PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2020/1099

Date: 9 December 2020

Queensland Government

LEC
Land and environment consultants

AMENDED IN RED

By: Jennifer Davison

Date: 23 November 2020

Queensland Government

The Bushfire management plan does not apply to the retienrement living precinct (Lot 102). Lot 102 will be subject to a separate application.

Bushfire management plan

Proposed development | Oxley Parkside, 53 Seventeen Mile Rocks Road | Oxley | Queensland
Prepared for Economic Development Queensland | 20 August 2020

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Bushfire management plan

Final V4

Report 19061 | Economic Development Queensland | 20 August 2020

Prepared by	Robert Janssen
Position	Managing principal
Signature	
Date	20 August 2020

Document control

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Draft	17 February 2020	R. Janssen	EDQ
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Final V4	20 August 2020	R. Janssen	LEC

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Disclaimer

Notwithstanding the precautions adopted in this report, it should always be remembered that bushfires burn under a range of conditions. An element of risk, no matter how small always remains, and although AS 3959-2018 is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any one building will withstand bushfire attack on every occasion.

It should be noted that upon lodgement of a development application, council and/or the fire service may recommend additional construction requirements.

Although every care has been taken in the preparation of this report, Land and Environment Consultants Pty Ltd accept no responsibility resulting from the use of the information in this report.

1 Introduction

Land and Environment Consultants Pty Ltd (**LEC**) was engaged to undertake a bushfire hazard assessment and prepare a bushfire management plan for stage 1 of the Oxley Priority Development Area (**proposed development**) at 53 Seventeen Mile Rocks Road, Oxley (**the site**), properly described as lot 600/SP236626.

An application for a development permit is being made for the proposed development under the *Oxley Priority Development Area Development Scheme* (DSDMIP 2019).

The site is affected by the Queensland State Planning Policy (**SPP**) *Bushfire prone area map* (**SPP bushfire prone area map**) for high and very high potential bushfire intensity areas and potential impact buffer area. Therefore, the application for a development permit is subject to assessment and compliance with outcomes of the SPP *Bushfire prone area code* (**SPP bushfire prone area code**) in the *Natural Hazards, Risk and Resilience – State Planning Policy State Interest guidance material* (DSDMIP 2019).

This bushfire management plan has been prepared to demonstrate how the proposed development will comply with outcomes of the SPP bushfire prone area code and considers technical guidance for bushfire hazard assessment and reporting in *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'* (QFES 2019) (**Bushfire resilient communities**) and *Technical assessment guideline - Bushfire reporting* (BCC 2019). It documents a bushfire hazard assessment for the site and identifies strategies that will be implemented to mitigate the potential impacts of bushfire hazard on life, property and the environment.

This bushfire management plan includes:

- an introduction (this section) and description of methods and information resources used for the bushfire hazard assessment;
- description of the site and the proposed development;
- bushfire hazard assessment;
- identification of bushfire hazards associated with the site and the proposed development;
- radiant heat exposure assessment;
- a plan for mitigating bushfire hazards; and
- assessment of the proposed development against the SPP bushfire prone area code.

1.1 Method

To meet the requirements of Bushfire resilient communities the following steps were undertaken:

- review of the SPP bushfire prone area map on the Queensland Government Development Assessment Mapping System and the Queensland regional ecosystem (**RE**) map, vegetation hazard class (**VHC**) map, severe fire weather map and fire history map on the Queensland Public Safety Business Agency (**PSBA**) online mapping system (**redi-portal**);
- a walk over the site and assessment of land within 140 metres (**m**) of the proposed development area for vegetation characteristics, current land management practices, slope, and evidence of previous fires;
- bushfire hazard assessment in accordance with the method in Bushfire resilient communities;
- radiant heat exposure assessment using the Fire Protection Association of Australia *BAL calculator V4.8* (**BAL calculator**) which models the 'method 2' bushfire attack level (**BAL**) assessment

procedure in the *Australian Standard for Construction of Buildings in Bushfire Prone Areas* (**AS 3959-2018**); and

- assessment of the proposed development against the SPP bushfire prone area code.

Aerial imagery of the site was accessed online from Google Earth to assist in validating observations and measurements made during the site assessment.

1.2 Suitably qualified person

This bushfire management plan was prepared by Robert Janssen who is a suitably qualified and experienced bushfire management consultant.

Robert is the managing principal at LEC and has over 20 years of experience in bushfire planning and operations. He has prepared bushfire management plans for residential, commercial and industrial property developments, utilities, government facilities and conservation estates.

Robert's formal qualifications as an environmental scientist and consulting experience are coupled with 10 years of experience as a nationally accredited fire-fighter with the national parks and wildlife service in New South Wales and Queensland.

2 Description of the site and the proposed development

This chapter provides a description of the site and the proposed development.

2.1 Site description

The location of the site is shown on Figure 2.1. It is 19.28 hectares (**ha**) of developed land and is accessed from Seventeen Mile Rocks Road which is a dual lane public road.

The site was formerly a school and is mostly developed with school buildings, roads, pathways, a childcare centre, parkland vegetation and sporting fields. Bushland vegetation occurs in the western part of the site and is mapped under the Queensland *Vegetation Management Act 1999* (**VMA**) as 'endangered'.

The south and east boundaries of the site adjoin suburban residential development. The north boundary adjoins Cliveden Avenue, Fort Bushland Reserve, land used for agriculture and large lot residential development. The west boundary adjoins large lot residential development with a large continuous area of bushland vegetation.

2.2 Proposed development

The overall master plan for the Oxley Priority Development Area and the reconfiguration of a lot plan for the stage 1 development area, ie the proposed development, are provided at Appendix 1. The stage 1 development area plan shows the layout of residential lots, retirement living precinct, child care site, roads and waterway corridor open space.

Retirement living and child care are defined as 'vulnerable use' development under the SPP bushfire prone area code.

The private waterway treatment area and the waterway corridor open space area will contain constructed landforms and will be subject to revegetation. Revegetation will consist of turf on the flatter and accessible areas to provide opportunities for informal recreation and grass species on earthworks embankment batters with a sparse density of shrubs and smooth-barked tree species (Place 2020).

Under the stage 2 development, bushland vegetation west of the waterway corridor open space will be retained and restored to improve the local regional ecosystem which correlates with VHC 9.1 *Moist to dry eucalypt open forest on coastal lowlands and ranges.*

