectives and outcomes are being met and to ensure that the relevant environmental issues i.e. EMP performance is being appropriately managed. Monitoring the performance of this EMP will determine whether the system is functioning adequately, which areas of the system need improvement and if any alternative procedures can be implemented that may be more effective than those currently in place.

Upon construction of the Site, this EMP shall be reviewed and updated accordingly.

Monitoring and evaluation of the EMP performance shall be instituted by Site management and should consist of the following elements:

- Review of the management actions detailed in this EMP to ensure that they are realistic, robust and have adequate resources available to them;
- Evaluation of records associated with the actions detailed in this EMP;

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

- Evaluation of any monitoring data collected (e.g. groundwater and surface water monitoring data) and EMP performance indicators with appropriate adjustment to this EMP if objectives are not being met;
- Evaluation of the incident report log with appropriate adjustment to this EMP
- Review of data gaps (if any) and the impact on EMP performance; and
- Review assumptions and uncertainties.

The EMP should also be continually reviewed and revised based on the following events:

- If significant change occurs to the Sites operations and/or infrastructure;
- Significant change occurs in the adjacent or surrounding areas;
- Stakeholder feedback and internal/external audits regarding environmental management performance;
- Introduction of technical advances or innovation that may positively impact environmental management performance;
- As a part of the Sites document review procedure; and
- At least once every three (3) years.

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN****REFERENCES**

ATC Williams (2022) Cardup Career & Rescue Fire Station, Byford. Technical Report for Iredale Pedersen Hook Architects, November 2022.

Aurora Environmental [Aurora] (2022). 169 Doley Road, Byford – Flora and Fauna Due Diligence Assessment. Technical Report for DFES, 15th September 2022.

Commonwealth Scientific and Industrial Research Organisation [CSIRO] (2022) State of the Climate Report 2022. Available at: <https://www.csiro.au/en/research/environmental-impacts/climate-change/State-of-the-Climat>

Department of Biodiversity, Conservation and Attractions [DBCA] (2019) Geomorphic Wetlands, Swan Coastal Plain (DBCA-019). GIS shapefile available at: <https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-swan-coastal-plain>

Department of Climate Change, Energy, the Environment and Water [DCCEEW] (2022) Directory of Important Wetlands in Australia. Available at: <https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands> and Australian Ramsar Wetlands at <https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/australian-ramsar-wetlands>

Department of Primary Industries and Regional Development [DPIRD] (2017) Soil Landscape Mapping - Best Available (DPIRD-027). GIS shapefile available at: <https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available>

Department of Water [DoW] (2008) Byford townsite drainage and water management plan. Technical Report DWMP1, September 2008. Available at: https://www.water.wa.gov.au/data/assets/pdf_file/0020/1694/81639.pdf

Department of Water [DoW] (2017). Peel-Harvey catchment Nutrient report 2015 - 2017 update – Upper Serpentine River. Available at: https://www.water.wa.gov.au/data/assets/pdf_file/0004/9409/111444.pdf

Department of Water and Environmental Regulation [DWER] (2022a) Contaminated Sites Database (DWER-059). Available at: <https://catalogue.data.wa.gov.au/dataset/contaminated-reported-sites-dwer-059>

Department of Water and Environmental Regulation [DWER] (2022b) Groundwater Map. Available at: <https://maps.water.wa.gov.au/Groundwater/>

Department of Water and Environmental Regulation [DWER] (2021). Clearing Regulations - Environmentally Sensitive Areas (DWER-046). Available at: <https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046>

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

Department of Water and Environmental Regulation [DWER] (2018) Peel-Harvey catchment Nutrient report 2018 - Upper Serpentine River. Available at: https://www.wa.gov.au/system/files/2022-06/Upper_Serpentine_River_2018.pdf

Environmental Protection Agency [EPA] (2004). Environmental Protection (Clearing of Native Vegetation) Regulations 2004. Environmental Protection Authority, Perth, Western Australia. 2004.

Government of Western Australia. (2019). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, <https://catalogue.data.wa.gov.au/dataset/dbca>

Hedde, E. M., Loneragan, O. W., and Havel, J. J. (1980) Vegetation Complexes of the Darling System, Western Australia. In department of Conservation and Environment, Atlas of Natural Resources, Darling System, Western Australia

Ironbark Environmental (2008) Shire of Serpentine- Jarrahdale Local Biodiversity Strategy.

Jordan, J.E. (1986) Armadale, part sheets 2033 I and 2133 IV, Perth Metropolitan Region, Environmental Geology Series, Geological Survey of Western Australia.

Shire of Serpentine Jarrahdale (2018) Local Planning Policy 2.4: Water Sensitive Urban Design Guidelines. Reference: E18/8840 Updated July 2018.

Wallbridge Gilbert Aztec (2019) Shire of Serpentine Jarrahdale – Integrated Water Management Strategy – Preliminary Water Security Study – Shortlist of Options. Available at: https://www.sjshire.wa.gov.au/Profiles/sj/Assets/ClientData/Integrated_Water_Management_Strategy.pdf

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

APPENDICES

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

APPENDIX 1 MANAGEMENT ACTIONS

CARDUP CFRS FIRE STATION: **ENVIRONMENTAL MANAGEMENT PLAN**

APPENDIX 2 GUILDFORD VEGETATION LISTING

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Scientific Name	Common Name	Annual/perennial	Form	Height (m)	Flora base habitat	Flora base soils and habitat	Flowering time	Flower colour	Significant Fauna Value
<i>Acacia pulchella</i>	Prickly Moses	perennial	Shrub	1.5	Low-lying areas, swamps, near watercourses	Spearwood dunes, Bassendean dunes, Pinjarra plains, Lateritic	Jun-Oct	yellow	
<i>Anigozanthos manglesii</i>	Mangles Kangaroo Paw	perennial	Herb	0.5		White, yellow or grey sand, sandy loam.	Sep-Nov	green & red	
<i>Anigozanthos viridis</i>	Green Kangaroo Paw	perennial	Herb	0.5	Winter-wet areas	Sand, loam, clay. Winter-wet areas.	Aug-Oct	green/yellow-green	
<i>Banksia grandis</i>	Bull Banksia	perennial	Tree	8		White or grey sand, laterite.	Sep-Dec	yellow-green	Black Cockatoo
<i>Banksia nivea</i>	Honeypot Dryandra	perennial	Shrub	0.5		Sandy soils, gravel, laterite, granite.	May-Sep	cream-yellow-orange-pink/red-brown	
<i>Beaufortia squarrosa</i>	Sand Beaufortia	perennial	Shrub	1.5	Sandplains, associated with winter-wet depressions	White, grey or yellow sand, sometimes over limestone, laterite. Sandplains, associated with winter-wet depressions.	Jan-Apr	red-orange-yellow	
<i>Brachyscome iberidifolia</i>	Swan River Daisy	annual	Herb	0.5	Along watercourses, on sandhills, in depressions over granite	Sandy, clay or saline soils. Along watercourses, on sandhills, in depressions over granite.	Aug-May	white-blue-purple	
<i>Calothamnus hirsutus</i>	Hawkeswood	perennial	Shrub	1	Ridges, winter-wet depressions	Yellow/grey sand, clay, sandy clay, loam, gravel, weathering sandstone, granite. Ridges, winter-wet depressions.	Sep-Dec	red	
<i>Calothamnus villosus</i>	Woolly Net Bush	perennial	Shrub	1	Rocky hills, outcrops	Sandy soils on granite, laterite or quartzite, clay. Rocky hills, outcrops.	Sep-Dec	red	
<i>Centella asiatica</i>	Centella	perennial	Herb	0.3		Often in winter-wet depressions.	all year	pink/purple-red/white	
<i>Conostylis aculeata</i>	Prickly Conostylis	perennial	Herb	0.5	Winter-wet areas, swamp margins, drainage areas, ditches, sand dunes	Sand, loam, clay, gravel, limestone, laterite. Winter-wet areas, swamp margins, drainage areas, ditches, sand dunes.	Sep-Oct	yellow	
<i>Corymbia calophylla</i>	Marri	perennial	Tree	35	Flats, hills, slopes, breakaways, wetlands, fringing salt marches, beside drainage lines	Red-brown clay loam, orange-brown sandy clay, gravel, grey sand over limestone, granite, laterite. Flats, hills, slopes, breakaways, wetlands, fringing salt marches, beside drainage lines.	Jan-May	white/pink	Black Cockatoo
<i>Dampiera alata</i>	Winged-stem Dampieri	perennial	Herb	0.5	Plains, swamps, hillslopes	Sandy or clay, often gravelly soils, laterite. Plains, swamps, hillslopes.	Aug-Nov	blue	
<i>Dampiera linearis</i>	Common Dampiera	perennial	Herb	0.5	Plains, stony ridges, seasonally wet flats	Sandy or clayey soils, laterite. Plains, stony ridges, seasonally wet flats.	Jul-Nov	blue	
<i>Daviesia decurrens</i>	Prickly Bitter-pea	perennial	Shrub	0.5	Well-drained slopes, adjacent to river	Red-brown loam over clay, gravel, laterite. Well-drained slopes, adjacent to river.	Jun-Aug	orange & red	
<i>Eremaea pauciflora</i>		perennial	Shrub	1	Undulating sandplains, low ridges, hillslopes, plateaus, moist depressions, breakaways, fringing salt marshes, roadverges	White, grey, yellow or brown sand, red-brown loam, sandy clay, gravel, laterite, limestone, granite. Undulating sandplains, low ridges, hillslopes, plateaus, moist depressions, breakaways, fringing salt marshes, roadverges.	Sept-Dec Sep-Dec	orange/red/yellow	

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Scientific Name	Common Name	Annual/perennial	Form	Height (m)	Flora base habitat	Flora base soils and habitat	Flowering time	Flower colour	Significant Fauna Value
<i>Eucalyptus lane-poolei</i>	Salmon White Gum	perennial	Tree	12	Slopes, creek banks	Sandy loam or sand, often with gravel over laterite or granite. Slopes, creek banks.	May-Sep Feb-May	white-cream	
<i>Eucalyptus rudis</i>	Flooded Gum	perennial	Tree	20	Wetter parts of south-western WA, flats, hillsides	Sandy or loam soils. Wetter parts of south-western WA, flats, hillsides.	August Apr-Nov	white	Black Cockatoo
<i>Gompholobium marginatum</i>		perennial	Shrub	0.3		Lateritic gravelly soils, granitic soils.	Aug-Sep	yellow	
<i>Grevillea bipinnatifida</i>	Fuchsia Grevillea	perennial	Shrub	1	Granite outcrops, hills, sometimes winter-wet flats	Granitic soils, sand, loamy clay, lateritic soils. Granite outcrops, hills, sometimes winter-wet flats.	Mar-Nov	orange-red	
<i>Haemodorum laxum</i>		perennial	Herb	1	Dry or seasonally damp situations	Grey or yellow sand, clay, gravel, laterite.	Jan to Nov	black/brown/green-brown	Can be grown and interesting addition as bush tucker
<i>Hakea ceratophylla</i>	Horned Leaf Hakea	perennial	Shrub	1	Seasonally wet flats, granite outcrops	Grey/brown or black sand, loam, gravel. Seasonally wet flats, granite outcrops.	Sep-Dec	brown-red	
<i>Hakea sulcata</i>	Furrowed Hakea	perennial	Shrub	1.5		Sandy soils over laterite, clay.	Aug-Sep	white-cream	
<i>Hakea trifurcata</i>	Two-leaf Hakea	perennial	Shrub	2		White, grey/brown sand over limestone or laterite, loam, gravel.	Jul-Oct	white/cream-pink	
<i>Hakea varia</i>	Variable-leaved Hakea	perennial	Shrub	4	Seasonally-wet flats	White, grey or red loamy sand, clay loam, laterite. Seasonally-wet flats.	Jul-Oct Jul-Aug	white-cream/yellow	Black Cockatoo
<i>Hardenbergia comptoniana</i>	Native Wisteria	perennial	Creep er	climber	Coastal limestone, sandplains, dunes	Sandy soils. Coastal limestone, sandplains, dunes.	Jun-Sep	blue-purple/white	
<i>Hemiandra pungens</i>	Snakebush	perennial	Shrub	0.5	Rock outcrops	Sand, clay and loam, gravel, laterite, granite. Rock outcrops.	Oct-Apr	white/blue-purple/pink	
<i>Hibbertia hypericoides</i>	Buttercup	perennial	Shrub	0.3		Variety of habitats.	Apr-Nov	yellow	
<i>Hibbertia racemosa</i>	Stalked Guinea Flower	perennial	Shrub	0.3	Coastal areas: dunes, plains & limestone	Grey, white or yellow sand. Coastal areas: dunes, plains & limestone.	Jul-Nov Jun-Nov	yellow	
<i>Hovea chorizemifolia</i>	Holly-leaved Hovea	perennial	Shrub	0.5	Hills, breakaways, granite outcrops	Sand, laterite, gravel. Hills, breakaways, granite outcrops.	Jun-Sep	blue-purple	
<i>Hovea pungens</i>	Devils Pins	perennial	Shrub	0.50	Granite outcrops, coastal limestone, flats, undulating sandplains	Shallow soils on rock, sandy soils, laterite, gravel, clay & loamy soils. Granite outcrops, coastal limestone, flats, undulating sandplains.	Jun-Nov	blue-purple	
<i>Hypocalymma angustifolium</i>	White Myrtle	perennial	Shrub	1	Flats, swamps, along watercourses, near permanent fresh-water springs, outcrops, hillsides	Grey to white sand, peaty soils, sandy clay, sandstone. Flats, swamps, along watercourses, near permanent fresh-water springs, outcrops, hillsides.	Jul-Oct	white-cream	
<i>Hypocalymma robustum</i>	Swan River Myrtle	perennial	Shrub	1	Undulating terrain, ridges	Gravelly lateritic soils, sandy soils. Undulating terrain, ridges.	Jul-Oct	pink/pink-red	
<i>Isopogon dubius</i>	Pincushion Coneflower	perennial	Shrub	1		Sand, sandy loam, clayey soils, lateritic sandy gravel.	Jul-Oct	pink/pink-red	
<i>Isopogon sphaerocephalus</i>	Drumstick Isopogon	perennial	Shrub	1.5		Laterite, sandy, often gravelly soils.	Aug-Nov	cream & yellow	
<i>Juncus kraussii</i>	Sea Rush	perennial	Rush	1.5	Swamps, brackish estuaries, saline flats	White or grey sand, clay, alluvium. Swamps, brackish estuaries, saline flats.	Nov-Dec	brown/red	
<i>Juncus pallidus</i>	Pale Rush	perennial	Rush	1.5	Swamps, watercourses	Clay. Swamps, watercourses.	Oct-Nov	green	
<i>Kennedia coccinea</i>	Coral Vine	perennial	Creep er	climber		Often sandy soils.	Aug-Nov	orange & pink/red & pink & purple	

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Scientific Name	Common Name	Annual/perennial	Form	Height (m)	Flora base habitat	Flora base soils and habitat	Flowering time	Flower colour	Significant Fauna Value
<i>Kennedia prostrata</i>	Scarlett Runner	perennial	Creep er	climber		Usually sandy gravelly soils.	Jul-Nov	red	
<i>Kennedia stirlingii</i>	Bushy Kennedia	perennial	Creep er	climber	Granite outcrops, hillsides, swampy areas, river banks	Sandy clay, laterite. Granite outcrops, hillsides, swampy areas, river banks.	Aug-Nov	orange-red	
<i>Kingia australis</i>	Kingia	perennial	Shrub	3		Sand, sandy loam, clayey loam.	Jul to Aug	yellow-green/brown-green	
<i>Kunzea recurva</i>		perennial	Shrub	2	Winter-wet depressions, rocky slopes	Variety of soils. Winter-wet depressions, rocky slopes.	Aug-Nov	pink/purple-red	
<i>Lambertia multiflora</i>	Many-flowered Honyesuckle	perennial	Shrub	2	Base of escarpment, plains, rocky hills, gorges, plateaus, roadsides	White, grey, yellow, brown sand, sandy clay, laterite, granite, limestone. Base of escarpment, plains, rocky hills, gorges, plateaus, roadsides.	Jun-Dec	yellow/orange-red	
<i>Lechenaultia biloba</i>	Blue Leschenaultia	perennial	Shrub	0.6	Hills, outcrops, flats	Lateritic or granitic soils. Hills, outcrops, flats.	Oct-Dec Jul-Nov	blue	
<i>Leptocarpus coangustus</i>		perennial	Rush	0.8	Swamps, rivers, lakes.	White or grey sand, clay, sandy clay, sometimes saline soils.	Jun to Oct.	brown-red	
<i>Lepidosperma longitudinale</i>	Pithy sword-sedge	perennial	Sedge	1	Seasonally wet flats, swamps	Black, white or grey peaty sand, clay. Seasonally wet flats, swamps.	Nov-Jan	brown	
<i>Macrozamia riedlei</i>	Zamia	perennial	Cycad	2	Jarrah forests	Lateritic soils. Jarrah forests.	Sep-Oct	cones	
<i>Melaleuca lateritia</i>	Robin Redbreast Bush	perennial	Shrub	2	Swampy areas	Black, grey or brown clay, dark brown sandy loam, yellow brown sandy clay, granite. Swampy areas.	Sep-Apr	red-orange	
<i>Melaleuca radula</i>	Graceful Honey Myrtle	perennial	Shrub	2	Associated with granite rocks or watercourses	Sandy, often gravelly soils over granite or laterite. Associated with granite rocks or watercourses.	Sep-Nov	pink-purple/white	
<i>Melaleuca viminea</i>	Mohan	perennial	Shrub	4	Near creeks or wet depressions, along watercourses, rocky coastal areas, flats	Sandy or clayey soils. Near creeks or wet depressions, along watercourses, rocky coastal areas, flats.	Aug-Oct	white-cream	
<i>Mesomelaena tetragona</i>	Semaphore Sedge	perennial	Sedge	0.4	Dry or seasonally damp situations	White, brown, grey, or lateritic sand, loam, sandy clay, gravel.		brown-black	For future consideration only: Essential part of Guilford complex especially locally but not grown in the nurseries
<i>Morelotia octandra</i>		perennial	Sedge	0.5	Dry or seasonally damp situations	White, brown, grey, or lateritic sand, loam, sandy clay, gravel.	Nov to Dec	brown	may be difficult to obtain but essential part of Guilford complex. Worth adding to supplementary list
<i>Neurachne alopecuroidea</i>	Foxtail Mulga Grass	perennial	Grass	0.5	Sandplains, hillslopes, outcrops	White, yellow, grey/brown or lateritic sand, clay, loam, granite. Sandplains, hillslopes, outcrops.	Aug-Nov	green-other	
<i>Patersonia occidentalis</i>	Western Patersonia	perennial	Herb	0.5	Winter-wet areas, dunes, granite outcrops	Grey-brown sand or sandy clay, red-brown clayey loam, gravel, laterite, ironstone, granite, limestone. Winter-wet areas, dunes, granite outcrops.	Sept-Dec	purple	
<i>Pericalymma ellipticum</i>	Swamp Teatree	perennial	Shrub	1	In elevated areas on seasonally swampy platforms	Leached sand with some clayey sands, lateritic soils. In elevated areas on seasonally swampy platforms.	Sep-Dec Sept-Dec	white-pink	
<i>Petrophile squamata</i>		perennial	Shrub	1.5	Sandplains, slopes, winter-wet swamps & flats	Sandy or clayey soils, laterite, granite. Sandplains, slopes, winter-wet swamps & flats.	Aug-Nov	yellow-cream-white	

CARDUP CFRS FIRE STATION: ENVIRONMENTAL MANAGEMENT PLAN

Scientific Name	Common Name	Annual/perennial	Form	Height (m)	Flora base habitat	Flora base soils and habitat	Flowering time	Flower colour	Significant Fauna Value
<i>Pimelea rosea</i>	Rose Banjine	perennial	Shrub	1	Coastal sand dunes & plains, limestone or granitic rises	Sand, sandy clay, gravel. Coastal sand dunes & plains, limestone or granitic rises.	Aug-Nov	pink/red-purple	
<i>Thysanotus multiflorus</i>	Many-flowered Fringe Lily	perennial	Herb	0.5		Sand, laterite, granite.	September	purple	
<i>Verticordia acerosa</i>		perennial	Shrub	1	Granite outcrops, hills, sandplains, clay flats, damp depressions	White or yellow sand, sandy gravel, stony loam, laterite. Granite outcrops, hills, sandplains, clay flats, damp depressions.	Aug-Nov Sep-Jan	yellow/orange-red-brown	
<i>Verticordia plumosa</i>	Plumed Featherflower	perennial	Shrub	1	Seasonally wet situations, rock outcrops, undulating plains, hills, road verges	Sandy or clayey soils, gravel, granite. Seasonally wet situations, rock outcrops, undulating plains, hills, road verges.	Sep-Dec Aug-Nov	pink-blue-purple-red-white	
<i>Xanthorrhoea preissii</i>	Grass Tree	perennial	Shrub	3	Ranges, coastal plain, near watercourses	Grey to black sands, grey-brown loam, brown gravelly sandy clay, laterite, granite. Ranges, coastal plain, near watercourses.	Nov-Jan	white-cream	Black Cockatoo
<i>Xylomelum occidentale</i>	Woody Pear	perennial	Tree	8		White or grey sand.	Dec-Feb	cream-white	
<i>Philotheca spicata</i>	Pepper and Salt	perennial	Shrub	0.6	NA	Variety of soils.	Jun to Nov	pink-purple-blue/white	

APPENDIX 3 WASTE MANAGEMENT PLAN



Perth

Dilhorn House, 2 Bulwer Street

Perth WA 6000

T (08) 9227 2600

F (08) 9227 2699

15 September 2022

Department of Fire and Emergency Services
c/- ACORPP, Level 2/2B, 338 Barker Road, SUBIACO WA 6008

Attention: Jessica Buchan

Dear Jessica,

RE: 169 DOLEY ROAD, BYFORD – FLORA AND FAUNA DUE DILIGENCE ASSESSMENT

Aurora Environmental (Aurora) has been engaged by the Department of Fire and Emergency Services (DFES) (the Client) to undertake a due diligence assessment of the flora, vegetation and fauna values on 169 Doley Road, Byford (the Site). It is understood that the Client is considering acquiring the Site to construct a career fire station.

This letter summarises the findings of Aurora Environmental's (Aurora) assessment of the flora, vegetation and fauna values of 169 Doley Road, Byford (the Site).

SCOPE OF WORK AND METHODOLOGY

The scope of work included the following:

- Desktop assessment of the flora, vegetation and fauna values within (and near) the site.
- A visual inspection of the Site to confirm current conditions.
- Preparation of this letter report summarising the findings of the assessment and the provision of advice related to State and Commonwealth environmental legislation.

The desktop assessment included a review of the following data sources:

- Department of Biodiversity, Conservation and Attractions (DBCA) threatened and priority flora and fauna and threatened ecological communities (TEC) databases;
- Free to access databases such as Dandjoo and Locate V5;
- The Index for Biodiversity Survey Assessments (IBSA) database;
- The Department of Climate Change, Energy, the Environment and Water's (DCCEEW's) Protected Matters Search Tool (PMST);
- The Department of Water and Environmental Regulation's (DWER's) native vegetation clearing permit system viewer to identify if there have been any native vegetation clearing applications submitted for the Site or near the Site;
- DCCEEW's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referrals page.

A site inspection was undertaken by Julia Schuurmans, a Graduate Environmental Scientist from Aurora on 12 September 2022. The purpose of the site inspection was to visually assess site conditions and validate the findings from the desktop assessment.

DESKTOP ASSESSMENT

Land Use

The Site is currently zoned 'Urban' under the Metropolitan Region Scheme (MRS) and 'Urban Development' in the Shire of Serpentine Jarrahdale's (SSJ) Town Planning Scheme No. 2.

Landgate (2022) historical aerial photography dating back to 1953 indicate that the Site was cleared and used for rural activities. In the 1974 photograph, the Site is cleared and vacant of any structures with two native trees within the Lot. A structure (shed?) first appears within the Site in the 1987 photograph with subsequent structures (also sheds) evident in the 2003 photograph. The residential dwelling present on the Site was constructed during 2005. Land to the immediate north of the Site is currently being developed for residential purposes.

Wetlands

The Geomorphic Wetland Area's map (DBCA-019, accessed 5 September 2022) (DBCA, 2022) shows a wetland palusplain covers the entirety of the Site. Wetland Unique Feature Identifier (UFI) 15797, Armadale Palusplain, is categorised as a 'Multiple Use' wetland, indicating the value of the wetland vegetation is degraded having been subject to historic disturbances.

A search of the PMST (DCCEEW, 2022) (Attachment 1) with a 5 km buffer applied indicates there are two wetlands of international importance (RAMSAR) that may be relevant to the Site:

- Forrestdale and Thomsons Lake; and
- Peel-Yalgorup system.

Forrestdale and Thomsons Lake are located more than 10 km from the Site and therefore will not be impacted by the development of the Site. As the Site is within the catchment of the Peel-Yalgorup system, State Planning Policy (SPP) No. 2.1 Peel-Harvey Coastal Plain Catchment (noting that this will be replaced by a revised SPP No. 2.9 Planning for Water) and the Bindjareb Djilba (Peel Harvey Estuary) Protection Plan will be relevant considerations for future development of the Site. Future development should consider implementation of water sensitive urban design principles including measures to ensure protection of groundwater and surface water quality.

Vegetation

The PMST report (Attachment 1) identifies the following TECs (which are afforded protection under the EPBC Act) as potentially occurring within the search area (within 5 km of the Site):

- Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered);
- Clay pans of the Swan Coastal Plain (Critically Endangered);
- *Corymbia calophylla* – *Kingia australis* woodlands on heavy soils of the Swan Coastal Plain (Endangered);

169 Doley Road, Byford
Flora, Vegetation and Fauna Environmental Due Diligence Assessment

- *Corymbia calophylla* – *Xanthorrhoea preissii* woodlands and shrublands of the Swan Coastal Plain (Endangered); and
- *Tuart (Eucalyptus gomphocephala)* Woodlands and Forests of the Swan Coastal Plain (Critically Endangered).

The conservation status in brackets listed above is the current status under the EPBC Act.

The search results from the DBCA's TECS and priority ecological communities (PECs) database (received 1 September 2022) indicates that there are no known occurrences of TECs or PECs within the Site. The following significant ecological communities have been recorded within 10 km of the Site, noting that the distances provided below represent the distance between the Site and the buffered extent of the TEC/PEC:

TECs

- *Bankia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain (floristic community type 20b as originally described in Gibson et al. (1994)). The nearest occurrence of this TEC is approximately 60 m south of the Site.
- *Corymbia calophylla* – *Kingia australis* woodlands on heavy soils of the Swan Coastal Plains – Critically Endangered (floristic community type 3a as originally described in Gibson et al. (1994)). The nearest occurrence of this TEC is approximately 330 m east of the Site.
- *Corymbia calophylla* - *Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain (floristic community type 3c as originally described in in Gibson et al. (1994)). The nearest occurrence of this TEC is approximately 1.4 km north-east of the Site.
- Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain) (Critically Endangered). The nearest occurrence of this TEC is approximately 1.3 km east of the Site.
- Southern wet shrublands, Swan Coastal Plain (floristic community type 2 as originally described in Gibson et al. (1994)) (Endangered). The nearest occurrence of this TEC is approximately 6.35 km south of the Site.
- Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. (1994)) (Endangered). The nearest occurrence of this TEC is approximately 8.8 km north-west of the Site.

PECs

- *Casuarina obesa* association (Priority 1). The nearest occurrence of this PEC is approximately 2.1 km north-west of the Site.
- Banksia Woodlands of the Swan Coastal Plain ecological community (Priority 3). The nearest occurrence of this PEC is approximately 1 km north-east of the Site.
- *Eucalyptus haematoxylon* - *E. marginata* woodlands on Whicher foothills (Priority 3). The nearest occurrence of this PEC is approximately 3.5 km south-east of the Site.
- Low lying *Banksia attenuata* woodlands or shrublands (Priority 3). The nearest occurrence of this PEC is approximately 8 km west of the Site.

169 Doley Road, Byford
Flora, Vegetation and Fauna Environmental Due Diligence Assessment

The conservation status in brackets listed above is the current status under the *Biodiversity Conservation Act 2016* (BC Act).

Flora

Commonwealth and State (DBCA) databases were used to obtain information on the potential presence of conservation significant flora within the general locality. A 10 km buffered search area was applied for the DBCA searches and a 5 km search area used for the PMST search. The consolidated list of flora species identified from the searches is provided in Table 1.

TABLE 1: CONSERVATION SIGNIFICANT FLORA

SPECIES	SOURCE		CONSERVATION STATUS	
	PMST	DBCA ¹	EPBC ACT	BC ACT
<i>Acacia horridula</i>	-	✓	-	Priority 3
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)	-	✓	-	Priority 1
<i>Acacia oncinophylla</i> subsp. <i>patulifolia</i>	-	✓	-	Priority 4
<i>Andersonia gracilis</i>	✓	-	Vulnerable	Threatened (Endangered)
<i>Anthocercis gracilis</i>	✓	-	Vulnerable	Threatened (Vulnerable)
<i>Amanita carneiphylla</i>	-	✓	-	Priority 3
<i>Amanita fibrilloses</i>	-	✓	-	Priority 3
<i>Amanita wadjukiorum</i>	-	✓	-	Priority 3
<i>Amanita wadulawitu</i>	-	✓	-	Priority 2
<i>Angianthus drummondii</i>	-	✓	-	Priority 3
<i>Babingtonia urbana</i>	-	✓	-	Priority 3
<i>Banksia kippistiana</i> var. <i>paenepeccata</i>	-	✓	-	Priority 3
<i>Caladenia huegelii</i>	✓	✓	Endangered	Threatened (Critically Endangered)
<i>Calectasia grandiflora</i>	-	✓	-	Priority 2
<i>Calytrix simplex</i> subsp. <i>simplex</i>	-	✓	-	Priority 1
<i>Diuris micrantha</i>	✓	✓	Vulnerable	Threatened (Vulnerable)
<i>Diuris purdiei</i>	✓	✓	Endangered	Threatened (Endangered)
<i>Drakaea elastica</i>	✓	✓	Endangered	Threatened (Critically Endangered)
<i>Drakaea micrantha</i>	✓	-	Vulnerable	Threatened (Endangered)

¹ DBCA search included the threatened and priority flora database and the Western Australian herbarium records.