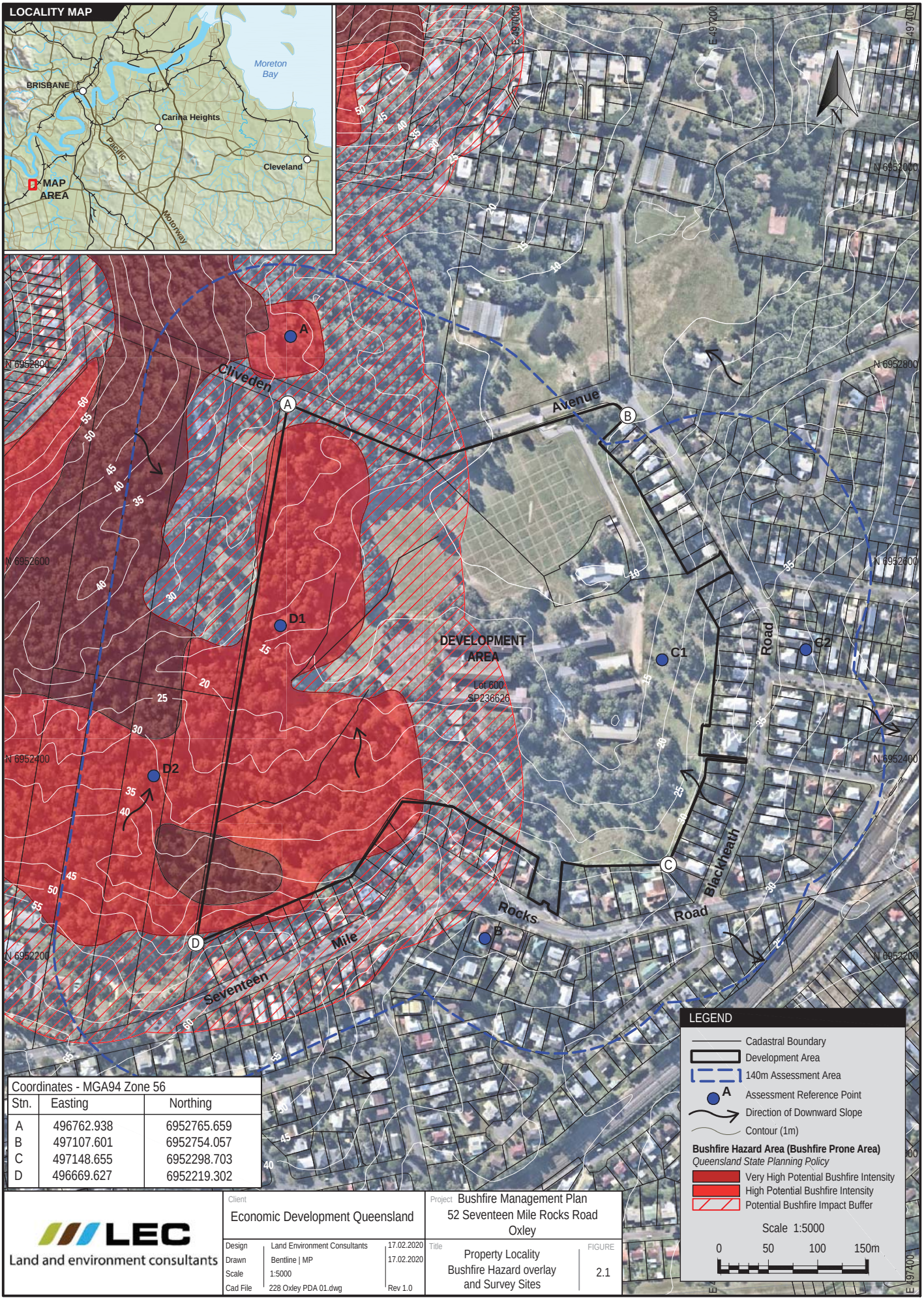
The public recreation park and balance of the site, ie the stage 2 development area, will continue to be a managed landscape with low cut grass.

Primary access to the proposed development will be from Seventeen Mile Rocks Road via a new road connection. Secondary access will be provided from Cliveden Avenue via a 4 m wide formed path (through the stage 1B development area) for use by emergency vehicles ensuring safe evacuation in case of a bushfire and ensuring efficient access to the open space and recreation areas by emergency vehicles.

The proposed development will be connected to mains water and will have a reticulated hydrant system.

2.3 SPP bushfire prone area map

The SPP bushfire prone area map for the site is shown on Figure 2.1 and indicates bushland vegetation in the western part of the site is the primary source of bushfire hazard affecting the proposed development.



Coordinates - MGA94 Zone 56

Stn.	Easting	Northing
A	496762.938	6952765.659
B	497107.601	6952754.057
C	497148.655	6952298.703
D	496669.627	6952219.302

LEC Land and environment consultants

Client: Economic Development Queensland

Project: Bushfire Management Plan
52 Seventeen Mile Rocks Road
Oxley

Design	Land Environment Consultants	17.02.2020
Drawn	Bentline | MP	17.02.2020
Scale	1:5000	
Cad File	228 Oxley PDA 01.dwg	Rev 1.0

Title: Property Locality
Bushfire Hazard overlay
and Survey Sites

FIGURE: 2.1

3 Bushfire assessment

This chapter provides details of the desktop review, site assessment and bushfire hazard assessment.

3.1 Severe fire weather

The severe fire weather map on the redi-portal indicates the 5 % annual exceedance probability forest fire danger index (**FFDI**) for the site is 55.

This FFDI value has been used for the bushfire hazard assessment in Section 3.4 and the radiant heat exposure assessment in Section 5.8.

3.2 Fire history

Fire history data on the redi-portal indicates no fires have occurred within 1 kilometre (**km**) of the site during the past 10 years.

3.3 Site assessment

LEC walked over the site and assessed land within 140 m of the site on 15 May 2018. Observations were recorded about current land use and management, vegetation characteristics, slope of land and evidence of previous fires.

The locations of site assessment reference points are shown on Figure 2.1. Table 3.1 provides a summary of observations associated with site assessment reference points and their features are shown in Photographs 3.1-3.5.

Table 3.1 Site observations

Assessment Point	Redi-portal VHC	Ground truthed VHC	Notes
A	VHC 9.1 *Moist to dry eucalypt open forest* (VHC 9.1)	VHC 9.1	Fort Bushland Reserve which runs north to the Brisbane River and is separated from the site by Clivenden Avenue.
B	VHC 42.6 *Nil to very low vegetation cover* (VHC 42.6)	VHC 42.6	Suburban residential development
C1	VHC 40.4 *Low grass or tree cover in rural areas* (VHC 40.4)	VHC 40.4	Managed vegetation in the stage 2 development area.
C2	VHC 42.6	VHC 42.6	Suburban residential development
D1	VHC 9.1	VHC 9.1	D1 is bushland vegetation in the western part of the site that will be retained and restored under the stage 2 development.
D2	VHC 10.1 *Spotted gum dominated open forests*	VHC 9.1	Bushland vegetation on land adjoining the west boundary of the site.

Photograph 3.1 VHC 9.1 at A

Photograph 3.2 View to VHC 42.6 at B

Photograph 3.3 VHC 40.4 at C1 with view to VHC 42.6 at C2

Photograph 3.4 VHC 9.1 at D1

Photograph 3.5 VHC 9.1 at D2

3.4 Bushfire hazard assessment

The bushfire hazard assessment in this report is based on the bushfire hazard assessment method in Bushfire resilient communities.

3.4.1 Potential bushfire intensity calculations

The potential bushfire intensity of assessment reference points was determined using the PSBA *Potential Bushfire Intensity Calculator* (version November 2014) which models the bushfire hazard assessment method in Bushfire resilient communities.

Part B of the SPP Natural Hazards, Risk and Resilience Technical Manual – A *'fit-for-purpose' approach in undertaking natural hazard studies and risk assessments* (DILGP 2016) (**SPP bushfire hazard assessment manual**) defines bushfire hazard classes as follows:

- very high – potential bushfire intensity > 40,000 kW/m;
- high – potential bushfire intensity 20,000-40,000 kW/m;
- medium – potential bushfire intensity 4,000-20,000 kW/m; and
- non bushfire hazard - potential bushfire intensity < 4,000 kW/m.

Results of potential bushfire intensity calculations are presented in Table 3.2.

Table 3.2 Potential bushfire intensity

Assessment reference point	Ground truthed VHC	Potential fuel load (t/ha)[1]	Slope (°)[2]	Potential bushfire intensity (kW/m)	Bushfire hazard class
A	VHC 9.1	24.2	7	32,104	High
B	VHC 42.6	2	0[2]	136	Non bushfire prone area
C1	VHC 40.4	5	6	1,290	Non bushfire prone area
C2	VHC 42.6	2	0[2]	136	Non bushfire prone area
D1	VHC 9.1	24.2	0	19,806	Medium
D2	VHC 9.1	24.2	7	32,104	High

Notes 1 potential fuel load taken from Bushfire resilient communities
2 slope default to 0 for VHC 42.6 which has discontinuous fuel

3.5 Bushfire hazard areas

Results of the potential bushfire intensity calculations determined that medium and high potential bushfire intensity areas occur in bushland vegetation along the north and west boundaries of the site, ie assessment reference points A, D1 and D2, and generally agree with the SPP bushfire prone area map.

Land within 100 m of a medium or high potential bushfire intensity area is vulnerable from exposure to radiant heat, ember attack and burning debris. To mitigate these potential impacts, the SPP bushfire hazard assessment manual identifies this land as a potential impact buffer area. Land affected by a potential impact buffer area is defined as a bushfire prone area for planning purposes.

Therefore, the bushfire hazard assessment has confirmed that the proposed development is affected by medium and high potential bushfire intensity areas and potential impact buffer area and is subject to compliance with outcomes of the SPP bushfire prone area code.

4 Bushfire hazards associated with the site

This chapter identifies bushfire hazards associated with the site.

4.1 Fire danger season

The fire danger season in South-east Queensland starts in August, peaks in September and begins to fall in November, but will remain elevated until consistent summer rainfall occurs. Typically, the worst fire weather conditions will be experienced during the fire danger season when the wind direction is from the north.