TABLE 1: CONSERVATION SIGNIFICANT FLORA

SPECIES	SOURCE		CONSERVATION STATUS	
	PMST	DBCA ¹	EPBC ACT	BC ACT
<i>Drosera occidentalis</i>	-	✓	-	Priority 4
<i>Drosera oreopodion</i>	-	✓	-	Priority 1
<i>Eleocharis keigheryi</i>	✓	-	Vulnerable	Threatened (Vulnerable)
<i>Eucalyptus x balanites</i>	✓	✓	Endangered	Threatened (Critically Endangered)
<i>Grevillea curviloba</i> subsp. <i>incurva</i>	✓	✓	Endangered	Threatened (Critically Endangered)
<i>Jacksonia gracillima</i>	-	✓	-	Priority 3
<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>	-	✓	-	Priority 2
<i>Lasiopetalum pterocarpum</i>	✓	-	Endangered	Threatened (Critically Endangered)
<i>Lepidosperma rostratum</i>	✓	✓	Endangered	Threatened (Endangered)
<i>Meionectes tenuifolia</i>	-	✓	-	Priority 3
<i>Millotia tenuifolia</i> var. <i>laevis</i>	-	✓	-	Priority 2
<i>Morelotia australiensis</i> (formerly <i>Tetraria australiensis</i>)	✓	✓	Vulnerable	Threatened (Vulnerable)
<i>Ornduffia submersa</i>	-	✓	-	Priority 4
<i>Pithocarpa corymbulosa</i>	-	✓	-	Priority 3
<i>Ptilotus sericostachyus</i> subsp. <i>roseus</i>	-	✓	-	Priority 1
<i>Schoenus capillifolius</i>	-	✓	-	Priority 3
<i>Schoenus pennisetis</i>	-	✓	-	Priority 3
<i>Schoenus</i> sp. Waroona (G.J. Keighery 12235)	-	✓	-	Priority 3
<i>Stylidium aceratum</i>	-	✓	-	Priority 3
<i>Stylidium longitubum</i>	-	✓	-	Priority 4
<i>Synaphea</i> sp. Fairbridge Farm	✓	-	Critically Endangered	Threatened (Critically Endangered)
<i>Synaphea</i> sp. Pinjarra Plain	✓	✓	Endangered	Threatened (Endangered)
<i>Synaphea</i> sp. Serpentine	✓	✓	Critically Endangered	Threatened (Critically Endangered)
<i>Thelymitra magnifica</i>	-	✓	-	Priority 1
<i>Thelymitra stellata</i>	✓	✓	Endangered	Threatened (Endangered)
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	-	✓	-	Priority 4

169 Doley Road, Byford
Flora, Vegetation and Fauna Environmental Due Diligence Assessment

The database records show that none of the species listed in Table 1 have been recorded within the Site. The closest records of conservation significant flora occur approximately 750 m south (*Amanita wadulawitu* and *Johnsonia pubescens* subsp. *cygnorum*, both Priority 2 species) and 1.3 km north-east (*Babingtonia urbana*, Priority 3 species) of the Site.

The Dandjoo database search identified 54 species of native and introduced flora as occurring within a 5 km radius of the Site. Threatened species are not listed within the Dandjoo database.

Fauna

Commonwealth and State (DBCA) databases were used to obtain information on the potential presence of conservation significant fauna within the general locality. A 10 km buffered search area was applied for the DBCA searches and a 5 km search area used for the PMST search. The consolidated list of fauna species identified from the searches is provided in Table 2.

TABLE 2: CONSERVATION SIGNIFICANT FAUNA

SPECIES	SOURCE		CONSERVATION STATUS	
	PMST	DBCA	EPBC ACT	BC ACT
Birds:				
<i>Botaurus poiciloptilus</i> (Australasian Bittern)	✓	✓	Endangered	Threatened (Endangered)
<i>Cacatua pastinator</i> (Muir's Corella)	-	✓	-	Specially Protected – Conservation Dependent
<i>Calidris canutus</i> (Red Knot)	-	✓	Endangered	Threatened (Endangered)
<i>Calidris ferruginea</i> (Curlew Sandpiper)	✓	✓	Critically Endangered	Threatened (Critically Endangered)
<i>Calidris tenuirostris</i> (Great Knot)	-	✓	Migratory	Threatened (Critically Endangered)
<i>Calyptorhynchus banksia naso</i> (Forest Red-tailed Black Cockatoo)	✓	✓	Vulnerable	Threatened (Vulnerable)
<i>Charadrius leschenaultia</i> (Great Sand Plover)	✓	✓	Vulnerable	Threatened (Vulnerable)
<i>Elanus scriptus</i> (Letter-winged Kite)	-	✓	-	Priority 4
<i>Falco peregrinus</i> (Peregrine Falcon)	-	✓		Specially Protected – Other Specially Protected
<i>Leipoa ocellata</i> (Malleefowl)	✓	✓	Vulnerable	Threatened (Vulnerable)
<i>Numenius madagascariensis</i> (Eastern Curlew)	✓		Critically Endangered	
<i>Oxyura australis</i> (Blue-billed Duck)	-	✓	-	Priority 4
<i>Rostratula australis</i>	✓		Endangered	

169 Doley Road, Byford
Flora, Vegetation and Fauna Environmental Due Diligence Assessment

TABLE 2: CONSERVATION SIGNIFICANT FAUNA

SPECIES	SOURCE		CONSERVATION STATUS	
	PMST	DBCA	EPBC ACT	BC ACT
(Australian Painted Snipe)				
<i>Sternula nereis</i> (Australian Fairy Tern)	✓		Vulnerable	
<i>Zanda baudinii</i> listed as <i>Calyptorhynchus baudinii</i> (Baudin's Black Cockatoo)	✓	✓	Endangered	Threatened (Endangered)
<i>Zanda latirostris</i> listed as <i>Calyptorhynchus latirostris</i> (Carnaby's Black Cockatoo)	✓	✓	Endangered	Threatened (Endangered)
Mammals:				
<i>Bettongia pencillata ogilbyi</i> (Woylie)	✓	✓	Endangered	Threatened (Critically Endangered)
<i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)	✓	✓	Vulnerable	Threatened (Vulnerable)
<i>Falsistrellus mackenziei</i> (Western False Pipistrelle)	-	✓	-	Priority 4
<i>Hydromys chrysogaster</i> (Rakali, Water Rat)	-	✓	-	Priority 4
<i>Isoodon fusciventer</i> (Quenda)	-	✓	-	Priority 4
<i>Myrmecobius fasciatus</i> (Numbat)	-	✓	Endangered	Threatened (Endangered)
<i>Notamacropus eugenii derbianus</i> (Tammar Wallaby)	-	✓	-	Priority 4
<i>Notamacropus Irma</i> (Wallaby)	-	✓	-	Priority 4
<i>Phascogale tapoatafa wambenger</i> (South-western Brush-tailed Phascogale)	-	✓	-	Specially Protected – Conservation Dependent
<i>Pseudocheirus occidentalis</i> (Western Ringtail Possum)	✓	✓	Critically Endangered	Threatened (Critically Endangered)
<i>Setonix brachyurus</i> (Quokka)	✓	✓	Vulnerable	Threatened (Vulnerable)
Reptiles:				
<i>Acanthophis antarcticus</i> (Southern Death Adder)	-	✓	-	Priority 3
<i>Ctenotus delli</i> (Dell's Skink)	-	✓	-	Priority 4

TABLE 2: CONSERVATION SIGNIFICANT FAUNA

SPECIES	SOURCE		CONSERVATION STATUS	
	PMST	DBCA	EPBC ACT	BC ACT
<i>Lerista lineata</i> Perth Slider, Lined Skink)	-	✓	-	Priority 3
<i>Neelaps calonotos</i> (Black-striped Snake)	-	✓	-	Priority 3
Invertebrates:				
<i>Austroconops mcmillani</i> (McMillan's Biting Midge)	-	✓	-	Priority 2
<i>Euoplos inornatus</i> (Inornate Trapdoor Spider)	-	✓	-	Priority 3
<i>Glacidorbis occidentalis</i> (Jarrah forest freshwater snail)	-	✓	-	Priority 3
<i>Idiosoma sigillatum</i> (Swan Coastal Plain Shield-backed Trapdoor Spider)	-	✓	-	Priority 3
<i>Leioproctus contrarius</i> (Short-tongued bee)	-	✓	-	Priority 3
<i>Leioproctus douglasiellus</i> (Short-tongued bee)	-	✓	Critically Endangered	Threatened (Endangered)
<i>Neopasiphae simplicior</i> (Short-tongued Bee)	-	✓	Critically Endangered	Threatened (Endangered)
<i>Synemon gratiosa</i> Graceful Sunmoth	-	✓	-	Priority 4
<i>Throscodectes xiphos</i> Styler Bush Cricket)	-	✓	-	Priority 1
Fish and Molluscs:				
<i>Geotria australis</i> (Pouched Lamprey)	-	✓	-	Priority 3
<i>Westralunio carteri</i> (Carter's Freshwater Mussel)	✓	✓	Vulnerable	Threatened (Vulnerable)

The DBCA's threatened and priority fauna database shows two records dated 2012 and 2014 of Quenda (*Isoodon fusciventer*), a Priority 4 listed taxon, occurring on the Lot (Lot 9007 on Deposited Plan 412692) immediately to the east of 169 Doley Road, Byford. Other records of conservation significant fauna include forest red-tailed black cockatoo, Carnaby's cockatoo and Quenda within Cardup Reserve south of the Site, as well as Peregrine Falcon, Southern Death Adder, Caspian tern (presumed to be an erroneous record), Carnaby's cockatoo, Baudin's cockatoo and Quenda within Brickwood Reserve.

The DBCA provided an extract from their black cockatoo database which contains records of black cockatoo breeding and roosting locations. The extract indicated that there are no known records of breeding or roosting occurring within the Site or on land immediately adjacent to the Site. The closest records are a Carnaby's cockatoo roost site near Brickwood Reserve, 1.2km north-east of the Site and forest red-tailed black cockatoo roost (now a cleared lot) approximately 2 km north-east of the Site.

The Dandjoo database search identified 15 arachnids as occurring within a 5 km radius of the Site. As this database is in its early stage of deployment, the fauna datasets available are limited.

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are specified areas, or a class of area declared under Section 51B of the *Environmental Protection Act 1986*. ESAs are associated with areas of significant vegetation, conservation significant flora and high value wetlands which may have land clearing constraints to prevent incremental degradation.

Buffered ESA mapping (Dataset: DWER-046, accessed 5 September 2022) (DWER, 2021) indicates that the Site is not mapped as an ESA. The nearest ESAs are approximately 50 m south and 330 m east of the Site. The reason for the ESA classification is not specified within the dataset. However, the ESAs appear related to the Bush Forever classification and the presence of TECs and conservation category wetlands (CCWs).

Referrals and Applications

On the 14 September 2022, the DWER's native vegetation clearing permit viewer does not show any clearing permits or clearing applications for the Site or for land immediately surrounding the Site.

A search of the EPBC Referrals portal identifies one referral (reference EPBC 2020/8779) directly adjacent to the Site. The referral was submitted by Delfina Properties Pty Ltd for a proposal to develop 18.80 ha of land located north of the Site for residential purposes. The Proposal required clearing of native vegetation which included:

- 2.83 ha of black cockatoo foraging habitat comprised of native vegetation (*Corymbia calophylla*, Marri);
- 2.88 ha of black cockatoo foraging habitat comprised of non-native vegetation; and
- 29 black cockatoo potential habitat trees (26 Marri (native species) including one with a hollow, two non-native species and one dead tree (species unknown)).

The referral application was determined as 'not a controlled action' indicating formal assessment under the EPBC Act was not required.

Biological Assessments

A search of the Index of Biological Surveys for Assessments (IBSA) database using a 5 km buffered search area from the Site identified the following three reports:

- Abernethy Road, Byford – Flora, Vegetation and Fauna Report prepared by 360 Environmental (2014) for the Shire of Serpentine Jarrahdale to support a native vegetation clearing application for modifications to Abernethy Road.

169 Doley Road, Byford
 Flora, Vegetation and Fauna Environmental Due Diligence Assessment

- Abernethy Road Upgrade, Byford – Flora, Vegetation and Fauna Report Addendum prepared by 360 Environmental (2015) for the Shire of Serpentine Jarrahdale to support a native vegetation clearing application for modifications to Abernethy Road.
- Report for Rail Reserves in the Shire of Serpentine Jarrahdale – Spring Flora and Vegetation Survey and Fauna and Habitat Assessment prepared by GHD (2012) for the Public Transport Authority of Western Australia.

In addition to the above reports, a black cockatoo habitat assessment for Lot 131 and Part Lot 6003 Doley Road and Lot 50 Warrington Road Byford by 360 Environmental (2020) was also identified from Aurora’s literature search. This report was prepared in support of the EPBC 2020/8779.

None of the above investigations included an assessment of the Site.

SITE ASSESSMENT

Aurora conducted a site inspection of 169 Doley Road, Byford on the 12 September 2022. Julia Schuurmans (Graduate Environmental Scientist) completed the inspection. Approximately 2.5 hours were spent on the Site which is considered sufficient to identify biological values present within the Site.

Flora and Vegetation

No occurrences of intact native vegetation communities were observed during the inspection. The Site has been landscaped with non-native trees (mostly eastern states species) and shrubs amongst cultivated lawns and weeds (Attachment 2). Due to the absence of any intact native vegetation communities within the Site, no TECs or PECs are present.

Only one native tree species (*Corymbia calophylla*, Marri) was recorded, with two specimens (approximately 8 to 10 m high) located in the south-eastern portion of the Site.

The significant flora taxa identified in the databases searches were not recorded on the Site during the inspection and are considered highly unlikely to occur due to the extensive and historic vegetation clearing, and the presence of introduced weed species. The following weed species were recorded during the site inspection:

- *Arctotheca calendula* (Capeweed)
- *Avena* sp. (Wild Oat Grass)
- *Cotula turbinata* (Funnel Weed)
- *Fumaria capreolata* (White Fumitory)
- *Geranium molle* (Dove’s Foot Cranesbill)
- *Osteospermum ecklonis* (Veldt Daisy)
- *Oxalis pes-caprae* (Soursob)
- *Oxalis purpurea* (Large-flower wood-sorrel)
- *Romulea rosea* (Guildford Grass)
- *Watsonia meriana* var. *bulbillifera* (Bungle Lily).

169 Doley Road, Byford
Flora, Vegetation and Fauna Environmental Due Diligence Assessment

Adjacent to the southern boundary of the Site within the road reserve there are approximately 26 Marri trees (*Corymbia calophylla*) (Attachment 2) and additional native plants including:

- *Eremaea pauciflora*
- *Kingia australis*
- *Xanthorrhoea preissii*.

The vegetation within the road reserve is degraded and no longer represents an intact native vegetation community.

Fauna

Quenda (also known as the Southern brown bandicoot (*Isoodon fusciventer*)), a Priority 4 listed species, were sighted during the site inspection. The landowner confirmed there is a small population that live between properties near the north-east corner of the Site.

Four species of birds were also observed during the site inspection, these were:

- *Eolophus roseicapilla* (Galah)
- *Gymnorhina tibicen* (Magpie)
- *Ocyphaps lophotes* (Crested Pigeon)
- *Phylidonyris novaehollandiae* (New Holland Honeyeater).

No other fauna species were observed during the inspection. One bird nest (Attachment 2) was observed within a *Eucalyptus* tree along the eastern boundary of the Site.

The landowner confirmed previous sightings of Black Cockatoos foraging on the Marri trees within the adjacent road reserve (Orton Road). Upon inspection near the south-east corner of the Site (on either side of the cross-over exiting onto Orton Road), two Marri trees had gumnuts at their bases that had chew marks most likely attributable to forest red-tailed black cockatoos (Attachment 2). Approximately 26 Marri trees (Attachment 2) were observed within the road reserve adjacent to the southern boundary of the Site.

Within the Site itself, two Marri trees were recorded. All other mature trees were non-native species (such as *Eucalyptus camaldulensis* and *Eucalyptus cladocalyx*) and are considered unlikely to provide any substantial foraging resources for black cockatoos.

Many of the mature trees present within the Site had a diameter at breast height of greater than 50 cm which classifies them as potential habitat trees. However, none of these trees possessed any hollows and therefore do not constitute breeding habitat. Large trees, particularly those near water sources, may provide roosting habitat. However, no evidence of roosting (such as scats, feathers and scratchings) were noted within the Site at the time of the inspection. European bees were observed near the eastern boundary of the Site.

Due to the absence of intact native vegetation communities and the very limited fauna habitat present, the Site is only likely to be used by fauna species which are able to persist within degraded habitats, and in particular more mobile fauna such as birds. The Marri trees within the site, along with other non-native species (such as fruit trees) may provide some foraging resources for black cockatoos.

APPROVALS

Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act provides the DCCEEW the authority to assess an action that may significantly impact on a matter of national environmental significance (MNES). A significant impact is defined as an impact which is important, notable, or of consequence, having regard to its context or intensity (DoE, 2013).

The EPBC Act applies to 'actions' which:

- have a 'significant impact' on 'matters of national environmental significance';
- are undertaken by Commonwealth government agencies and have a significant impact on the environment anywhere in the world; or
- are undertaken by any person and have a significant impact on Commonwealth land (even if the activity is not actually carried out on the Commonwealth land).

If a project fits one of these descriptions, it will be required to be referred to the DCCEEW. If the project is not consistent with any of the above descriptions, the environmental impact assessment provisions of the EPBC Act will not apply and there is no need to obtain the approval of the Commonwealth Minister for the Environment (EDO, 2012).

Based on the desktop review and site assessment, the MNES of relevance to the Site is the potential impact upon black cockatoo habitat. The Site contains very limited black cockatoo habitat, noting that that two Marri trees provide some foraging resources. There are approximately 26 Marri trees within the road reserve along the southern boundary of the Site.

The Significant Impact Guidelines (DoE 2013) and the newly released Referral Guidelines for 3 WA Threatened Black Cockatoo Species (Australian Government, 2022) were reviewed to consider the need for a referral to the DCCEEW for impacts to black cockatoos.

None of the potential habitat trees within the Site possess a hollow and therefore are not suitable for breeding. There was no evidence of black cockatoo breeding or roosting within the Site.

The Site generally comprises non-native species. These trees are not the preferred food source for black cockatoos and would most likely make up a very small proportion of the black cockatoo diet. The two Marri trees recorded within the Site provide some foraging resources. Due to the species mix present within the Site, the foraging habitat present is regarded as being of negligible value.

Based on the habitat values present and the fact less than one hectare of negligible value habitat will be impacted, Aurora Environmental considers that clearing the Site will not significantly impact any MNES and therefore an EPBC referral to DCCEEW is not recommended.

Environmental Protection Act 1986 – Part IV

Part IV of the *Environmental Protection Act 1986* (EP Act) (Sections 38 and 48) enables the Environmental Protection Authority (EPA) to assess significant proposals, strategic proposals and land use planning schemes. When determining whether a proposal will be formally assessed, the EPA considers the significance of potential environmental impacts that may arise from the proposal.

169 Doley Road, Byford
 Flora, Vegetation and Fauna Environmental Due Diligence Assessment

The EPA uses environmental factors and associated objectives as the basis for assessing whether a proposal or scheme's impact on the environment is acceptable. The environmental factors and objectives, therefore, underpin the environmental impact assessment process. Environmental factors are those parts of the environment that may be impacted. Flora and Vegetation and Terrestrial Fauna are only two examples of environmental factors considered by the EPA.

Referral under Section 38 of the EP Act can be made by:

- The proponent;
- A decision-making authority (DMA); or
- A third party.

Referral to the EPA is generally undertaken where a project or proposal is deemed to have a high risk of causing a significant environmental impact. Based on the results of this assessment, it is considered unlikely that development of the Site will have a significant impact upon flora, vegetation and fauna aspects. On this basis, a referral to the EPA under Part IV of the EP Act is not recommended.

Environmental Protection Act 1986 – Part V

Under Section 51C the EP Act, clearing of native vegetation requires a permit from the DWER, unless there is an applicable exemption under Schedule 6 of the EP Act or prescribed under Regulation 5 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Native vegetation clearing applications are assessed against the "Ten Clearing Principles" to determine whether the proposed clearing is at variance to the Principles. The Ten Clearing Principles aim to ensure that potential impacts of clearing native vegetation are appropriately considered.

The Site contains two Marri trees which may have naturally regenerated from those specimens in the adjacent road reserve. Naturally regenerated vegetation comprising native species is likely to be considered native vegetation as defined in the EP Act. However, a native vegetation clearing permit is unlikely to be needed for the development of the Site due to the likely application of Regulation 5, Item 1 exemption (Clearing to construct a building). This exemption permits clearing to the extent that is necessary for the lawful construction of a building or other structure on a property. For this exemption to apply the following must be observed:

- Clearing is conducted by or with the authority of the landowner;
- All relevant approvals are in place to permit the construction of the buildings or structures;
- The clearing is not to exceed 5 ha in any financial year; and
- The clearing does not impact riparian vegetation.

Based on our understanding of the project, it would appear that this exemption will be applicable and therefore a clearing permit to remove the two marri trees within the Site will not be needed.

Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides a framework for the protection of biodiversity in Western Australia. The objectives of the Act are to provide for:

169 Doley Road, Byford
Flora, Vegetation and Fauna Environmental Due Diligence Assessment

- the conservation and protection of biodiversity and biodiversity components in Western Australia; and
- the ecologically sustainable use of biodiversity components in Western Australia.

The scope of the BC Act and its associated Regulations protects flora, fauna, ecological communities and critical habitats².

As the Project will not impact threatened species, TECs or critical habitats for threatened species, no approvals under the BC Act are expected to be required.

CONCLUSION

Aurora was commissioned to undertake an environmental due diligence assessment of 169 Doley Road, Byford (the Site) to ascertain if the Site contained any flora, vegetation or fauna values that are worthy of protection and to determine if any environmental approvals under State or Commonwealth environmental legislation is required.

The desktop assessment component found that the general locality may contain significant fauna, flora and ecological communities. However, the desktop review and site inspection confirmed that the Site has been the subject of historic clearing which has removed any native vegetation communities. Therefore, it is unlikely that any significant flora or ecological communities are present. The remnant vegetation present within the Site is mostly comprised of non-native species which provide very limited habitat resources for fauna species which are able to persist in degraded environments. The landowner confirmed that black cockatoos occasionally forage on Marri trees situated within the adjacent road reserve (Orton Road). Foraging residues in the form of chewed marri nuts were observed during the inspection. Two marri trees were recorded within the Site. Clearing of vegetation within the Site is unlikely to significantly impact black cockatoos.

Based on the findings of this environmental due diligence assessment for flora, vegetation and fauna values Aurora Environmental considers that:

- Further site assessments are not warranted;
- Referral to the DCCEEW under the EPBC Act is not required as MNES will not be significantly impacted by the development of the Site.
- Referral to the EPA under the EP Act is not required as clearing of the Site will not significantly impact flora, vegetation and fauna values.
- It appears that Regulation 5, Item 1 exemption may be applicable to this project and therefore a clearing permit under Part V of the EP Act is not likely to be needed.
- Prior to construction commencing on the Site that measures are implemented to prevent the resident Quenda population from accessing the Site during construction to avoid mortality of these species.
- The design of the fire station should consider how water sensitive urban design principles and protection of surface water and groundwater quality may be achieved.

² Critical habitats are habitats listed under the BC Act as being critical to the survival of a threatened species or a threatened ecological community

169 Doley Road, Byford
Flora, Vegetation and Fauna Environmental Due Diligence Assessment

For and on behalf of Aurora Environmental,



Paul Zuvela
Principal Environmental Scientist

Attachments:

1. Protected Matters Search Tool Report
2. Site Photographs

REFERENCES

Australian Government (2022) Referral Guideline for 3 WA Threatened Black Cockatoo Species. Department of Agriculture, Water and the Environment, Canberra, Australia.

Department of Biodiversity, Conservation and Attractions (2022) Geomorphic Wetlands of the Swan Coastal Plain dataset (DBCA-019) [Geomorphic Wetlands, Swan Coastal Plain \(DBCA-019\) - Datasets - data.wa.gov.au](https://data.wa.gov.au), accessed 5 September 2022.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022) Protected Matters Search Tool. <https://www.awe.gov.au/environment/epbc/protected-matters-search-tool> , accessed 5 September 2022

Department of the Environment (DoE) (2013) Significant Impact Guidelines 1.1 - Matters of National Environmental Significance.

Department of Water and Environmental Regulation (2021) Environmentally Sensitive Area's Map Reference DWER-046. [Clearing Regulations - Environmentally Sensitive Areas \(DWER-046\) - Datasets - data.wa.gov.au](https://data.wa.gov.au), accessed 5 September 2022.

Environmental Defender's Office of Western Australia Inc. (EDO) (2012) An introduction to Commonwealth Impact Assessment – Fact Sheet 06, updated November 2012.

Landgate (2022) Mapviewer Plus. <https://map-viewer-plus.app.landgate.wa.gov.au/>, accessed 14 September 2022.

DISCLAIMER

This document has been produced in accordance with and subject to an agreement between Aurora Environmental (“Aurora”) and the client for whom it has been prepared (“Client”). It is restricted to those issues that have been raised by the Client in its engagement of Aurora and prepared using the standard of skill and care ordinarily exercised by Environmental / Occupational Health and Safety consultants in the preparation of such documents.

Any person or organisation that relies on or uses the document for purposes or reasons other than those agreed by Aurora and the Client without first obtaining the prior written consent of Aurora, does so entirely at their own risk and should not alter their position or refrain from doing so in reliance of this document. Aurora denies all liability in tort, contract or otherwise for any loss, damage or injury of any kind whatsoever (whether in negligence or otherwise) that may be suffered as a consequence of relying on this document for any purpose other than that agreed by Aurora.

Attachment 1

Protected Matters Search Tool Report



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 05-Sep-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	32
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	3
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	21
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Forrestdale and thomsons lakes	Within 10km of Ramsar site	In feature area
Peel-yalgorup system	30 - 40km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area	In buffer area only
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Endangered	Community known to occur within area	In buffer area only
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain	Endangered	Community known to occur within area	In buffer area only
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community may occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Roosting known to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat known to occur within area	In feature area
Dasyurus geoffroi Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat may occur within area	In feature area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat known to occur within area	In feature area
OTHER			
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
PLANT			
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In feature area
Anthocercis gracilis Slender Tailflower [11103]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leafed Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat known to occur within area	In feature area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area	In feature area
Lasiopetalum pterocarpum Wing-fruited Lasiopetalum [64922]	Endangered	Species or species habitat may occur within area	In buffer area only
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Pinjarra Plain (A.S. George 17182) [86878]	Endangered	Species or species habitat known to occur within area	In feature area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Tetraria australiensis Southern Tetraria [10137]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area

Migratory Terrestrial Species

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		
Commonwealth Land - [51517]	WA	In buffer area only
Commonwealth Land - [51380]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50876]	WA	In buffer area only

Listed Marine Species	[Resource Information]		
-----------------------	--------------------------	--	--

Scientific Name	Threatened Category	Presence Text	Buffer Status
-----------------	---------------------	---------------	---------------

Bird			
------	--	--	--

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Cardup	Nature Reserve	WA	In buffer area only
Unnamed WA42044	Nature Reserve	WA	In buffer area only
Unnamed WA51963	Conservation Park	WA	In buffer area only

Regional Forest Agreements

[Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
South West WA RFA	Western Australia	In buffer area only

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Byford Rail Extension, Byford, WA	2020/8764	Controlled Action	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Tonkin Highway Extension ??? Thomas Road to South Western Highway	2019/8608	Controlled Action	Post-Approval	In feature area
Not controlled action				
Abernethy Road upgrade (Kardan, Tourmaline & Soldiers) Byford, WA	2015/7441	Not Controlled Action	Completed	In buffer area only
BaptistCare Byford Aged Care Facility	2021/9111	Not Controlled Action	Completed	In buffer area only
Bristle Holdings Pty Ltd, Cardup Brickworks, South of Byford	2020/8834	Not Controlled Action	Completed	In buffer area only
Construction of international rowing course and commercial/residential areas	2003/1034	Not Controlled Action	Completed	In buffer area only
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed	In buffer area only
Gold Fusion Pty Ltd /Residential development/South Western Highway 40km southeast of Perth /WA/Devel	2014/7185	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Residential Development, Lots 3, 5 and 900 Taylor Rd Mundijong, WA	2019/8457	Not Controlled Action	Completed	In buffer area only
Residential development at Lot 54 Cockram Street and Lot 119 Sparkman Road, Mundijong	2020/8618	Not Controlled Action	Completed	In buffer area only
Residential development at Taylor Road and Adams Street, Mundijong, WA	2020/8780	Not Controlled Action	Completed	In buffer area only
Residential Development Various Lots Doley Road, Orton Road and Lawrence Way, Beenyup Grove Byford,	2020/8779	Not Controlled Action	Completed	In feature area
Tonkin Highway Extension	2001/470	Not Controlled Action	Completed	In buffer area only
Undertake a Controlled Fuel Reduction Burn	2008/4262	Not Controlled Action	Completed	In buffer area only
Urban development of Lots 9049 and 9063, The Glades, Byford, WA	2015/7607	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Wungong Transfer Mains Project	2007/3532	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Residential Subdivision on Abernethy Road, Byford	2009/4767	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Residential Development Doley Road, Orton Road and Lawrence Way	2020/8679	Referral Decision	Completed	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

[© Commonwealth of Australia](#)

Department of Agriculture Water and the Environment

GPO Box 858

Canberra City ACT 2601 Australia

+61 2 6274 1111

Attachment 2

Site Photographs



Photo 1: South-west corner of the Site, showing cleared land with lawn. Photographed from Doley Road.



Photo 2: Northern portion of the Site, to the right of the house, contains trees and shrubs planted in a row with cultivated lawns. Photographed from the north fence line facing west.



Photo 3: South-east corner of the Site contains lawns with a number of individual Eucalyptus trees along the east fence line. Photographed facing south.



Photo 4: *Corymbia calophylla* (Marri) tree on the Site, that contains lawn at the base. Photographed at the south-east corner of the Site.



Photo 5: *Eucalyptus* tree growing along the eastern boundary of the Site, reaching heights of 13m.



Photo 6: *Eucalyptus* tree growing at various locations throughout the property.



Photo 7: A birds nest identified within a the *Eucalyptus* tree along the eastern boundary of the Site.



Photo 8: Gumnuts with chew marks found at the base of *Corymbia calophylla* (Marri) located near the south-east corner of the Site.



Photo 9: *Corymbia calophylla* (Marri) trees growing adjacent to the Site's southern boundary within the Road Reserve (Orton Road). Photographed facing west.



Photo 10: *Corymbia calophylla* (Marri) trees growing within adjacent road reserve (Orton Road), south of the Site. Photographed facing south.



Photo 11: Gumnuts from *Corymbia calophylla* (Marri) trees, with evidence of chew marks.



Photo 12: *Kingia australis* growing beneath *Corymbia calophylla* (Marri) trees within the road reserve (Orton Road).



Photo 13: *Eremaea pauciflora* growing beneath *Corymbia calophylla* (Marri) within the adjacent road reserve (Orton Road).



Photo 14: *Arctotheca calendula* (Capeweed) and *Oxalis pes-caprae* (Soursob), identified growing in the lawn throughout the Site.



Photo 15: *Cotula turbinara* (Funnel weed) and *Oxalis purpurea* (Large-flower wood-sorrel), identified growing in the lawn throughout the Site.



Photo 16: *Oxalis pes-caprae* (Soursob), *Fumaria capreolata* (White Fumitory) and *Avena* sp. (Wild Oats) growing in the lawn within the Site and along the verges.