FFDI values represent the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long and short-term drought effects. The severe fire weather map accessed on the redi-portal indicates the 5% annual exceedance probability FFDI for the site is 55.

Fire danger ratings (**FDR**) are based on the forecast weather conditions, ie FFDI, and gives advice about the level of bushfire threat on a day. An FFDI of 55 is commensurate with a very high FDR and will be associated with hot, dry and windy conditions. If a fire starts and takes hold under these conditions, it will be difficult to control in large areas of natural vegetation.

4.2 Fire history

As discussed in Section 3.2, no fires have occurred within 1 km of the site during the past 10 years.

4.3 Likely direction of bushfire attack

The likely directions of bushfire attack on the proposed development are from the north and the west, ie assessment reference points A, D1 and D2, where medium and high potential bushfire intensity areas occur.

The potential impact of these bushfire attack scenarios on the retirement living precinct is partially mitigated by the waterway corridor open space which will contain a constructed landform and will be subject to revegetation with bioretention grass species and a sparse density of trees consistent with VHC 40.4.

These bushfire attack scenarios are further assessed in Section 5.8.

4.4 Potential bushfire hazard from adjacent land use

The site is surrounded by residential development, agricultural land, bushland (including bushland reserve) and agricultural land. Based on fire history data discussed in Section 4.2, these land uses are not a bushfire hazard in relation to the proposed development.

Prescribed burning could be performed in the Fort Bushland Reserve for conservation and/or fuel hazard reduction purposes. Prescribed burns are carefully planned and controlled and except for temporary nuisance from smoke and increased traffic are unlikely to have any significant impacts on the proposed development.

4.5 Water and access

The site has access to mains water and a public road network capable of accommodating emergency vehicles.

5 Bushfire hazards associated with the proposed development

This chapter identifies potential bushfire hazards associated with the proposed development.

5.1 Population

The proposed development will not materially increase the number of people exposed to bushfire hazard given that the site was a school, is currently used for childcare and public recreation and is surrounded by suburban residential development.

Residential lots adjoining bushland vegetation adjoining the site will include provisions to ensure residential buildings are appropriately separated from bushfire hazard.

5.2 Hazardous materials

The proposed development does not involve storage or manufacture of hazardous materials as defined in the glossary of the SPP (2017).

5.3 Vulnerable use

The proposed development includes retirement living and childcare precincts which are defined as 'vulnerable use' development under the SPP bushfire prone area code.

Vulnerable uses are often more difficult to evacuate, and occupants may not be able to support themselves or assist in property protection during a bushfire event.

Development within the retirement living and childcare precincts will be appropriately separated from bushfire hazard to facilitate the safe evacuation of occupants.

5.4 Bushland vegetation retention

Bushland vegetation will be retained and restored in the western part of the site under the stage 2 development and will result in the retention of a bushfire hazard area in this part of the site.

The bushland vegetation will be separated from the retirement living precinct by the private waterway treatment and the waterway corridor open space which will contain a constructed landform and will be subject to revegetation mostly consisting of turf and grass species (and a sparse density of shrub and smooth-barked tree species) that will have a much lower potential fuel load than the bushland vegetation.

Bushland vegetation in the western part of the site also adjoins lots 24-30.

5.5 Emergency access

Emergency access to the proposed development will be via the existing public road network.

Primary access to the proposed development will be from Seventeen Mile Rocks Road via a new road connection. Secondary access will be provided from Cliveden Avenue via a 4 m wide path (through the stage 1B development area) for use by emergency vehicles ensuring safe evacuation in case of a bushfire and ensuring efficient access to the open space and recreation areas by emergency vehicles.

Roads and driveways within the proposed development will be designed to provide efficient access for emergency vehicles and the orderly evacuation of the site.

5.6 Fire-fighter water supply

The proposed development will be connected to mains water and will have an appropriately designed reticulated hydrant system in public road reserves.

5.7 Warnings and emergency planning

Queensland emergency services use a range of methods to warn the community about bushfire, severe weather and other emergencies that require preparation and action at the property level. Future residents of the proposed development will have exposure to advice and warnings by Queensland emergency services via radio, online media, and local community safety announcements.

5.8 Radiant heat exposure

The SPP bushfire prone area code seeks residential lots to provide building locations for residential dwellings which achieve a radiant heat flux ≤ 29 kW/m^2. The radiant heat exposure outcome for 'vulnerable use' development is specified in Section 9.4 of Bushfire resilient communities, which requires the development footprint of a 'vulnerable use' to be separated from hazardous vegetation by a distance which achieves a radiant heat flux $\underline{<}$ 10 kW/m^2.

As discussed in Section 4.3, the likely directions of bushfire attack on the proposed development are from the north and west where medium and high potential bushfire intensity areas occur, ie assessment reference points A, D1 and D2.

The potential impact of these bushfire attack scenarios on the retirement living precinct is partially mitigated by the waterway corridor open space which will contain a constructed landform and will be subject to revegetation with bioretention grass species and a sparse density of trees consistent with VHC 40.4.

Radiant heat exposure modelling was performed on these bushfire attack scenarios to determine the position of the 29 kW/m^2 radiant heat flux contour on residential lots, ie lots 23-30, and the position of the 10 kW/m^2 radiant heat flux contour on the retirement living precinct.

Bushfire resilient communities provides 2 options for radiant heat exposure modelling, being the Queensland Fire and Emergency Services *Bushfire asset protection zone width calculator* (QFES 2019), or 'method 2 of AS 3959-2018, subject to the adoption of site-specific values. The latter option was adopted for this bushfire management plan.

Inputs used to model these bushfire attack scenarios and results from the BAL calculator are provided in Appendix 2. The context of the results in terms of mitigation measures for residential lots and the retirement living precinct are discussed in Chapter 6.

It should be noted that the childcare centre precinct is 55 m from the waterway corridor open space and 80 m from bushland vegetation that will be retained in the western part of the site and is not affected by the 10 kW/m^2 radiant heat flux contour.

6 Bushfire mitigation plan

This chapter identifies measures that will be implemented as part of the proposed development to mitigate the risk of bushfire hazards and to comply with outcomes of the SPP Bushfire prone area code.

It is the total of the mitigation measures in this chapter that will reduce the risk of bushfire hazards to a tolerable level. Failure to implement all actions in their entirety could result in an increased level of exposure to the bushfire hazards.

6.1 Bushfire protection zones

A 29 kW/m^2 bushfire protection zone will be established in lots 23-30 as shown on Figure 6.1.

The effects of the bushfire protection zones on the developer are:

- a registered surveyor must survey and peg the bushfire protection zone on each lot;
- the bushfire protection zone must be established as a covenant area and shown on site plans;
- fencing and retaining walls in the bushfire protection zone must be constructed with fire resisting materials and designed to allow the movement of native fauna;
- remove heavy fuels, eg dead fallen branches/ logs which are > 1 centimetre (**cm**) thickness;
- remove shrubs and small trees with stem diameter < 10 cm at chest height;
- remove trees which overhang or interfere with the building area and trees/tree branches identified by an arborist as dead/rotting or dangerous;
- remove branches from retained trees that are < 2 m above ground level; and
- prospective purchasers of affected lots must be notified about the effects of the bushfire protection zone on future development.

The effects of the bushfire protection zones on prospective purchasers are:

- *Building Code of Australia* (2019) (**BCA**) residential classifications of building are not permitted in the bushfire protection zone;
- landscaping in the bushfire protection zone is designed so that 80 % of the bushfire protection zone has an understorey which consists of lawn and/or built features, eg pedestrian pathway, driveway, carpark, swimming pool, retaining wall, etc;
- landscaping in the bushfire protection zone and the balance of the lot must be designed appropriately for a bushfire hazard area and comply with specifications in Section 6.2; and
- a cleared path which provides unimpeded access for emergency services must be maintained around the building from the driveway at all times.

A 10 kW/m^2 bushfire protection zone will be established in lot 102, ie retirement living precinct. The indicative location of this bushfire protection zone is shown on Figure 6.1 and is subject to refinement and finalisation. This will be undertaken upon completion of detailed design work for the constructed landform and revegetation in the private waterway treatment area and the waterway corridor open space area which adjoin the south and west boundaries of lot 102. The effects of the bushfire protection zone on the developer and prospective purchasers listed above will be applied to lot 102 when the bushfire protection zone is finalised.