Photo 17: *Watsonia meriana* (Bungle Lily) and *Romulea rosea* (Guildford Grass) identified growing along the verges of the Site.



Photo 18: *Osteospermum ecklonis* (Veldt Daisy) and *Geranium molle* (Doves's Foot Cranesbill), growing in the lawn within the Site and along the verges.

Ref.	Soil and Landform Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
1.1	Minimise bulk earthworks areas, volumes, depths. Restrict filling to that required for built form only.	Design phase	Construction management plan. Design drawings, specifications.	Terpkos	<ul style="list-style-type: none"> Balanced cut to fill (< 500 m³ imported fill). No adverse impact on remnant vegetation due to erosion or earthworks. Meet Byford DWMP surface water and groundwater clearance targets.
1.2	Building design to be sympathetic to topography and in-situ soil behaviour.	Design phase	Design drawings, specifications	IPH	
1.3	Landscape design and levels to be sympathetic to topography, with planting mixes to suit soil profile and water regime.	Design phase	Design drawings, specifications	EPCAD	
1.4	A habitable floor level of minimum 0.5 m above the regional 1% AEP flood level to ensure adequate flood protection of buildings and assets	Design phase	Design drawings, specifications	Terpkos	
1.5	A habitable floor level of minimum 1.2 m above the maximum groundwater level (perched or controlled) to ensure adequate protection of buildings	Design phase	Design drawings, specifications	Terpkos	
1.6	Biofilter and swale invert levels (alternatively, drainage pit and underground storage invert levels) either: <ul style="list-style-type: none"> at or above controlled groundwater level; or minimum 0.3 m above maximum groundwater level. 	Design phase	Design drawings, specifications	Terpkos	
1.7	Excavation activities are required to maintain a minimum clearance of 0.5 m between the excavation floor and groundwater level. The pre-development groundwater monitoring results will establish seasonal groundwater level patterns to inform the construction program, and ongoing groundwater monitoring will ensure safe distance from prevailing groundwater levels (see section 4.8). If groundwater is encountered during construction, works shall cease and the Superintendent shall be notified immediately.	Design and construction phases	Construction management plan	Construction Contractor	No groundwater observations during construction phase
1.8	Where excavation for removal of existing infrastructure (swimming pool, soakwells, leach drains, tree roots, etc.) penetrates the clayey sand, backfill shall be with similar clayey sand to prevent sub-surface ponding (ATC 2022).	Construction phase	Construction management plan. Finished level survey of sub-surface clayey sand.	Construction Contractor	Compliance with requirements. No visible waterlogging.
1.9	Where excavation or bulk earthworks exposes or penetrates the surface of the clayey sand, the clayey sand shall be suitably mounded or graded to ensure it is free-draining, if not already (ATC 2022).	Construction phase	Construction management plan. Finished level survey of sub-surface clayey sand.	Construction Contractor	Compliance with requirements No visible waterlogging.
1.10	Prepare an Erosion and Sediment Control Plan for the construction phase to ensure protection of site infrastructure and the downstream environment.	Prior to construction phase	Erosion and Sediment Control Plan and monitoring reports.	Construction Contractor	<ul style="list-style-type: none"> Meet Byford DWMP pollutant reduction targets. No damage to site infrastructure due to erosion Regular observations of minimal soil and soil matter within site surface drains

Ref.	ASS / PASS management	Timing	Reporting/Evidence	Responsible Party	Management Targets
2.1	Samples should be collected from the clay geological layer at the Site and tested for relevant ASS parameters (see DWER Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes).	Before construction	Laboratory analytical results ASS site investigation report	· IPH · TERPKOS	Not applicable
2.2	If ASS or PASS is identified during excavation activities and is required to be disturbed, the Site will require the preparation of site specific management plans as follows: · ASS management plan; and · ASS groundwater management plan. Both management plans are required to follow guidelines provided by DWER and include details of the following: · Results of the investigation; · Extent and scope of the disturbance activities; and ASS/PASS management details including excavation, handling, storage, neutralisation, and disposal.	Before construction	· ASS mgmt. plan; and · ASS groundwater mgmt. plan.	All involved in design and construction	If identified ASS/PASS not disturbed and potential impacts under Section mitigated
2.3	All fill that is to be used at the Site shall not be sourced from an ASS/PASS moderate or high risk area	Before construction	Construction management plan with ASS/PASS elements	All involved in design and construction	No ASS/PASS soils introduced to the Site
2.4	An ASS Groundwater Management Plan is required to support any application for a Construction Dewatering License from DWER. It should provide the following: · Detailed estimates of location of groundwater extraction; · Extent of the influence of extraction; and · Treatment and disposal of potentially contaminated groundwater. Existing or purpose built monitoring wells should be used to confirm that there is no sign of impact on the groundwater ecosystems.	Before construction	As determined by the ASS groundwater management plan	All involved in design and construction	Groundwater impacts minimised as per requirements of ASS groundwater management plan

Ref.	ASS / PASS management	Timing	Reporting/Evidence	Responsible Party	Management Targets
3.1	Preparation of an onsite incident response manual that includes spill management placed in an easily accessible location for all personnel	Start of operations	Incident response manual	· DFES · Site mgmt.	<ul style="list-style-type: none"> · Staff adherence to spill response manual · Spills that occur are controlled with no material entering into stormwater drains · Spills are cleaned up promptly · Limited spills resulting from human error
3.2	Training of staff in spill response measures and equipment	Ongoing	Training records	· DFES · Site mgmt.	
3.4	All hazardous chemicals are to be stored within dedicated storage areas with adequate secondary containment	Ongoing	Inspection records Site logs	· DFES · Site mgmt.	
3.5	PFAS chemicals or chemicals containing PFAS are restricted at the Site. New chemical introductions shall be reviewed for the presence of PFAS	Ongoing	· Inspection records · Material Safety Data Sheets	· DFES · Site mgmt.	No PFAS chemicals observed at site during regular inspections
3.6	Provide adequate spill containment equipment (e.g., spill kits) around bulk storage areas	Ongoing	Inspection records Purchase records	· DFES · Site mgmt.	Spills that occur are controlled with no material entering into stormwater drains
3.7	Regular inspections of storage vessels and equipment on-site to confirm that there are no leaks and that all taps are adequately closed off after use and at the end of each day	Every two weeks	Inspection records	· Site mgmt.	No spills resulting from storage vessel/equipment failure
3.8	Vehicles (Fire trucks) to be serviced and refuelled within the workshop and service bays only	Ongoing	Operations manual	· Site mgmt.	No observations of cleaning/servicing outside of allowed areas

Ref.	Management Actions – Surface and Groundwater Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
4.1	Install a minimum of three groundwater monitoring wells at the Site and complete groundwater monitoring events aligned with AS/NZG 5667.11:1998 to establish baseline groundwater conditions at the Site	Minimum 2 years prior to construction. Minimum twice annually in Spring (groundwater high) and Autumn (groundwater low).	Baseline seasonal groundwater quality and levels established for the Site. Surveyed locations and levels of bores.	· DFES · Site mgmt.	· Comply with Byford DWMP monitoring requirements · Establish reliable baseline groundwater quality, levels and trends across site during Spring (high groundwater) and Autumn (low groundwater)
4.2	Groundwater monitoring wells should be installed at the following locations: · One hydro-geologically upgradient from the operations building; · One hydro-geologically downgradient from the operations buildings; and · One within the wash down bay area.	Minimum 2 years prior to construction.			
4.3	Increase the nutrient adsorption capacity of the in-situ landscape via revegetation (including deep-rooted species and trees) and soil improvement (e.g. high phosphorous retention index (PRI)). In line with the Byford townsite DWMP (DoW 2008), pollutant reduction targets to be achieved are as follows (as compared with a development that does not actively manage water quality): · at least 60% reduction of total phosphorous (TP); and · at least 45% reduction of total nitrogen (TN).	Construction and operation phase. Monitoring minimum twice annually in Spring (groundwater high) and Autumn (groundwater low).	Soil material testing and specification. Annual groundwater monitoring report	· Construction contractor · DFES · Site mgmt.	
4.4	Institute an annual groundwater monitoring program that consists of groundwater monitoring well sampling and reporting. The program at a minimum should consist of the following analysis regime: · Physical parameters (water level, pH, salinity, turbidity, temperature, conductivity, Chemical Oxygen Demand, Biological Oxygen Demand); · Total Recoverable Hydrocarbons (TRH) (to check for any changes due to vehicles and site operation); · Heavy metals (arsenic, mercury, lead, nickel, copper, zinc, and cadmium); · Nutrients (NOx; ammonia (NH4); total nitrogen (TN); filterable reactive phosphorus (FRP); and · Total phosphorus (TP), chloride: sulphate ratio (to indicate any change from the baseline levels that may suggest that there has been sulphate released due to the oxidation of ASS).	Construction and operation phases. Minimum twice annually in Spring (groundwater high) and Autumn (groundwater low).	Annual groundwater monitoring report	· DFES · Site mgmt.	· Meet Byford DWMP pollutant reduction targets · Comply with Byford DWMP design requirements · Groundwater quality remains or improves over the life cycle of the Site · No adverse impacts (onsite and offsite) from groundwater quality at the Site · Negative impacts to groundwater are captured early with appropriate remedial actions taken
4.5	In line with the Byford townsite DWMP (DoW 2008), design and construct a biological treatment system (biofilter and swale) to achieve the following. Alternatively, a structural treatment system (treatment pits and underground storage) may be implemented. · Maintain pre-development flow rates discharging from site (7 L/s in 20% AEP event, 22 L/s in 1% AEP event), by providing sufficient volumetric detention (130 m3 in 20% AEP event, 298 m3 in 1% AEP event) and appropriate conveyance on-site; · Biofilter to be a minimum of 2% impervious catchment area, and large enough to capture the first flush event (63.2% AEP – 1 hr) unless modelled treatment performance is sufficient (see below targets); · As compared to a development that does not actively manage water quality, achieve pollutant reduction targets of at least: · 80% of TSS · 60% of TP · 45% of TN · 70% of gross pollutants · [OPTIONAL] To achieve maximum Green Star points, achieve stretch goals for pollutant reduction targets, which are most feasibly achieved with a biological treatment system, as follows: · 90% of TSS · 70% of TP · 60% of TN · 95% of gross pollutants · 90% of petroleum hydrocarbons; and · 98% of free oils	Design phase. Minimum twice annually monitoring in operation phase during Autumn and Winter (high rainfall events) (see item 4.7)	Design drawings, specifications. Surface water monitoring program report.	· IPH · Terpkos · DFES	· Meet Byford DWMP pollutant reduction targets · Comply with Byford DWMP design requirements · Surface water quality remains or improves over the life cycle of the Site · No adverse impacts (onsite and offsite) from surface water flows and quality at the Site · Negative impacts to surface water are captured early with appropriate remedial actions taken
4.6	Optimise the size and function of the biological treatment system (alternatively, the structural treatment system), by tailoring the treatment to the pollutant profile of each sub-catchment.	Design phase	Design drawings, specifications	· IPH · Terpkos	Maximise design efficiency
4.7	Prepare and undertake treatment system commissioning, including pre- and post-treatment testing to ensure pollutant reduction targets are met.	End of construction phase, prior to handover.	· Meeting minutes · System commissioning report · Status Report	· Construction Contractor · DFES	Ensure as-constructed assets achieve design intent and performance targets
4.8	For sub-catchments subject to heavy contamination not suited to biological treatment (e.g. covered servicing area, decontamination area), capture and treat runoff in oily water separator system (or similar) and connect to sewer.	Design phase	· Meeting minutes · System commissioning report · Status Report	HDA	
4.9	Institute an annual surface water monitoring program that consists of surface water sampling and reporting. Pollutant reduction targets to be achieved in line with the Byford townsite DWMP (DoW 2008) – see item 4.6 above.	Minimum twice annually monitoring in operation phase during Autumn and Winter (high rainfall events) (see item 4.7)	Surface water monitoring program report	DFES, Management	· Meet Byford DWMP pollutant reduction targets · Surface water quality remains or improves over the life cycle of the Site · No adverse impacts (onsite and offsite) from surface water flows and quality at the Site

Ref.	Management Actions – Surface and Groundwater Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
4.1	Prepare an Erosion and Sediment Control Plan for the construction phase to ensure protection of the site flora, fauna and soil, and the downstream environment.	Prior to construction phase.	Erosion and Sediment Control Plan and monitoring reports.	Contractor	Meet Byford DWMP pollutant reduction targets. Regular observations of minimal soil and soil matter within site surface drains
4.11	Minimise scheme water demand for external and internal use by harvesting stormwater at its highest level of use, as follows. Note, Green Star ratings allocate one (1) point for every 10% reduction in potable water use. · Rainwater off rooves for internal reuse (toilet flushing, etc.), irrigation and operations · Treated stormwater off carparks, footpaths, etc. for irrigation and operations	Design phase	Design drawings, specifications. Water bills indicating reduction in water usage.	DFES, Management	Reduce scheme water use as far as practicable
4.12	Reduce internal potable water use by implementing high-water efficiency appliances and tapware (minimum 5 star WELS [JF4] [JF5] rating).	Design phase	Design drawings, specifications. Water bills indicating reduction in water usage.	DFES, Management	Reduce scheme water use as far as practicable

Ref.	Revegetation	Timing	Reporting/Evidence	Responsible Party	Management Targets
5.1	Salvage <i>Kingia australis</i> plants that will be affected by construction of access road to Orton Road and reuse on site (choose visible range perhaps at the intersection with Dooley Road to retain sense of place)	During site development	Photographs of new location for salvaged <i>Kingia australis</i> plants	<ul style="list-style-type: none"> IPH DFES 	<i>Kingia australis</i> plants remain at the Site
5.2	Increase resilience of the existing Marri trees and support threatened fauna by planting a second row of Marri trees as a minimum or clumps of marri trees alongside existing trees.	During site development	Photographs of newly planted Marri trees	<ul style="list-style-type: none"> IPH DFES 	New Marri trees grow to establishment/maturity
5.3	Use exclusively local native species wherever possible. List of suitable species is provided in Appendix 3	Post construction, Ongoing	<ul style="list-style-type: none"> Revegetation plan Planting plan Site logs Monitoring reports Meeting minutes Photographs 	<ul style="list-style-type: none"> DFES Site mgmt. 	Revegetation Plan is prepared and implemented.
5.4	Plant in accordance with the hydrological conditions (e.g. species in the biofilter are different to drier / higher elevations on site) using plants that are indigenous to the site and the surrounds.				
5.5	Avoid using weedy species such as the native <i>Acacia saligna</i> , <i>Eucalyptus camaldulensis</i> and the eastern states species like <i>*Callistemon sp.</i> , <i>*Corymbia citriodora</i> etc.				
5.6	Monitor and plant growth and diversity of any revegetated areas and adjust future revegetation efforts to improve success.				
5.7	Consider introducing native food (bush tucker) and medicinal plants to the Site				
	Management Actions for DROUGHT	Timing	Reporting/Evidence	Responsible Party	Management Targets
5.8	Revegetate during winter (high rainfall season) to enable the establishment of new seedlings during cooler months when the plants are less likely to dehydrate.	Ongoing	Vegetation and landscaping maintenance plan	<ul style="list-style-type: none"> DFES Site mgmt. 	<ul style="list-style-type: none"> Year on year downward trend in irrigation water usage Limited plant replacements required to replace dead plants
5.9	In the short term, irrigate planted stock during summer to ensure establishment. Use waterwise design and fittings.				
5.10	Utilise mulching (use coarse, fire retardant and weed free mulch) in landscaped areas				
5.11	Select species that are able to adapt to drying conditions that are native to site.				
	Management Actions - Weed Control	Timing	Reporting/Evidence	Responsible Party	Management Targets
5.12	Remove or prune back non native vegetation such as Brazilian Pepper tree.	During site development	<ul style="list-style-type: none"> Photos of removed Brazilian pepper tree 	<ul style="list-style-type: none"> IPH DFES 	
5.13	Where necessary (e.g. for removing the Brazilian Pepper Tree), apply herbicide according to the recommended rate and using the appropriate marker dye.	During site development	<ul style="list-style-type: none"> Report indicating herbicide has been used to treat Brazilian pepper tree stump 		

Ref.	Revegetation	Timing	Reporting/Evidence	Responsible Party	Management Targets
5.14	When undertaking weed spraying measures, avoid spraying in windy, very hot, wet or dusty conditions. Spray only when rain is not expected within 3 days of the spray application.	Ongoing	<ul style="list-style-type: none"> · Spray logs · Weed control checklist 	<ul style="list-style-type: none"> · DFES · Site mgmt. · All staff 	<ul style="list-style-type: none"> · Noxious weeds are identified, removed and disposed of appropriately · Noxious weeds are eliminated or minimised · A long-term Weed Management Plan is prepared and implemented · Surfactants not used as a part of weed control
5.15	Ensure that weeds are sprayed at the correct time, usually when they are growing strongly, and before seed set.				
5.16	Ensure staff and contractors minimise disturbance to vegetation when accessing landscaped areas during maintenance activities to reduce the establishment and spread of weeds.	Ongoing	Landscape maintenance planning	<ul style="list-style-type: none"> · DFES · Site mgmt. · All staff 	
5.17	Continue to measure the percentage cover of weeds annually as an indicator of vegetation health and the assessment of weed control efforts.				
5.18	Consider the use of photo monitoring locations for each garden bed / verge. The monitoring photos can be used as a key performance indicator annually to assess the effectiveness of ongoing weed control.	Ongoing	Photos	<ul style="list-style-type: none"> · DFES · Site mgmt. · All staff 	
5.19	Implement the revegetation program following weed control where required.	Ongoing	<ul style="list-style-type: none"> · Meeting minutes · Photos · Revised revegetation program plan 	<ul style="list-style-type: none"> · DFES · Site mgmt. · All staff 	
5.20	Restrict the use of surfactants for weed control.	Ongoing	Herbicide purchase records	<ul style="list-style-type: none"> · DFES · Site mgmt.. · All staff 	
5.21	Apply manual weed control to minimise use of chemicals and damage to revegetated plants: i.e. hand weed around plants if the weeds are growing close to or intertwined with the plant.	Ongoing	Landscape maintenance planning	<ul style="list-style-type: none"> · DFES · Site mgmt. · All staff 	
5.22	Maintain lawn areas to prevent spread of lawn into vegetated garden beds. Use lawn mower catcher adjacent to garden beds for the same reason.				

Ref.	Revegetation	Timing	Reporting/Evidence	Responsible Party	Management Targets
	Plant disease	Timing	Reporting/Evidence	Responsible Party	Management Targets
For Dieback:					
5.23	Ensure all personnel conducting work on site are familiar and trained in the dieback hygiene protocols (Green Card minimum standard).	Ongoing	Landscape maintenance planning	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	No observations of dieback made at the Site
5.24	Ensure all vehicles and equipment used in the area are clean prior to site entry. During operational stages of development, vehicles should be cleaned in the designated wash down area	Ongoing	Staff training and awareness records	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	
5.25	Ensure that the contractors and the CFRS Fire Station staff practice dieback hygiene procedures when working in the landscaped areas.	Ongoing			
5.26	Undertake dieback assessment and mapping if an area is suspected of containing dieback in the future.	Ongoing			
For Marri Canker:					
5.27	Cut and dispose affected trees or branches and dispose off site. (Where only branches are removed, tree may grow for many years without showing additional symptoms).	Ongoing	<ul style="list-style-type: none"> Vegetation maintenance plan Staff training and awareness records 	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	No observations of dieback made at the Site
	Use clean equipment to cut the branches and clean between each tree and after all pruning is completed. Use 75% ethanol or methylated spirits for this task.				
	Cover any wounded areas with the suitable wound paint to prevent infection of the newly cut surfaces.				
	Avoid pruning during wet weather.				
	Always prune least affected trees first before moving to trees that have a greater level of damage.				
For Honey Fungus:					
5.28	Do not touch or move plants with signs of disease and contact Department of Agriculture Pest and Disease Information Service immediately for guidance on management Free call 1800 084 881.	Ongoing	<ul style="list-style-type: none"> Vegetation maintenance plan Staff training and awareness records 	<ul style="list-style-type: none"> DFES Site mgmt. All staff 	No observations of Honey Fungus made at the Site
For Myrtle Rust:					
5.29	Do not touch or move plants with signs of disease and contact Department of Agriculture Pest and Disease Information Service immediately for guidance on management Free call 1800 084 881.				
	If possible, email a photograph and details of the plant location to info@agric.wa.gov.au .				

Ref.	Revegetation	Timing	Reporting/Evidence	Responsible Party	Management Targets
	Do not take a sample to send to the Pest and Disease Information Service. Cutting off a piece of the diseased plant could dislodge the spores and accelerate the local spread of myrtle rust. Immediately wash any clothes/ PPE and skin that may have come in contact with spores.	Ongoing	vegetation maintenance plan · Staff training and awareness records	· DFES · Site mgmt. · All staff	No observations of Myrtle Rust made at the site
5.30	Use drip irrigation rather than sprinkler irrigation for native plants. Avoid overwatering.				
5.31	Maintain fence around the site to prevent and control unauthorised access which can spread the disease.				

Ref.	Management Actions - Fauna	Timing	Reporting/Evidence	Responsible Party	Management Targets
6.1	Ensure appropriate measures are taken during construction to protect fauna. This includes covering any open excavations and areas where fauna may reside and checking then each day prior to start of works.	Before construction	<ul style="list-style-type: none"> Incident reports Fauna observations 	IPH	<ul style="list-style-type: none"> No/minimal observations of fauna loss Minimal damage to existing fauna habitat or suitable replacement habitat created
6.2	Ensure staff are educated on the impact's construction works and later operation of the building can have on fauna and how best to avoid and or minimise these impacts.	Ongoing	<ul style="list-style-type: none"> Staff training and awareness records 	<ul style="list-style-type: none"> DFES Site mgmt. 	
6.3	Complete training for all staff regarding fauna present at the Site and appropriate behaviours when encountering fauna				
6.4	Ensure all trees and vegetation scheduled for removal are checked for presence of fauna and nests prior to clearing. Organise fauna translocation (preferably local to the site) if required.	Before construction	Vegetation maintenance plan	IPH	
6.5	Use flora that provide food, roosting and breeding habitat for local native fauna such as Forest Red Tailed Black-Cockatoo and Quanda for landscaping and future revegetation efforts.	Before construction	<ul style="list-style-type: none"> Vegetation maintenance plan Forest Red Tailed Black-Cockatoo and Quanda counts for reporting to DBCA 	IPH	No/minimal observations of fauna loss
6.6	Consider an artificial nesting box or the Black Cockatoos.	During site development And operations	<ul style="list-style-type: none"> Photo of nesting box 	<ul style="list-style-type: none"> IPH DFES 	Nesting box usage by Black Cockatoos
6.7	Retain logs (especially if hollow) larger dead branches, sticks and some leaf litter as fauna habitat for ground dwellers within landscaped areas that are 5 - 10 m away from the building and access pathway interface.	During site development and operations	<ul style="list-style-type: none"> Photos of logs retained 	<ul style="list-style-type: none"> IPH EPCAD DFES 	<ul style="list-style-type: none"> No/minimal observations of fauna loss Minimal damage to existing fauna habitat or suitable replacement habitat created
6.8	Carry out timely weed control.	During site development and operations according to weed management plan	Weed management plan	All staff	<ul style="list-style-type: none"> Noxious weeds are identified, removed and disposed of appropriately Noxious weeds are eliminated or minimised
6.9	Ensure pest species such as mice, rats, foxes, mosquitoes are managed in accordance with the best management practices. Control of rats and mice will support the control of feral predators such as domestic cats.	During site development and operations according to pest management plan	Pest management plan	<ul style="list-style-type: none"> IPH DFES Site mgmt. 	<ul style="list-style-type: none"> No fauna deaths due to pest species No observations of feral predators at the Site Minimal observations of pest species
6.10	Ensure that the fencing is dog proof.	During site development and operations	Pest management plan Inspection logs	<ul style="list-style-type: none"> IPH DFES Site mgmt. 	<ul style="list-style-type: none"> No fauna deaths due to dogs

Ref.	Management Actions - Fauna	Timing	Reporting/Evidence	Responsible Party	Management Targets
6.11	Implement management actions outlined in the Shire of Serpentine Jarrahdale Mosquito control guidelines: · Cover up: Wear long, loose-fitting, light colored clothing, covering as much of the body as you can. · Repel: When outdoors and mosquitoes are present, apply insect repellent containing DEET (diethyltoluamide) or picaridin evenly to exposed skin. · Clean up: Simple changes around your home/business can reduce mosquito breeding. Remove, empty or cover water-holding containers.	During site development and operations	Pest management plan	· IPH · DFES · Site mgmt.	Minimisation of mosquito born viruses affecting staff and adjacent residents
6.12	Remove any containers with stagnant water that is close to the development and change water in any water baths and or bird waterers regularly.	During site development and operations			
6.13	Cover rainwater, stormwater and septic tank openings, wells, or other large water containers with mosquito-proof mesh.	During site development and operations			

Ref.	Management Actions - Heritage	Timing	Reporting/Evidence	Responsible Party	Management Targets
7.1	Promote local native flora that have Aboriginal cultural significance.	Ongoing	Vegetation management plan	<ul style="list-style-type: none"> · DFES · Site Mgmt · All staff 	Vegetation management plan that includes that have Aboriginal cultural significance
7.2	Enable demonstration of cultural burn practices within the Cardup CFRS operational area	Once every 2 years	<ul style="list-style-type: none"> · Meeting minutes · Photos · Pamphlets or other information presented to the public 	<ul style="list-style-type: none"> · DFES · Site Mgmt · All staff 	Cultural burn practice demonstration held within prescribed time periods
7.3	Institute 'Welcome to the Country' for site visitors and as part of site induction procedures	Ongoing	<ul style="list-style-type: none"> · Meeting minutes · Induction material 	<ul style="list-style-type: none"> · DFES · Site Mgmt · All staff 	Not applicable

Ref.	Management Actions - Fire	Timing	Reporting/Evidence	Responsible Party	Management Targets
8.1	Implement a weed management programme to control weeds in the natural areas.	Ongoing	Weed Management Plan	· DFES · Site Mgmt · All staff	· Weeds that pose a fire risk are identified, removed and disposed of appropriately · Weeds that pose a fire risk are eliminated or minimised
8.2	Maintain fences around the development to prevent and control public access thus reducing the potential for ignition.	· Pre-construction · Ongoing	· Site security planning · Design documents	· IPH · DFES	· No unauthorised access from the public maintained
8.3	Apply only coarse / chunky mulch or composted wood chips in landscaped areas as this form of mulch is less likely to ignite due to large particle size or avoid mulching altogether. Use of gravel is also appropriate for the site. All areas that are regularly inundated in winter should be mulch free (e.g. biofilter).	Ongoing	· Vegetation management plan · Landscape design	· EPCAD · DFES · Site Mgmt	· No fires or other ignition events at the Site · Fuel load present at the Site is reduced or eliminated
8.4	Prepare a Bush Fire Emergency Response Plan for the Building once constructed. Review this plan every three (3) years.	After construction	· Bush Fire Emergency Response Plan · Evidence of review completed every 3 years	· DFES · Site Mgmt · All staff	· Bush Fire Emergency Response Plan is reviewed
8.5	Prune vegetation within the 20m buffer from the development. This includes pruning of lower (below 2 m) branches and thinning out the shrub layer so it does not form a continuous dense cover.	Ongoing	· Vegetation management plan · Landscape design	· DFES · Site Mgmt · All staff	Fuel load present at the Site is reduced or eliminated
8.6	Remove any dead vegetation and excess leaf litter within 20 m of the building and dispose off site at a suitable SoSJ composting facility.	Ongoing			
8.7	Perform cultural patch burning of the landscaped areas if appropriate (e.g. if mulched with gravel and the species are tolerant of fire.	Ongoing			
8.8	Use low growing fire-retardant species that are locally native and suited to the habitat closer to the building (e.g., <i>Conostylis aculeata</i> , <i>Patersonia occidentalis</i>).	Ongoing			
8.9	Revegetate burnt areas if the plants are damaged beyond repair.	Ongoing			

Ref.	Management Actions – Noise Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.1	All machines, equipment, plant and vehicles proposed for the Site shall be of types complying with Worksafe Western Australia requirements for noise abatement. The operation of such machines, equipment, plant and vehicles shall be certified to be within the limits of the Environmental Protection (Noise) Regulations 1997	Ongoing	Equipment certifications for all applicable equipment	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Compliance with Worksafe Western Australia requirements for noise abatement
9.2	Maintain and do not modify acoustic treatments on vehicles or machinery, i.e.: do not remove mufflers, and carry out regular inspections of the machinery to ensure treatments are in place	Twice yearly inspections	<ul style="list-style-type: none"> No evidence of acoustic treatment modification Inspection log 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	Minimal to no noise complaints from the public
9.3	Undertake construction activities within the standard construction hours (7am and 7pm Monday to Saturday)	During construction	Construction management plan	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	
9.4	Place any static equipment that generates noise (e.g. generators and compressors) will be located as far as practicable from nearby noise sensitive receivers	Design phase	Building infrastructure design	<ul style="list-style-type: none"> IPH 	
9.5	Selection of machinery and operational practices will be undertaken to produce the lowest practical level of noise and vibration. All machinery where practical will be fitted with exhaust mufflers	Ongoing	<ul style="list-style-type: none"> Building infrastructure design Construction management plan 	<ul style="list-style-type: none"> IPH DFES 	
9.6	Include education on the importance of minimisation of noise and vibration during construction and methods for minimising noise and vibration impacts in the site induction.	Ongoing	Training records Induction material	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	
9.7	Early consultation conducted with community stakeholders on the likely impact of activities likely to cause disruption	Ongoing	<ul style="list-style-type: none"> Stakeholder engagement material (presentations, pamphlets etc.) Meeting minutes 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	
9.8	In areas where noise exceeds the specified levels, prominent warning signs shall be displayed and hearing protection shall be provided to all onsite workers	Ongoing	<ul style="list-style-type: none"> Signage Photos PPE available 	<ul style="list-style-type: none"> DFES Site Mgmt All staff 	
Ref.	Management Actions – Vibration Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.9	Provide adequate and ongoing communications with adjacent residents regarding the timing of works, type of works and possible times of high impact	<ul style="list-style-type: none"> Pre construction During operations 	<ul style="list-style-type: none"> Stakeholder engagement material (presentations, pamphlets etc.) Meeting minutes 	<ul style="list-style-type: none"> IPH TERPKOS EPCAD 	