6.2 Landscaping

Landscaping in lots 23-30 and in lot 102, ie the retirement living precinct, will be designed to minimise the potential for it to catch fire and compromise buildings or evacuation of buildings.

Guidance for landscaping in a bushfire prone area is provided in the guideline *Landscaping for Bushfire – Garden design and plant selection* (CFA 2011) which is publicly available online.

Design criteria for landscaping include:

- plants > 10 cm in height must not be located close to vulnerable parts of the building such as windows and doors;
- plants should be located so that they do not touch walls or other elements of the building when they reach maturity;
- trees should not be planted close to other trees and should not overhang the building when they reach maturity;
- shrubs should be planted at intervals ≥ 3 times their width at maturity and not planted around the base of trees;
- ground cover plantings should be used to fill spaces between shrubs;
- grass must be maintained at < 10 cm in height; and
- use non-flammable mulch, eg gravel, scoria (pumice), pebbles, shells, crushed brick, etc.

Some plants have characteristics that reduce the likelihood of ignition. Plant selection should favour species with the following characteristics:

- well suited to local growing conditions;
- high moisture content;
- open and loose branching with sparse leaves;
- course texture;
- wide, flat and thick leaves;
- smooth bark; and
- low levels of oils, waxes and resins.

Over time plants may become diseased, stressed or die and become more flammable as moisture content decreases. Therefore, regular maintenance must be carried out, including:

- removing dead trees and fallen branches;
- clearing ground fuel from underneath plants;
- replacing plants that die or become diseased;
- keeping plants well hydrated through watering and use of non-flammable mulch;
- removing any fine or dead material that may accumulate in plants; and
- removing weeds.

6.3 Building approvals

Building approval on lots affected by the SPP bushfire prone area map will be subject to compliance with BAL construction specifications in AS 3959-2018 as required under the BCA.

Indicatively, compliance with AS 3959-2018 will be applicable to BCA residential classifications of buildings within 100 m of bushland vegetation that will retained and restored in the western part of the site under the stage 2 development.

Owners of affected lots will be responsible for obtaining a BAL assessment report when seeking building approval.

6.4 Vehicle access

Access from public roads for emergency vehicles and directions of escape for occupants are shown on Figure 6.1.

The public road network, pathway through the Stage 1B development area and private roads in the retirement living precinct will be designed and constructed in accordance with *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots 2015* (QFES 2015) which defers to the *Road Planning and Design Manual – 2nd Edition* (DTMR 2013).

6.5 Hydrants

The proposed development will be connected to mains water and will have a reticulated hydrant system in public road reserves and private roads in the retirement living precinct.

The reticulated hydrant system will be designed and constructed in accordance with *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots 2015* (QFES 2015) which defers to the local water retailers specifications which incorporate the *Australian Standard – Fire hydrant installations System design, installation and commissioning* (AS 2419.1-2017) *Appendix B*.

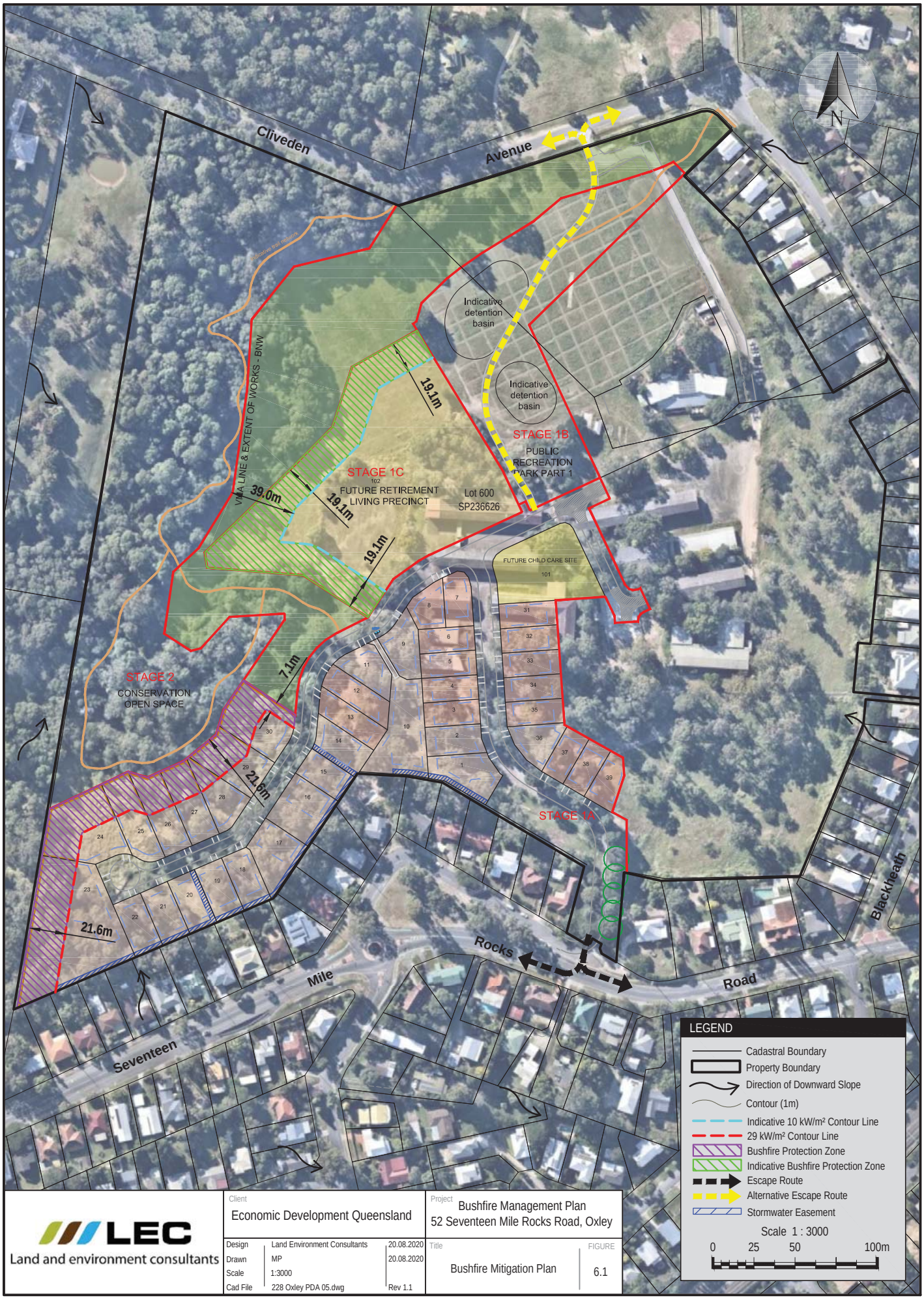
6.6 Service installation

Water, electricity and gas reticulation will be installed underground.

6.7 Emergency response planning

Future residents will be responsible for preparing for the bushfire season. The Queensland Rural Fire Service has publicly available information to assist the community prepare for the bushfire season which includes an online template to prepare a bushfire survival plan which can be accessed at Bushfire survival plan.

Future management of the retirement living precinct and childcare centre precinct will prepare and implement an emergency response plan in accordance with their responsibilities under the Queensland *Work Health and Safety Regulation 2011*.



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Client: Economic Development Queensland

Project: Bushfire Management Plan
52 Seventeen Mile Rocks Road, Oxley

Design	Land Environment Consultants	20.08.2020
Drawn	MP	20.08.2020
Scale	1:3000	
Cad File	228 Oxley PDA 05.dwg	Rev 1.1

Title: Bushfire Mitigation Plan

FIGURE: 6.1

7 Conclusion

This bushfire management plan demonstrates how the proposed development will comply with outcomes of the SPP bushfire prone area code and considers technical guidance for bushfire hazard assessment and reporting in Bushfire resilient communities and *Technical assessment guideline - Bushfire reporting* (BCC 2019).

A bushfire hazard assessment of land within 140 m of the site, including retained bushland vegetation within the site and vegetation restoration areas, confirmed that the proposed development is affected by bushfire hazard and is subject to compliance with outcomes of the SPP bushfire prone area code.