Ref.	Management Actions – Noise Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
9.10	Ensure that vehicles and equipment are appropriately sized to satisfactorily undertake the work	<ul style="list-style-type: none"> · Pre construction · During operations 	Construction management plan	<ul style="list-style-type: none"> · IPH · TERPKOS · EPCAD 	No vibration complaints from the public
9.11	Unload, store, and manoeuvre construction materials as far as possible from buildings that may be susceptible to vibration damage	Construction	Construction management plan	<ul style="list-style-type: none"> · IPH · TERPKO · EPCAD 	
9.12	Vibration complaints will be addressed within 24 hours unless otherwise explained to the complainant.	Ongoing	Incident reporting log including correction action undertaken	<ul style="list-style-type: none"> · DFES · Site Mgmt · All staff 	Complaints addressed within 24 hours unless otherwise explained to the complainant.
9.13	A combined register (noise and vibration) including date and time of all incidents and complaints must be maintained The register must also include how the issue was rectified.	Ongoing and reviewed annually	Incident register that includes noise and vibration	<ul style="list-style-type: none"> · DFES · Site Mgmt · All staff 	Correct and up to date incident register that is reviewed annually

Ref.	Management Actions – Air Quality	Timing	Reporting/Evidence	Responsible Party	Management Targets
10.1	Promote responsible refrigerant use at the Site by engaging appropriate refrigerant management contractors that meet WA and National certification and licensing requirements	Ongoing	<ul style="list-style-type: none"> Contractor management procedure ensuring contractors hold required certifications/licenses 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> Meet WA and National certification and licensing requirements for contractor engagement Limiting GHG emissions from the Site
10.2	Ensure that flammable refrigerants are not stored and used at the Site	Ongoing	<ul style="list-style-type: none"> No equipment present utilising flammable refrigerants 	<ul style="list-style-type: none"> DFES Site Mgmt 	No incidents related to flammable refrigerants
10.3	Ensure that low Global Warming Potential (GWP) CO2 eq refrigerant gas is used at the Site	Ongoing	<ul style="list-style-type: none"> Purchase or maintenance orders indicating the type of refrigerant gas used 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> No refrigerant leaks of high GWP refrigerant gas Limiting GHG emissions from the Site
10.4	In the event of a refrigerant gas leak, ensure that the leak is rectified by a certified/licensed contractor before recharging air conditioning equipment. This is to prevent ongoing leaks of refrigerant	Ongoing	<ul style="list-style-type: none"> No ongoing refrigerant gas topups Stable or reducing trend in refrigerant gas top ups 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> No ongoing leaks of refrigerant gas Limiting GHG emissions from the Site
10.5	Do not charge refrigeration and air conditioning equipment with a higher global warming potential (GWP) refrigerant than the equipment was designed to use (the design refrigerant).	Ongoing	<ul style="list-style-type: none"> Purchase or maintenance orders indicating the type of refrigerant gas used 	<ul style="list-style-type: none"> DFES Site Mgmt 	<ul style="list-style-type: none"> Limiting GHG emissions from the Site Maintain refrigerant equipment integrity

Ref.	Management Actions – Access Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
11.1	In areas where the construction traffic intersects with existing roads traffic management measures will be agreed with the Shire to minimise the localised short term impacts	During construction	· Traffic management plan · Construction management plan	· Construction contractor	· Traffic management measures implemented · No traffic incidents resulting from site construction
11.2	Public notification of construction activities, will be given prior to commencement of works in each area	During construction	· Copy of public notification		Public notification complete
11.3	Appropriate approvals or permits will be obtained (including Shire and Main Roads WA)	During construction	Traffic management plan		All required approvals obtained
11.4	Road access shall be maintained in the project area via signed detours and/or single lane access	During construction	Traffic management plan		Access signage installed
11.5	When construction work is being undertaken within or adjacent to designated road reserves, road signs will be located on local and main roads	During construction	· Traffic management plan · Construction management plan		Access signage installed
11.6	Any material spilled from haulage vehicles leaving the project area will be cleaned up as soon as possible. Appropriate signage will be used/erected during this cleanup process.	During construction	Construction management plan		Access signage installed Spills cleaned up within 24 hours
11.7	Where there is any risk of public injury such as open trenches etc., the construction area will be fenced or otherwise cordoned off	During construction	Construction management plan		Fencing installed
11.8	Machinery and plant will be kept in locked compounds when the construction area is not in use	During construction	Construction management plan		· DFES · IPH
11.9	Spoil and mulch heaps shall be no higher than 1.2 m	During construction	Construction management plan	· DFES · IPH · TERPKOS	No evidence of soil erosion arising from soil and mulch heaps
11.10	Advisory warning boards shall be placed on fenced construction zones and compounds. The warning boards shall state the nature of the hazard and give a staffed contact telephone number for emergencies.	During construction	Construction management plan	· DFES · IPH	Access signage installed
11.11	Where there is any risk of public injury such as open trenches etc., the construction area will be fenced or otherwise cordoned off	During construction	Construction management plan	· DFES · IPH	Fencing installed

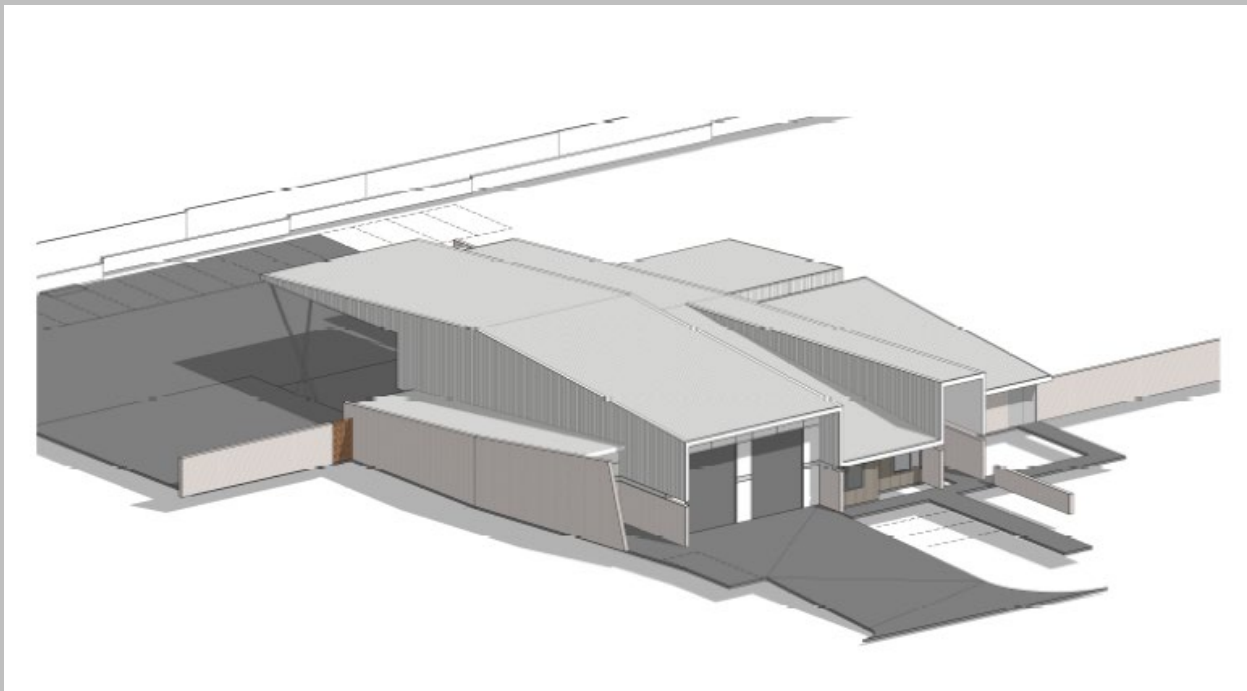
Ref.	Management Actions – Incident Management	Timing	Reporting/Evidence	Responsible Party	Management Targets
12.1	Provide and advertise a telephone number for public reporting of incidents for the duration of the construction works.	During construction	· Proof of advertisement	· Construction contractor	Not applicable
12.2	Undertake daily examinations of the Site during construction so that any incidents are identified as quickly as possible;	Daily during construction	· Site log · Incident reports	Construction contractor	No ongoing/unidentified environmental incidents
12.3	In the event of an environmental incident, an Environmental Incident Report shall be prepared which shall include; · A description of the incident and potential root causes; · Corrective actions undertaken; and · Preventative actions undertaken to prevent a recurrence of the incident.	Within 48 hours of the incident	Incident reports	· DFES · Site mgmt. · All staff	Clear and concise ENV incident reports
12.4	The Environmental Incident Report will be provided to the Shire and DFES management within 48 hours of the incident occurring.	Within 48 hours of the incident	Shire acknowledgement of incident report	· DFES · Site mgmt. · All staff	Ontime submissions of ENV incident reports
12.5	The corrective strategies that were implemented will be assessed to determine whether successful mitigation had occurred;	3 months after the incident	· Incident report review · Meeting minutes	· DFES · Site mgmt. · All staff	· No recurrence of incidents · Elimination/mitigation of the root causes that led to the incident in the first instance
12.6	Annual environmental incident review to identify trends, isolated reoccurrences and potential for improvement	Annual	Meeting minutes Action log/tracker	· DFES · Site mgmt.	· No recurrence of incidents · Elimination/mitigation of the root causes that led to the incident in the first instance



Perth (Head Office)
12 Monger Street
Perth WA 6000

T +61 (0)8 9227 9355
F +61 (0)8 9227 5033

www.syrinx.net.au
ABN: 39 092 638 410



Cardup Career Fire & Rescue Service Fire Station

WASTE MANAGEMENT PLAN

April 2023
For Iredale Pedersen Hook Architects



Document Control

Report **22053 WMP - RPT001**

Version	Date	Prepared by	Approved	Issue Details
1	06.01.23	JK	JK	Draft for comment
2	20.04.23	JK	JK	Revised draft post DFES commets

Limitations of Report

Syrinx Environmental PL has prepared this report as a professional consultant. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for the use, perusal or otherwise, by parties other than the Client, the Owner and their nominated consulting advisors without the consent of the Owner. No further information can be added without the consent of the Owner, nor does the report contain sufficient information for purposes of other parties or for other uses. The information contained in this report has been prepared in good faith, and accuracy of data at date of issue has been compiled to the best of our knowledge. However, Syrinx Environmental PL is not responsible for changes in conditions that may affect or alter information contained in this report before, during or after the date of issue.

Syrinx Environmental PL accepts site conditions as an indeterminable factor, creating variations that can never be fully defined by investigation. Measurements and values obtained from sampling and testing are indicative within a limited time frame and unless otherwise specified, should not be accepted as actual realities of conditions on site beyond that time frame.

© 2023 Syrinx

Except as provided by the Copyright Act 1968, no part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means without the prior written permission of Syrinx Environmental PL. Enquiries should be directed to the Corporate Intellectual Property Officer.

CFRS FIRE STATION: **WASTE MANAGEMENT PLAN****TABLE OF CONTENT**

1.0	INTRODUCTION	3
1.1	CONTEXT	3
1.2	KEY COMPONENTS	3
2.0	WASTE INVENTORY	3
2.1	OFFICE AND DOMESTIC OPERATIONS	4
2.2	FIREFIGHTING, TRAINING AND MAINTENANCE OPERATIONS	4
2.2.1	Non-Hazardous Waste	4
2.2.2	Hazardous Waste	5
3.0	BIN STORE LOCATION AND AMENITY	6
3.1	BIN STORE LOCATION	6
3.2	BIN STORE AMENITY	7
4.0	WASTE TRANSFER PROCEDURE	8
5.0	ROLES AND RESPONSIBILITIES AND MANAGEMENT OF CHANGE	8
5.1	ROLES AND RESPONSIBILITIES	8
5.2	REPORTABLE INCIDENTS	8
5.3	MANAGEMENT OF CHANGE	9
6.0	REDUCE, REUSE AND RECYCLE (3R) STRATEGY	10
	REFERENCES	11

CFRS FIRE STATION: **WASTE MANAGEMENT PLAN****LIST OF TABLES**

Table 1: Office and Domestic Waste Inventory	4
Table 2: Firefighting, Training and Maintenance Operations Non-Hazardous Waste Inventory	4
Table 3: Firefighting, Training and Maintenance Operations Hazardous Waste Inventory	5
Table 4: Bin Store Amenity	7

LIST OF FIGURES

Figure 1: Primary Hazardous and Non-Hazardous Waste Storage Locations	6
Figure 2: MGB setting out on Orton Road and retrieval route	8
Figure 3: Waste Avoidance and Resource Recovery Act Waste Hierarchy	10

CFRS FIRE STATION: **WASTE MANAGEMENT PLAN**

1.0 INTRODUCTION

This Waste Management Plan (WMP) has been prepared for Iredale Pedersen Hook Architects for the Site development application for the proposed Cardup Career Fire and Rescue Service (CFRS) Fire Station ("the Site") within the Shire of Serpentine – Jarrahdale ("the Shire"). The Site is located at Lot 169 Doley Road, Byford, WA, 6122

This WMP addresses the operational phase of the Site. Once approved by the Shire, waste collection and disposal activities are to be undertaken in accordance with this WMP, subject to any additional conditions of planning approval.

Once construction of the Site is completed, this WMP should be reviewed and updated accordingly.

1.1 CONTEXT

For efficient and effective waste management, the collection and centralisation of waste and recyclables should be carefully considered at the building design and development phase. The Shire's vision for the management of waste is to increase capacity to recover and recycle waste, improve sustainability and reduce impacts on the environment and landfill sites while establishing a means to address future demands.

This WMP has been created to support the Shire's waste management vision and facilitate compliance with local and state waste management regulations. The measures detailed in this plan are designed to ensure that the disposal and management of wastes do not adversely affect health, amenity or environmental values.

1.2 KEY COMPONENTS

This WMP consists of the following core components:

- Waste Inventory;
- Bin store location and amenity;
- Waste transfer procedure;
- Roles and responsibilities and management of change; and
- Reduce, Reuse and Recycle (3R) strategy.

2.0 WASTE INVENTORY

Waste inventories consisting of planned waste types, generation rates, storage locations and transportation schedules for the Site are detailed in the following sections. Waste generation rates have been calculated based on Western Australian Local Government Association (WALGA) *Commercial and Industrial Waste Management Plan Guidelines*.

CFRS FIRE STATION: **WASTE MANAGEMENT PLAN****2.1 OFFICE AND DOMESTIC OPERATIONS**

Waste generation for the office and domestic operations (toilet, kitchen, gym) operations is presented as Table 1 below.

Table 1: Office and Domestic Waste Inventory

Location	Size (m ²)	WALGA Guideline Minimum Waste Generation Rates	Waste Description	General Waste Generation Rate	Recycling Generation Rate	Onsite Storage Location	Pickup Schedule
Office, kitchen, toilets and multipurpose areas	212.9	10L/100m ² /day	General waste (food, plastic, office waste)	150L per week	150L per week	Bin store centre housing six 240L MGB	Determined by the Shire
Living Areas (6 dorms, bathrooms, gym)	193.9	60L/occupant/week (General Waste) 20L/occupant/week (Recyclables)	General waste(food, plastic, domestic waste)	360L per week	120L per week		

2.2 FIREFIGHTING, TRAINING AND MAINTENANCE OPERATIONS**2.2.1 Non-Hazardous Waste**

Non-Hazardous waste generation for firefighting, training and maintenance operations is presented as Table 2 below.

Table 2: Firefighting, Training and Maintenance Operations Non-Hazardous Waste Inventory

Location	Size (m ²)	WALGA Guideline Minimum Waste Generation Rates	Waste Description	General Waste Generation Rate	Recycling Generation Rate	Onsite Storage Location	Pickup Schedule
Workshop	22.2	10L/100m ² /day	Scrap metal, rags, ad-hoc maintenance waste	15.54L per week	15.54L per week	Bin store centre housing six 140L MGB	Determined by the Shire

CFRS FIRE STATION: **WASTE MANAGEMENT PLAN****2.2.2 Hazardous Waste**

Hazardous waste for the Site is defined as waste that falls under Schedule 1 of the Environmental Protection (Controlled Waste) Regulations 2004. These wastes are generated as part of firefighting, training and maintenance operations and shall be collected by a Department of Water and Environmental Regulation (DEWR) licensed hazardous waste collector/carrier at a schedule determined by CFRS personnel and the waste collector.

Activities that generate Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) contaminated waste (i.e. waste foam water or debris) are prohibited.

Hazardous waste storage locations within the Site should be clearly identified with appropriate warning labels.

The hazardous waste inventory for the Site is presented as Table 3 below.

Table 3: Firefighting, Training and Maintenance Operations Hazardous Waste Inventory

Location	Size (m ²)	WALGA Guideline Minimum Waste Generation Rates	Waste Description	Hazardous Waste Generation Rate	Recycling Generation Rate	Onsite Storage Location	Pickup Schedule
Store/Workshop Flammable liquid cabinet	22	Not stated	Empty containers used to store cleaning solutions, adhesives and lubricants	Unknown	Unknown	Chemical storage area	Determined by CFRS and waste collector
		Not stated	Empty containers used to store fire extinguishing foam (PFAS free)	Unknown	Unknown		

CFRS FIRE STATION: WASTE MANAGEMENT PLAN

3.0 BIN STORE LOCATION AND AMENITY

3.1 BIN STORE LOCATION

The primary bin centre for the storage of 260L MGBs will have an approximate size of 9.7 m² and its location is presented as Figure 1 below.

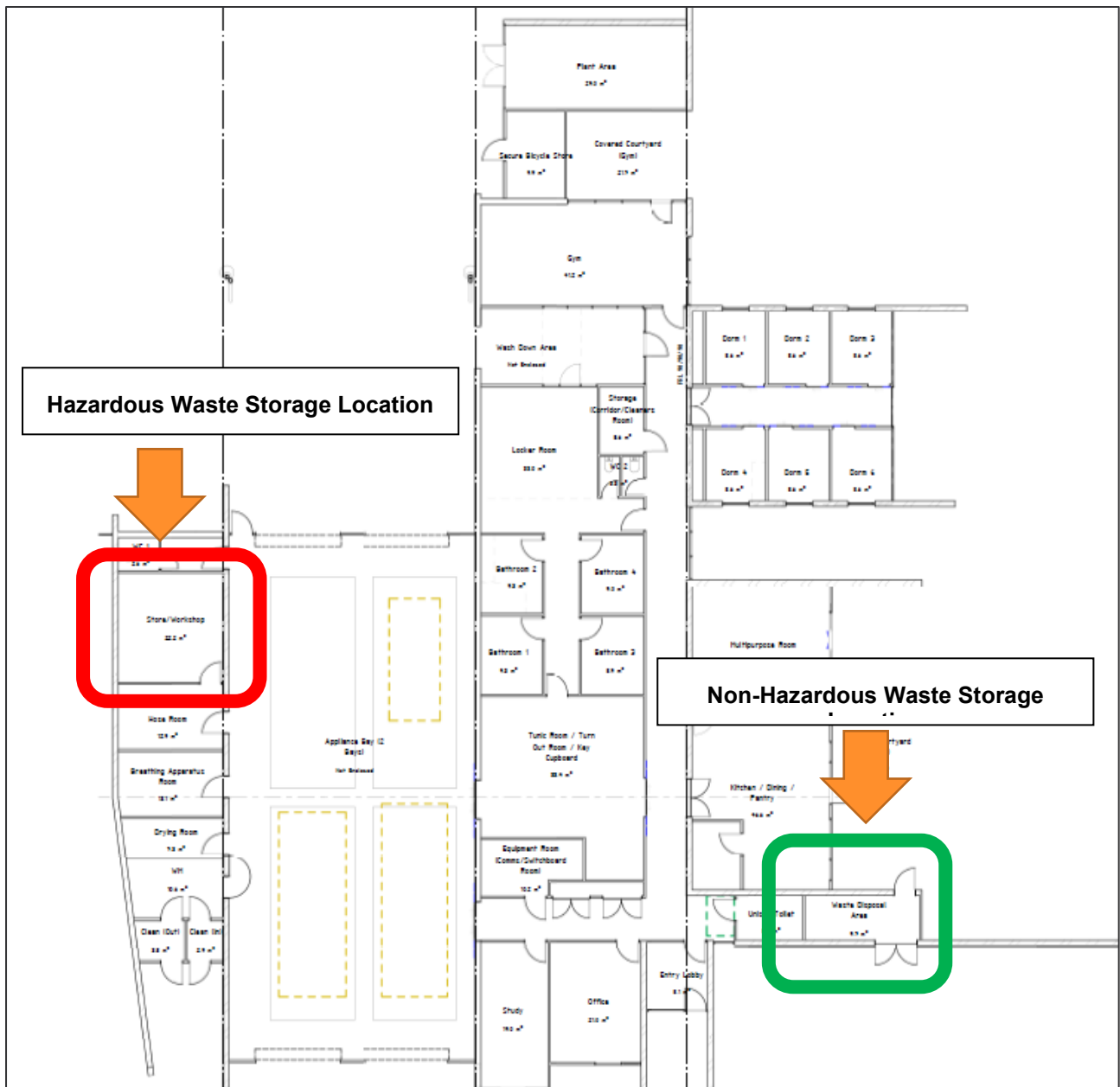


Figure 1: Primary Hazardous and Non-Hazardous Waste Storage Locations

CFRS FIRE STATION: **WASTE MANAGEMENT PLAN****3.2 BIN STORE AMENITY**

The Site bin store details and associated management controls are presented on Table 4 below.

Table 4: Bin Store Amenity

Bin Transfer	
Access ways	<p>All access ways are designed to allow for the bins to move through without restriction and to allow flexibility in future bin sizing</p> <p>Can be secured to prevent unauthorized access</p>
Bin Store	
Storage	<p>Provides adequate storage space for current sized MGBs and provides some flexibility to meet future needs</p> <p>Sufficient space provided to visually inspect the integrity of MGBs and control overflowing and potential spillage</p> <p>Enclosed and integrated into the Site design as to not affect visual amenity</p>
Segregation	<p>Provide adequate storage space to segregate general waste and recycling MGBs</p>
Amenity	<p>Allow for trouble free cleaning, facilitate pest management activities, provide adequate ventilation to control potential odours</p> <p>A water tap will be provided to facilitate cleaning in the Bin store, any waste water will be drained through the impervious floor to the sewer</p>
Health and Safety	<p>Bin store is generally flat and thus MGBs are not required to be moved up/down any significant slope</p> <p>Appropriate signage to be erected to ensure that waste is disposed correctly, communicate waste system procedures and other health and safety considerations</p>

CFRS FIRE STATION: WASTE MANAGEMENT PLAN

4.0 WASTE TRANSFER PROCEDURE

CFRS staff or cleaning services will manually transfer waste and recyclables directly from the operational, office and living areas to the Bin store. CFRS staff or cleaning services will be responsible for setting out and retrieving MGBs to the Orton Rd verge on the Shire nominated collection days. Figure 2 below presents the route that should be taken.

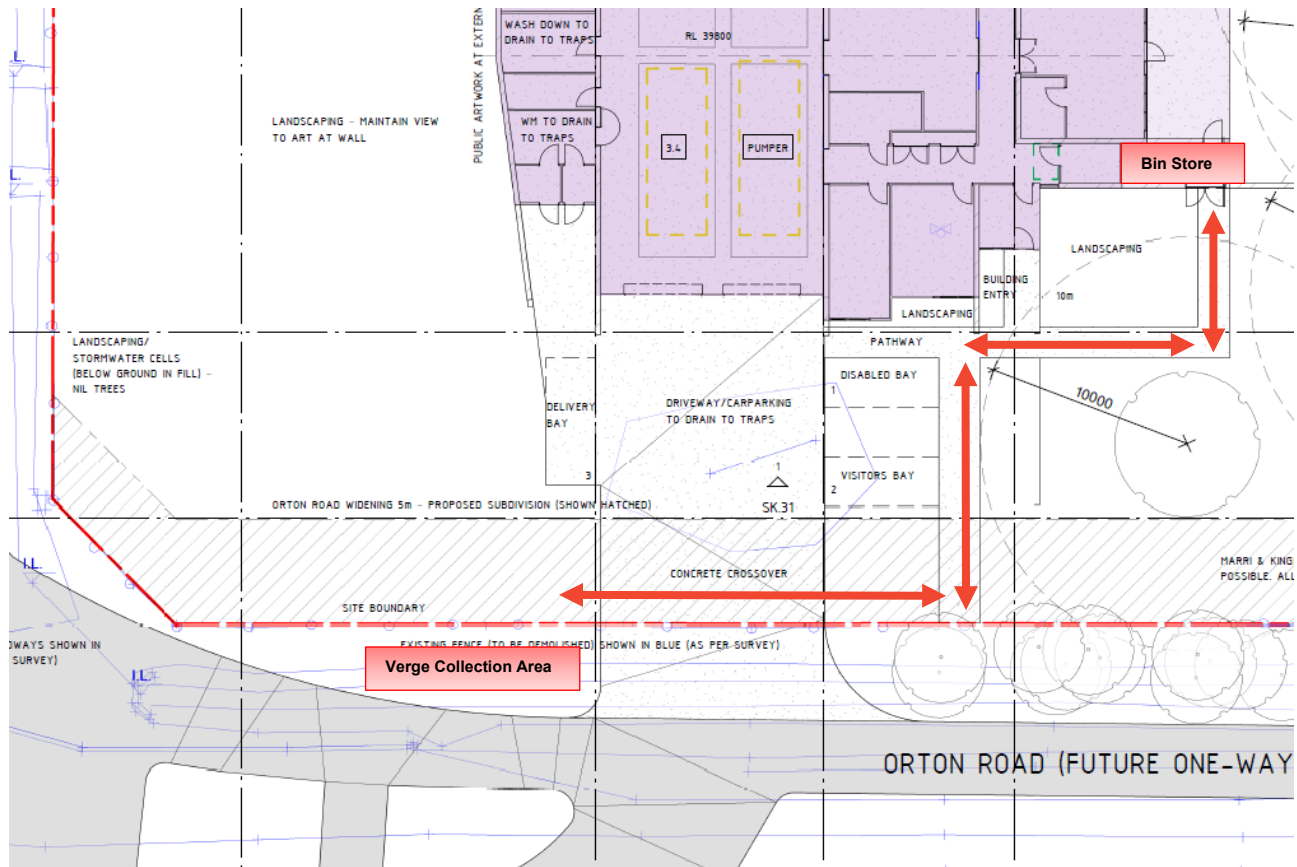


Figure 2: MGB setting out on Orton Road and retrieval route

5.0 ROLES AND RESPONSIBILITIES AND MANAGEMENT OF CHANGE

5.1 ROLES AND RESPONSIBILITIES

The CFRS general manager will be responsible for overseeing the waste management system and the implementation of this WMP. All staff members shall be responsible for correctly disposing of their waste in the correct storage bin and maintaining waste free work and living areas.

All CFRS staff shall be made aware of this WMP and how to adhere to its requirements.

5.2 REPORTABLE INCIDENTS

Under section 72 of the *Environmental Protection Act 1986*, companies must report discharges of waste likely to cause pollution or environmental harm, as soon as practicable. It is a requirement that DEWR

CFRS FIRE STATION: **WASTE MANAGEMENT PLAN**

is notified as soon as practicable by either verbal or electronic means, followed by written notification as soon as practicable after the discharge of waste has occurred.

It is the CFRS general managers responsibility to ensure this regulatory requirement is met. [Reporting guidelines](#) are provided by DEWR.

5.3 MANAGEMENT OF CHANGE

This WMP shall be updated/reviewed as per the following:

- Periodically (at least once every three years) as part of the Sites document review program;
- If significant changes in waste generation rates and types of waste generated occurs;
- Change in waste management regulations, Shire collection systems or guidelines are introduced i.e. the introduction of Food Organic, Garden Organics (FOGO) bins; and
- Significant changes to the site operations or change in waste management services provider.

Any significant changes to the WMP shall be communicated to all staff in a timely manner to ensure that compliance with the WMP is maintained.

6.0 REDUCE, REUSE AND RECYCLE (3R) STRATEGY

The Western Australian *Waste Avoidance and Resource Recovery Act 2007* sets out the waste hierarchy presented as Figure 3 below. The waste hierarchy ranks waste management options in order of their general environmental desirability. Avoiding (reduce) waste is the most preferred with disposal to landfill to be avoided as much as possible.

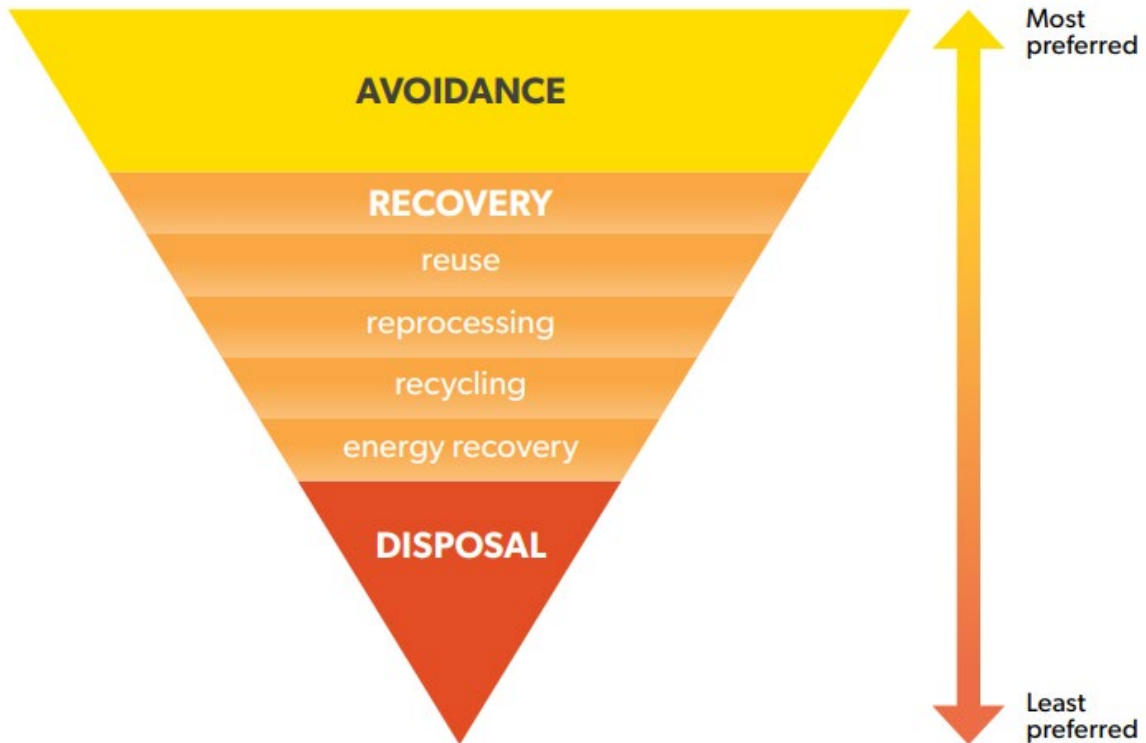


Figure 3: Waste Avoidance and Resource Recovery Act Waste Hierarchy

CFRS shall create and maintain a 3R program to support the Shires waste management vision. This program shall be reviewed periodically and modified as necessary.

REFERENCES

Environmental Protection Act 1986. Section 72

Waste Avoidance and Resource Recovery Act 2007

Commercial and Industrial Waste Management Plan Guidelines. Western Australian Local Government Association (WALGA)

Environmental Protection (Controlled Waste) Regulations 2004 Schedule 1 – Controlled Waste