Mitigation measures that will be implemented as part of the proposed development are specified in Chapter 6. With the implementation of these mitigation measures, the proposed development complies with outcomes in the SPP bushfire prone area code as demonstrated at Appendix 3.

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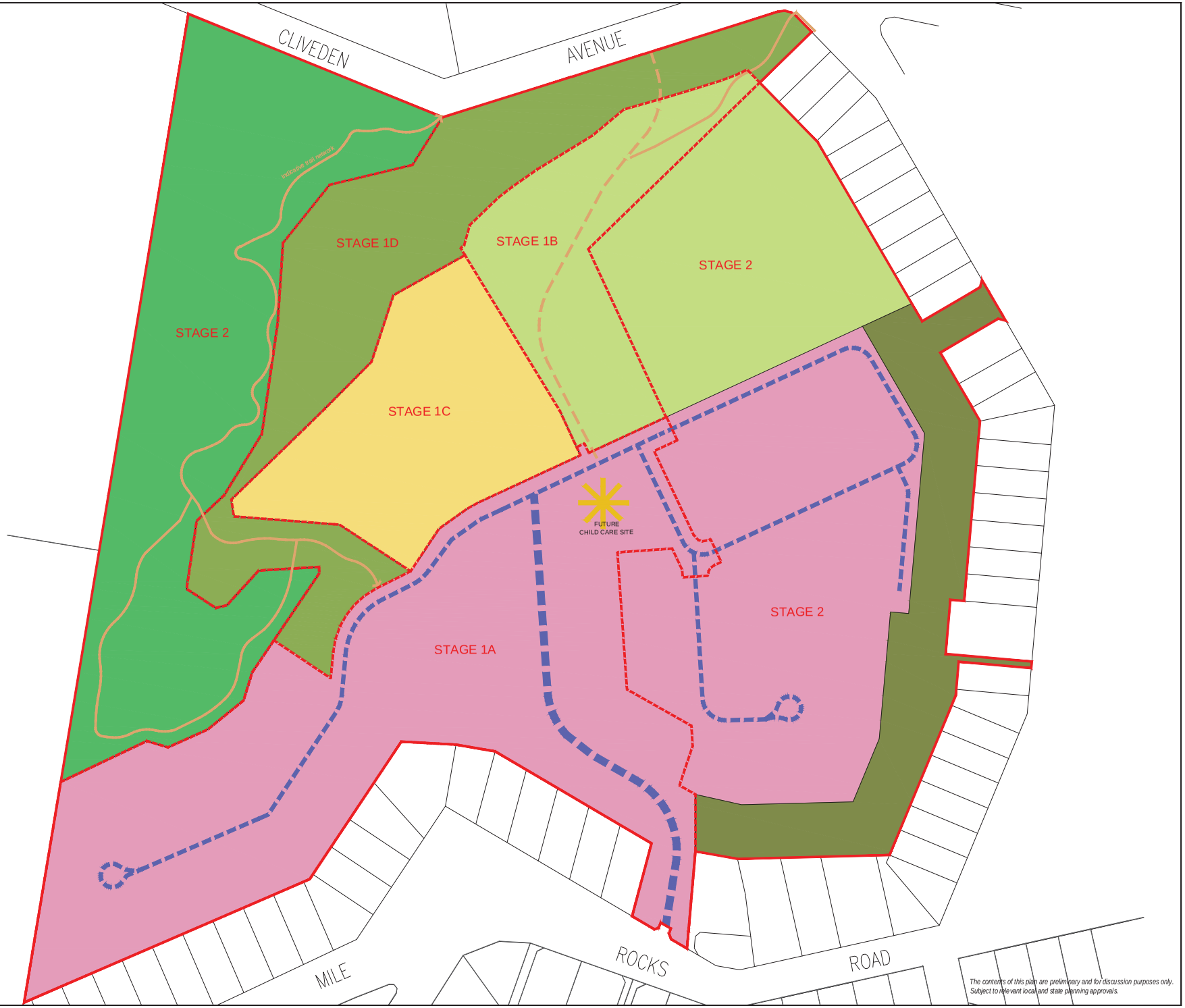
Appendix 1 Proposed site plan



The contents of this plan are preliminary and for discussion purposes only. Subject to relevant local and state planning approvals.

place design group.

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PROJECT

Oxley Priority Development Area

CLIENT

EDQ

KEY PLAN / NOTES

- SUBJECT SITE
- STAGING BOUNDARIES
- PRECINCT 1 : ENVIRONMENTAL PROTECTION
- PRECINCT 2a : DRAINAGE RESERVE (WATERWAY CORRIDOR)
- PRECINCT 2b : PUBLIC RECREATION PARK
- PRECINCT 3a : NEIGHBOURHOOD
- PRECINCT 3b : LIFESTYLE AND CARE
- HILLSIDE REMEDIATION
- PRIVATE WATERWAY TREATMENT
- INDICATIVE ROAD NETWORK
- INDICATIVE TRAIL NETWORK
- INDICATIVE EMERGENCY / MAINTENANCE ACCESS PATHWAY

NOT FOR CONSTRUCTION

ISSUE	CODE	ISSUE DESCRIPTION	BY	CHK	DATE

PRE - Preliminary | CA - Council Approval | T - Tender | CON - Construction

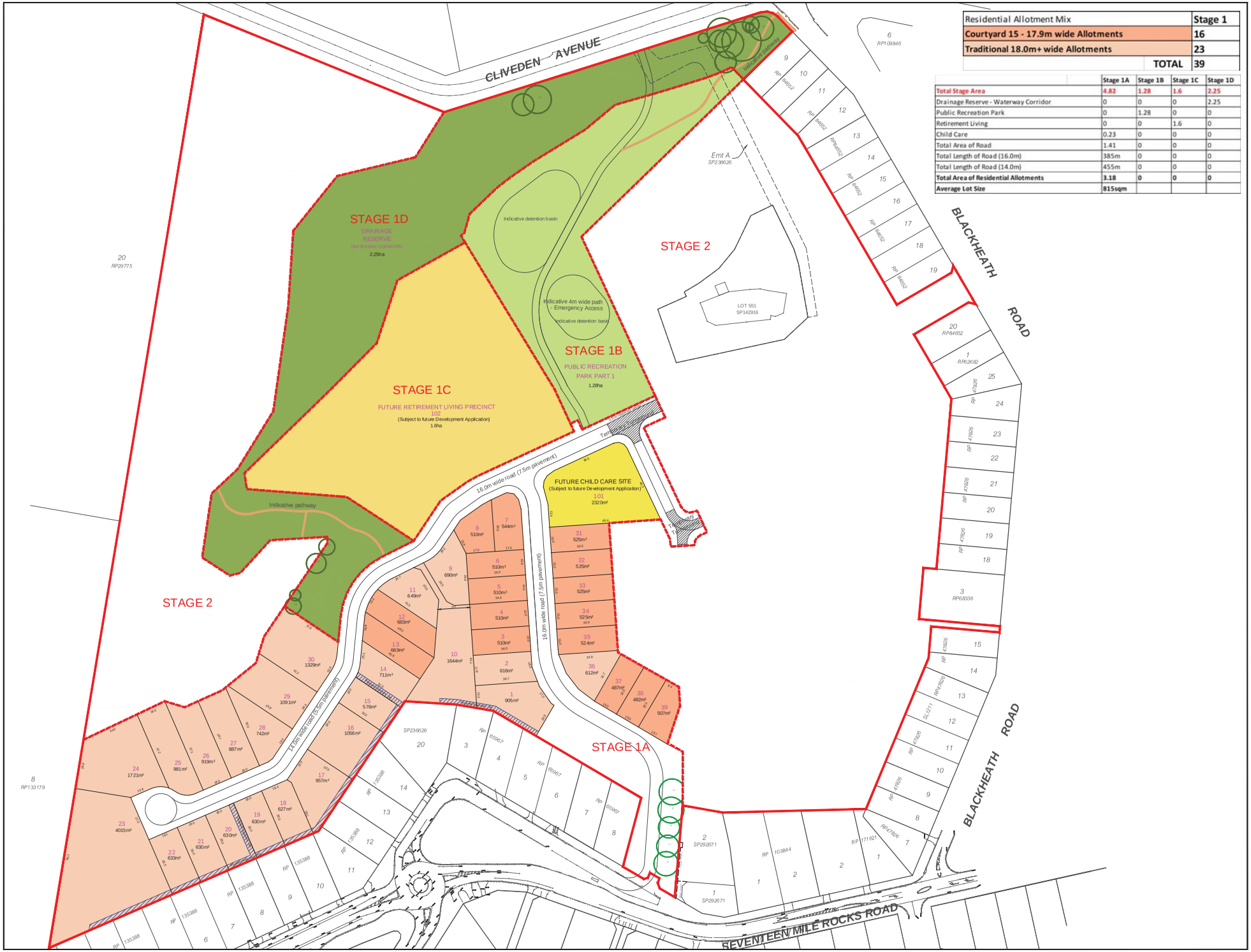
DRAWING TITLE

OVERALL MASTER PLAN

DESIGN	:	CK
DOCUMENT	:	JB
PROJECT	:	1018015
SCALE	:	1:1000@A1
DATE	:	17.08.2020

NORTH

SHEET NUMBER	REVISION
1018015_25	Rev F



Residential Allotment Mix	Stage 1
Courtyard 15 - 17.9m wide Allotments	16
Traditional 18.0m+ wide Allotments	23
TOTAL	39

	Stage 1A	Stage 1B	Stage 1C	Stage 1D
Total Stage Area	4.82	1.28	1.6	2.25
Drainage Reserve - Waterway Corridor	0	0	0	2.25
Public Recreation Park	0	1.28	0	0
Retirement Living	0	0	1.6	0
Child Care	0.23	0	0	0
Total Area of Road	1.41	0	0	0
Total Length of Road (16.0m)	385m	0	0	0
Total Length of Road (14.0m)	455m	0	0	0
Total Area of Residential Allotments	**3.18**	**0**	**0**	**0**
Average Lot Size	**815sqm**			

place design group.

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PROJECT

Oxley Priority Development Area

CLIENT

EDQ

KEY PLAN / NOTES

- SUBJECT SITE
- STAGING BOUNDARIES
- FUTURE RETIREMENT LIVING SITE
- FUTURE CHILD CARE SITE
- STORMWATER & ACCESS EASEMENT
- PUBLIC RECREATION PARK
- DRAINAGE RESERVE (WATERWAY CORRIDOR)
- INDICATIVE PATHWAY
- EXISTING VEGETATION TO BE RETAINED WITHIN ROAD RESERVE (SUBJECT TO ENGINEERING DESIGN)
- EXISTING VEGETATION TO BE RETAINED WITHIN OPEN SPACE

NOT FOR CONSTRUCTION

DRAWING TITLE

RECONFIGURATION OF A LOT
STAGE ONE

DESIGN	:	CK
DOCUMENT	:	JB
PROJECT	:	1018015
SCALE	:	1:1000@A1
DATE	:	17.08.2020

NORTH

SHEET NUMBER
1018015_34

REVISION
Rev C

Appendix 2 Radiant heat exposure calculations

Lots 23-30

- Forest fire danger index - 55
- Vegetation – VHC 9.1 *Moist to dry eucalypt open forest on coastal lowlands and ranges*
- Overall fuel load – 34.2 t/ha
- Surface fuel load – 24.2 t/ha
- Slope – 7^0 down slope
- Site slope – 7^0 down slope
- Flame width – 100 m

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	55	Rate of spread	2.58 km/h
Vegetation classification	Forest	Flame length	20.93 m
Surface fuel load	24.2 t/ha	Flame angle	56 °, 67 °, 74 °, 79 °, 80 ° & 88 °
Overall fuel load	34.2 t/ha	Elevation of receiver	6.68 m, 6.98 m, 6.25 m, 5.04 m, 4.19 m & 0 m
Vegetation height	n/a	Fire intensity	45,746 kW/m
Effective slope	7 °	Transmissivity	0.862, 0.838, 0.8090000000000001, 0.783, 0.77 & 0.714
Site slope	7 °	Viewfactor	0.6069, 0.4542, 0.3078, 0.2097, 0.1704 & 0.0459
Flame width	100 m	Minimum distance to < 40 kW/m²	16.19999999999996 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	21.60000000000004 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	31.00000000000017 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	42.60000000000034 m
		Minimum distance to < 10 kW/m²	49.80000000000044 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

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

Retirement living precinct

The retirement living precinct adjoins the waterway corridor open space, ie VHC 40.4, but is within 100 m of bushland vegetation in the western part of the site, ie VHC 9.1. Therefore, the 10 kW/m^2 radiant heat flux contour in the retirement living precinct was determined by overlaying the 10 kW/m^2 radiant heat flux contours from bushfire attack scenarios through the bushland vegetation in the western part of the site, ie VHC 9.1, and the waterway corridor open space, ie VHC 40.4, and tracing the worst case scenario.

VHC 9.1 in the bushland vegetation in western part of the site

- Forest fire danger index - 55
- Vegetation – VHC 9.1 *Moist to dry eucalypt open forest on coastal lowlands and ranges*
- Overall fuel load – 34.2 t/ha
- Surface fuel load – 24.2 t/ha
- Slope – 0° slope
- Site slope – 0° slope
- Flame width – 100 m

FPA AUSTRALIA | FLAMESOL

Calculated February 7, 2020, 12:35 pm (MDc v.4.8)

J19061 (BB VHC9.1)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	55	Rate of spread	1.59 km/h
Vegetation classification	Forest	Flame length	14.48 m
Surface fuel load	24.2 t/ha	Flame angle	53 °, 63 °, 71 °, 75 °, 77 ° & 82 °
Overall fuel load	34.2 t/ha	Elevation of receiver	5.78 m, 6.45 m, 6.84 m, 6.99 m, 7.05 m & 7.17 m
Vegetation height	n/a	Fire intensity	28,222 kW/m
Effective slope	0 °	Transmissivity	0.872, 0.853, 0.828, 0.802, 0.789 & 0.727
Site slope	0 °	Viewfactor	0.6024, 0.4465, 0.301, 0.2046, 0.1661 & 0.0451
Flame width	100 m	Minimum distance to < 40 kW/m²	11.99999999999997 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	16.09999999999996 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	23.40000000000006 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	32.9000000000002 m
		Minimum distance to < 10 kW/m²	39.00000000000028 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

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

VHC 40.4 in the waterway corridor open space

- Grassland fire danger index – 78 (approximate equivalence to FFDI 55)
- Vegetation - VHC 40.4 *Low tree or grass cover in built up areas*
- Overall fuel load – 5 t/ha
- Surface fuel load – 5 t/ha
- Slope – 0° slope
- Site slope – 0° slope
- Flame width – 100 m

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	78	Rate of spread	10.14 km/h
Vegetation classification	Grassland	Flame length	6.1 m
Surface fuel load	5 t/ha	Flame angle	54 °, 64 °, 73 °, 78 °, 80 ° & 85 °
Overall fuel load	5 t/ha	Elevation of receiver	2.46 m, 2.74 m, 2.91 m, 2.98 m, 3 m & 3.03 m
Vegetation height	n/a	Fire intensity	26,195 kW/m
Effective slope	0 °	Transmissivity	0.889, 0.88, 0.865, 0.846, 0.835 & 0.76
Site slope	0 °	Viewfactor	0.5865, 0.4293, 0.2868, 0.1934, 0.1566 & 0.0431
Flame width	100 m	Minimum distance to < 40 kW/m²	5.199999999999998 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	7.099999999999991 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	10.59999999999998 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	15.59999999999996 m
		Minimum distance to < 10 kW/m²	19.1 m

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

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

Flame temperature

The recommended input for flame temperature in Bushfire resilient communities is 1,200 K and is different to the standard input for flame temperature in the 'method 2' procedure in AS 3959-2018, which is 1,090 K.

AS 3959-2018 recognises that there is overwhelming difficulty accurately measuring flame temperature in both laboratory and field environments and that results of the 'method 2' procedure are very sensitive to flame temperature.

Existing scientific literature suggests that flame temperature for determining flame emissive power vary greatly and the majority of them fall within a range between 1,000-1,200 K. Bushfire resilient communities has chosen the highest end of the flame temperature spectrum as the standard input for calculating radiant heat exposure.

The proposed development is infill development with a suburban context and is exposed to a relatively small bushfire hazard area as opposed to a large continuous bushfire hazard area that might be associated with a wildland setting, eg national parks estate, forestry plantation, etc. Therefore, it was considered that a balanced approach was warranted for radiant heat exposure modelling in this bushfire management plan and the standard input for flame temperature in the 'method 2' procedure in AS 3959-2018 was used, ie 1,090 K.

Appendix 3 SPP Bushfire prone area code assessment

Performance outcomes	Acceptable outcomes	Compliance assessment
Section A **Reconfiguring a lot (RaL) – where creating lots of more than 2,000 square metres**		
PO1 The subdivision layout: (a) enables future buildings to be located away from slopes and land forms that expose people or property to an intolerable risk to life or property; and (b) facilitates emergency access and operational space for firefighters in a reduced fuel area between future buildings and structures and hazardous vegetation, that reduce risk to an acceptable or tolerable level. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	**AO1.1** A development footprint plan is identified for each lot that avoids ridgelines, saddles and crests where slopes exceed 15 per cent. **AO1.2** A development footprint plan is identified for each lot that is separated from the closest edge to the adjacent mapped medium, high or very high potential bushfire intensity area by: (a) a distance that is no closer than the distances specified in Table 5 at all development footprint plan boundaries; or (b) a distance that achieves a radiant heat flux level of 29 kW/m2 or less at all development footprint plan boundaries. Note – This separation area is often termed an asset protection zone. Note – The radiant heat flux levels can be established by undertaking a bushfire hazard assessment in accordance with the methodology in the QFES Bushfire resilient communities document.	**Complies with PO1** The retirement living precinct is > 2,000 m^2 and includes a bushfire protection zone which will separate future development from hazardous vegetation. The bushfire management plan provides specifications for the design and management of the bushfire protection zone with the objective of it providing a low fuel hazard area with discontinuous fuels.
PO2 The subdivision layout enables: (a) future buildings to be located as close as possible to property entrances to facilitate safe evacuation during a bushfire event; and (b) future site access to be located and designed to allow safe evacuation of the site by occupants and maintain access by emergency services under critical event conditions.	**AO2** A development footprint plan is identified for each lot that: (a) is located within 60 metres of the street frontage; and (b) sited to enable a route between the development footprint plan and the street frontage with a gradient that does not exceed of 12.5 per cent.	**Not applicable at this stage** Development of the retirement living precinct will be subject to a development application at which time compliance with PO2 will be assessed.

Performance outcomes	Acceptable outcomes	Compliance assessment
Section B		
Reconfiguring a lot (RaL) – where creating lots of 2,000 square metres or less		
PO3 The subdivision layout: (a) avoids creating lots on slopes and land forms that expose people or property to an intolerable risk to life or property; and (b) facilitates emergency access and operational space for firefighters in a reduced fuel area between future buildings and structures and hazardous vegetation, that reduce risk to an acceptable or tolerable level. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment, in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	**AO3.1** The subdivision layout results in lots that are sited so that they are separated from the closest edge to the adjacent mapped medium, high or very high potential bushfire intensity area by: (a) a distance that is no closer than the distances specified in Table 5 at all lot boundaries; or : (b) a distance that achieves a radiant heat flux level of 29 kW/m^2 or less: (i) at the building envelope, if identified at RaL stage; or (ii) where a building envelope is not identified, at all lot boundaries. Note – This separation area is often termed an asset protection zone. Note – The radiant heat flux levels can be established by undertaking a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document. Note – For staged developments, temporary separation areas may be absorbed as part of subsequent stages. Note - Existing cleared areas external to the site may only be used in calculating necessary separation where tenure ensures that the land will remain cleared of hazardous vegetation (for example the land is a road, watercourse or highly managed park in public ownership). **AO3.2** The subdivision layout does not create lots that are within bushfire prone areas and on ridgelines, saddles and crests where slopes exceed 15 per cent (roads and parks may be located in these areas)	**Complies with AO3.1 and AO3.2** Lots adjoining bushland vegetation and the waterway corridor open space have a bushfire protection zone which will separate buildings from hazardous vegetation. The bushfire protection zone on residential lots is designed for buildings to achieve a radiant heat flux ≤ 29 kW/m^2. The future development of the retirement living precinct will be associated with a 'vulnerable' use. Therefore, the bushfire protection zone in this area is designed for buildings to achieve a radiant heat flux ≤ 10 kW/m^2. The bushfire protection zone over the retirement living precinct shown on Figure 6.1 in the Bushfire management plan is indicative. Its location will be refined and finalised upon complete of detailed design work for the constructed landform and revegetation in the private waterway treatment area and the waterway corridor open space area which adjoin the south and west boundaries of the precinct. The slope of the site is generally less than 15 %.

Performance outcomes	Acceptable outcomes	Compliance assessment
Section C		
Reconfiguring a lot (RaL) – where creating more than 20 lots		
PO4 The subdivision layout is designed to minimise the length of the development perimeter and number of lots exposed to hazardous vegetation. Note – For example, avoid finger-like subdivision patterns or substantive vegetated corridors between lots.	**AO4** No acceptable outcome is prescribed	**Complies with PO4** The proposed development avoids finger-like subdivision patterns into bushfire hazard areas and corridors of bushfire hazard between lots.
PO5 The subdivision layout provides for adequate access and egress and safe evacuation routes, to achieve an acceptable or tolerable risk to people.	**AO5.1** The subdivision layout: (a) avoids the creation of bottle-neck points in the movement network within the development (for example, avoids hourglass patterns); and (b) ensures the road network has sufficient capacity for the evacuating population. **AO5.2** The subdivision layout ensures evacuation routes: (a) direct occupants away from rather than towards or through areas with a greater potential bushfire intensity; and (b) minimise the length of route through bushfire prone areas.	**Complies with PO5** Primary access to the proposed development will be from Seventeen Mile Rocks Road via a new road connection. Secondary access will be provided from Cliveden Avenue via a 4 m wide pathway (through the stage 1B) development area) for use by emergency vehicles ensuring safe evacuation in case of a bushfire and ensuring efficient access to the open space and recreation areas by emergency vehicles. The public road network, pathway through the stage 1B development area and private roads in the retirement living precinct will be designed and constructed in accordance with *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots 2015* (QFES 2015) which defers to the *Road Planning and Design Manual – 2nd Edition* (DTMR 2013).
PO6 The subdivision layout provides adequate buffers between hazardous vegetation and development. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a	**AO6.1** The subdivision layout results in an asset protection zone being located to create a separation area from adjacent mapped medium, high or very high potential bushfire intensity areas. **AO6.2** The asset protection zone is	**Complies with PO6** Lots adjoining bushland vegetation and the waterway corridor open space have a bushfire protection zone which will separate buildings from hazardous vegetation. The bushfire protection zone on residential lots is designed for

Performance outcomes	Acceptable outcomes	Compliance assessment
consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment, in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	comprised of: (a) parks and open spaces; and/or (b) lots greater than 2000 square metres; and/or (c) public roads (termed perimeter roads). Note – Parks and open space may be located within the mapped medium, high and very high potential bushfire intensity areas to create a separation between the development and the balance of the bushfire prone area. Note – Portions of lots greater than 2000 square metres may be located within the mapped medium, high and very high potential bushfire intensity areas. Refer Figure 5. **AO6.3** Where the asset protection zone includes lots greater than 2000 square metres a development footprint plan is identified for each lot that is located in accordance with AO1.2.	buildings to achieve a radiant heat flux ≤ 29 kW/m^2. The future development of the retirement living precinct will be associated with a 'vulnerable' use. Therefore, the bushfire protection zone in this area is designed for buildings to achieve a radiant heat flux ≤ 10 kW/m^2. The bushfire protection zone over the retirement living precinct shown on Figure 6.1 in the Bushfire management plan is indicative. Its location will be refined and finalised upon complete of detailed design work for the constructed landform and revegetation in the private waterway treatment area and the waterway corridor open space area which adjoin the south and west boundaries of the precinct.
PO7 Parks or open space provided as part of the asset protection zone do not create additional bushfire prone areas. Note –The undertaking of a bushfire hazard assessment, in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome.	**AO7** Where the asset protection zone includes parks or open spaces, they: (a) comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, cultivated gardens and nature strips; or (b) are designed to ensure a potential available fuel load is maintained at less than eight tonnes/hectare in aggregate and with a fuel structure that remains discontinuous. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres.	**Complies with PO7** The public recreation park will be a playing field with mown grass.

Performance outcomes	Acceptable outcomes	Compliance assessment
PO8 Perimeter roads are accessible for fire-fighting vehicles, to facilitate emergency access and operational space for fire- fighting, maintenance works and hazard reduction activities.	**AO8.1** Where the asset protection zone includes a perimeter road it: (a) has a two-lane sealed carriageway clear of hazardous vegetation; and (b) is connected to the wider public road network at both ends and at intervals of no more than 200 metres; and (c) does not include design elements that may impede access for fire-fighting and maintenance for fire- fighting purposes (for example traffic calming involving chicanes). **AO8.2** Where the subdivision contains a reticulated water supply, the road network and fire hydrants are designed and installed in accordance with: (a) *Fire Hydrant and Vehicle Access Guidelines for residential, commercial and industrial lots*, Queensland Fire and Emergency Services, 2015, unless otherwise specified by the relevant water entity; and (b) the *Road Planning and Design Manual 2nd edition*, Department of Transport and Main Roads, 2013	**Complies with PO8** The public road network, pathway through the stage 1B development area and private roads in the retirement living precinct will be designed and constructed in accordance with *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots 2015* (QFES 2015) which defers to the *Road Planning and Design Manual – 2nd Edition* (DTMR 2013). The proposed development will be connected to mains water and will have a reticulated hydrant system in public road reserves and private roads in the retirement living precinct. The reticulated hydrant system will be designed and constructed in accordance with *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots 2015* (QFES 2015) which defers to the local water retailers specifications which incorporate the *Australian Standard – Fire hydrant installations System design, installation and commissioning* (AS 2419.1-2017) *Appendix B*.
Section D		
Reconfiguring a lot (RaL) – where creating additional lots for the purpose of residential development and a reticulated water supply is not provided.		
PO9 The subdivision layout provides for perimeter roads or fire trail and working areas that are accessible by the type of fire-fighting vehicles servicing the area, to facilitate emergency access and operational space for fire-fighting, maintenance works and hazard reduction activities.	**AO9.1** The subdivision layout includes: (a) a fire trail and working area designed and constructed in accordance with the design parameters in Table 6 that separates the residential lot or development footprint plan from adjacent mapped medium, high or very high potential	**Not applicable**

Performance outcomes	Acceptable outcomes	Compliance assessment
	bushfire intensity areas; or (b) a perimeter road designed and constructed in accordance with AO8.1.	
Section E		
Material change of use		
PO10 Site layout achieve an acceptable or tolerable risk to people. Landscape or open space provided as part of the development: (a) acts as a buffer between hazardous vegetation and development; and (b) does not create additional bushfire prone areas. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	**AO10.1** Site layout places the landscape and open spaces within the site between premises and adjacent mapped medium, high or very high potential bushfire intensity areas. Refer Figure 7. **AO10.2** This landscaping and open space comprises protective landscape treatments that: (a) comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses and cultivated gardens; or (b) are designed to ensure a potential available fuel load is maintained at less than 8 tonnes/hectare in aggregate and that fuel structure remains discontinuous. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres.	**Not applicable**
PO11 The development establishes evacuation areas, to achieve an acceptable or tolerable risk to people	**AO11** If in an isolated location, development establishes direct access to a safe assembly/evacuation area. Note – Guidance on identifying safe evacuation areas is contained in the QFES *Bushfire resilient communities* document.	**Not applicable**

Performance outcomes	Acceptable outcomes	Compliance assessment
PO12 If on a lot of over 2000m^2, where involving a new premises or an existing premises with an increase in development footprint, development: (a) locates occupied areas as close as possible to property entrances to facilitate safe evacuation during a bushfire event; and (b) ensures vehicular access is located and designed to allow safe evacuation of the site by occupants and maintain access by emergency services under critical event conditions	**AO12** No acceptable outcome is prescribed.	**Not applicable**
PO13 Development is located within a reticulated water supply area or includes a dedicated static water supply that is available solely for fire-fighting purposes and can be accessed by fire-fighting vehicles. Note – Swimming pools, farm ponds and dams are not considered reliable sources of static water supply in Queensland due to regular drought events. [Note for Local Government – Information on how to provide an appropriate static water supply, may form a condition of a development approval. For further information on preferred solutions refer to the QFES *Bushfire resilient communities* document.]	**AO13** No acceptable outcome is prescribed	**Not applicable**
PO14 Vulnerable uses listed in Table 7 are not established or intensified within a bushfire prone area unless: (a) there is an overriding need in the public interest for the new or expanded service the development provides; and (b) there are no other suitable alternative locations within the required catchment; and (c) site planning can appropriately mitigate the	**AO14.1** No acceptable outcome is prescribed.	**Not applicable**

Performance outcomes	Acceptable outcomes	Compliance assessment
risk (for example, siting ovals for an educational establishment between the hazardous vegetation and structures. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome		
PO15 Community infrastructure providing essential services listed in Table 7 are not established within a bushfire prone area unless: (a) there is an overriding need in the public interest for the new or expanded service the development provides (for example, there are no other suitable alternative locations that can deliver the required level of service or meet emergency service response times during and immediately after a bushfire event); and (b) the infrastructure can function effectively during and immediately after a bushfire event. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome	**AO15** No acceptable outcome is prescribed. (i)	**Not applicable**
PO16 Development avoids or mitigates the risks to public safety and the environment from the manufacture or storage of materials listed in Table 7 that are hazardous in the context of bushfire to an acceptable or tolerable level. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this acceptable outcome.	**AO16** No acceptable outcome is prescribed.	**Not applicable**

Performance outcomes	Acceptable outcomes	Compliance assessment
Editor's note – In addition to the requirements of this code the *Work Health and Safety Act 2011* and associated Regulation and Guidelines, the *Environmental Protection Act 1994* and the relevant building assessment provisions under the *Building Act 1975* contain requirements for the manufacture and storage of hazardous substances. Information is provided by Business Queensland on the requirements for storing and transporting hazardous chemicals, available at: www.business.qld.gov.au/running-business/protecting-business/risk-management/hazardous-chemicals/storing-transporting.		
Section F		
Where involving an asset protection zone		
PO17 Asset protection zones are designed and managed to ensure they do not increase the potential for bushfire hazard. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome.	**AO17.1** Landscaping treatments within any asset protection zone comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres. OR **AO17.2** Landscaping management within any asset protection zone maintains a: (a) potential available fuel load which is less than eight tonnes/hectare in aggregate; and (b) fuel structure which is discontinuous. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this acceptable outcome.	**Complies with AO17.1** Section 6.1 of the bushfire management plan identifies the impact of the bushfire protection zone on the developer and on future purchasers of the affected lots. Section 6.2 of the bushfire management plan identifies landscaping treatment for lots affected by the bushfire protection zone.
Section G		

Performance outcomes	Acceptable outcomes	Compliance assessment
Where planning provisions or conditions of approval require revegetation or rehabilitation		
PO18 Revegetation or rehabilitation areas are designed and managed to ensure they do not result in an unacceptable level of risk or an increase in bushfire intensity level. Note – The undertaking of a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome.	**AO18.1** Required revegetation or rehabilitation: (a) is located outside of any asset protection zone; or (b) maintains a potential available fuel load which is less than eight tonnes/hectare in aggregate and fuel structure which is discontinuous. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with acceptable outcome (b). **AO18.2** Revegetation or rehabilitation of areas located within mapped medium, high or very high potential bushfire intensity areas, revegetate and rehabilitate in a manner that maintains or reduces the existing fuel load. OR Revegetation or rehabilitation of areas located within the mapped potential impact buffer area, revegetate and rehabilitate in a manner that maintains or reduces the existing fuel load. Note – The preparation of a vegetation management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this acceptable outcome.	**Complies with AO18.1** An appropriately designed bushfire protection zone separates bushland vegetation from building areas on adjacent lots. Radiant heat exposure modelling used to design the bushfire protection zone assumed vegetation restoration in the western part of the site (undertaken during stage 2) reached a mature state with a potential fuel load consistent with vegetation hazard class (VHC 9.1).