North Coast Environmental Services
Environmental Management Consultants

SUNSHINE COAST REGIONAL COUNCIL
APPROVED
MCU17/0106 20 April 2020

BUSHFIRE HAZARD ASSESSMENT AND MANAGEMENT PLAN v2

AREA C OF THE PALMVIEW MASTER PLANNED AREA

LOT 346 ON SP287465

LAXTON ROAD

PALMVIEW

FOR

PEET LIMITED

FEBRUARY 2020

PO Box 9566 Pacific Paradise QLD 4564
ABN: 60 625 108 625

DOCUMENT CONTROL

Project Number: J000240

Client: Peet Limited

Document: Bushfire Hazard Assessment and Management Plan

Site: Lot 346 on SP287465
Area C of the Palmview Master Planned Area under the Palmview Structure Plan
Laxton Road, Palmview

File Location: C:\CLIENTS\PEET - PALMVIEW AREA C\02_BHAMP\Bushfire Hazard Assessment & Management Plan v2 - Palmview Area C-28022020.docx

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Contents

1 INTRODUCTION

1.1 Background

This Bushfire Hazard Assessment and Management Plan has been prepared to assess the degree of potential bushfire hazard acting on, and to prescribe bushfire risk minimisation strategies for, Area C of the Palmview Master Planned Area, formally described as Lot 346 on SP287465, located at Laxton Road, Palmview (referenced hereafter as 'the site').

The report was requested as a condition of the Preliminary Approval granted by Sunshine Coast Council for a material change of use of premises to which sections 242 and 899 of the Sustainable Planning Act 2009 apply to vary the effect of the planning scheme for Area C of the Palmview Master Planned Area under the Palmview Structure Plan (SCC Ref: MCU17/0106).

Condition 22 of the Approved Negotiated Decision Notice states that 'Subsequent to the approval of this preliminary approval and as part of the Local Area Development (Neighbourhood) Plan(s), the applicant must submit a Fire Management Plan which must include the following:

(a) a plan relating to the whole of the land the subject of this Preliminary Approval;

(b) a statement of the land the subject of this Preliminary Approval's context within the broader area, particularly in relation to potential off-site sources of increased fire hazard;

(c) the location and severity of potential bushfire hazard which must have been identified by undertaking a site-based assessment based on the following:

(i) detailed data collected at the local level;

(ii) factors such as vegetation type, slope, aspect, and fire history (if available);

(iii) considering and assessing on-and-off site hazard implications of and for the development, including those posed by any nearby bushland;

(iv) future land uses and ecosystem rehabilitation objectives;

(d) recommended remedial measures including specific features of the development design such as land use type, vehicular access, lot layout and house site location, proposed fire-fighting infrastructure such as water supply and fire maintenance trails, recommended standard of building construction, clearing and landscaping and advice to new residents;

(e) a clear statement of any impact of the chosen mitigation measures on the environmental values of Area C and the measures taken to avoid or minimise this impact; and

(f) a statement of the anticipated future bushfire hazard for the land the subject of this Preliminary Approval that might arise as part of revegetation objectives, by allowing for the provision for future assessment in accordance with paragraph C'.

This Bushfire Hazard Assessment and Management Plan therefore represents the applicant's response to Condition 22.

1.2 The Sunshine Coast Planning Scheme 2014 Bushfire Hazard Overlay Map

The Sunshine Coast Council's Bushfire Hazard Overlay Map depicts the presence of a Medium Bushfire Hazard Area and associated Buffer impacting portions of the northern and southern extents of the site (refer to Plate 1).

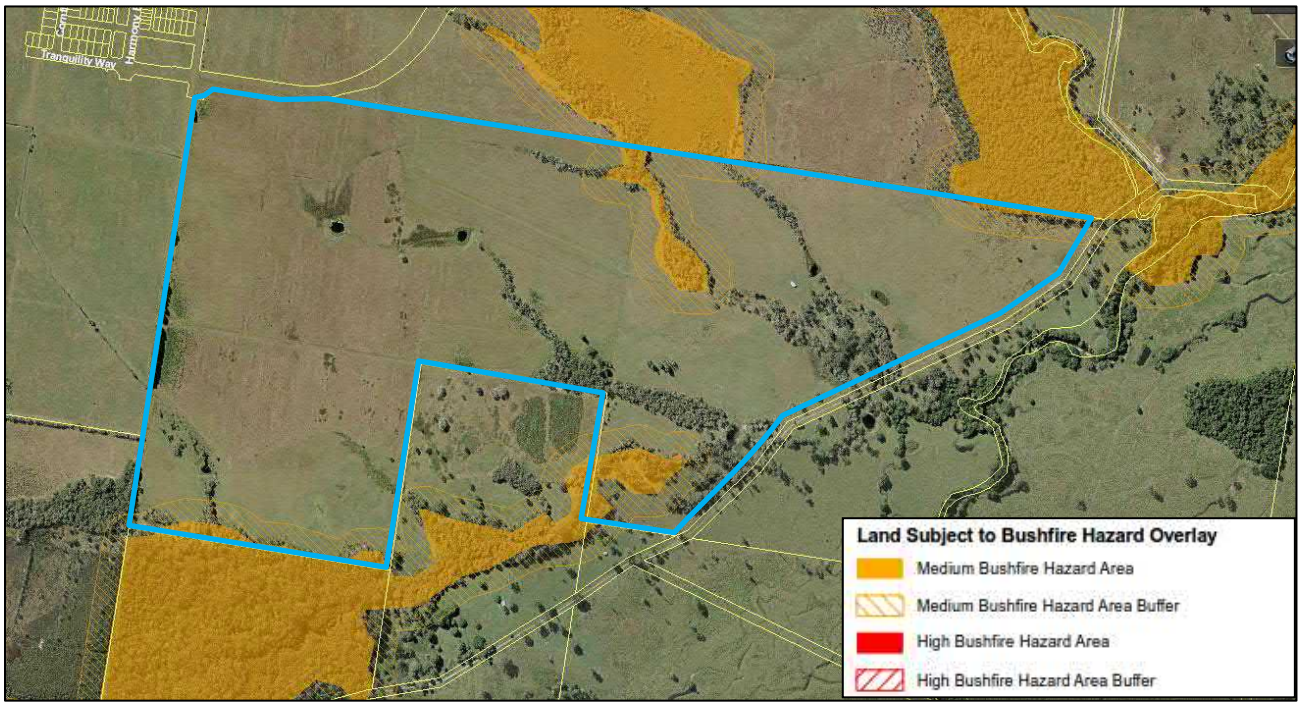


Plate 1 – Bushfire Hazard Overlay Areas

1.3 State Planning Policy Assessment Benchmark Mapping

The site is mapped on the State Planning Policy (SPP) Interactive Mapping System's Bushfire Prone Area mapping as containing a High and Medium Potential Bushfire Intensity Area and associated Potential Impact Buffer areas (refer to Plate 2).

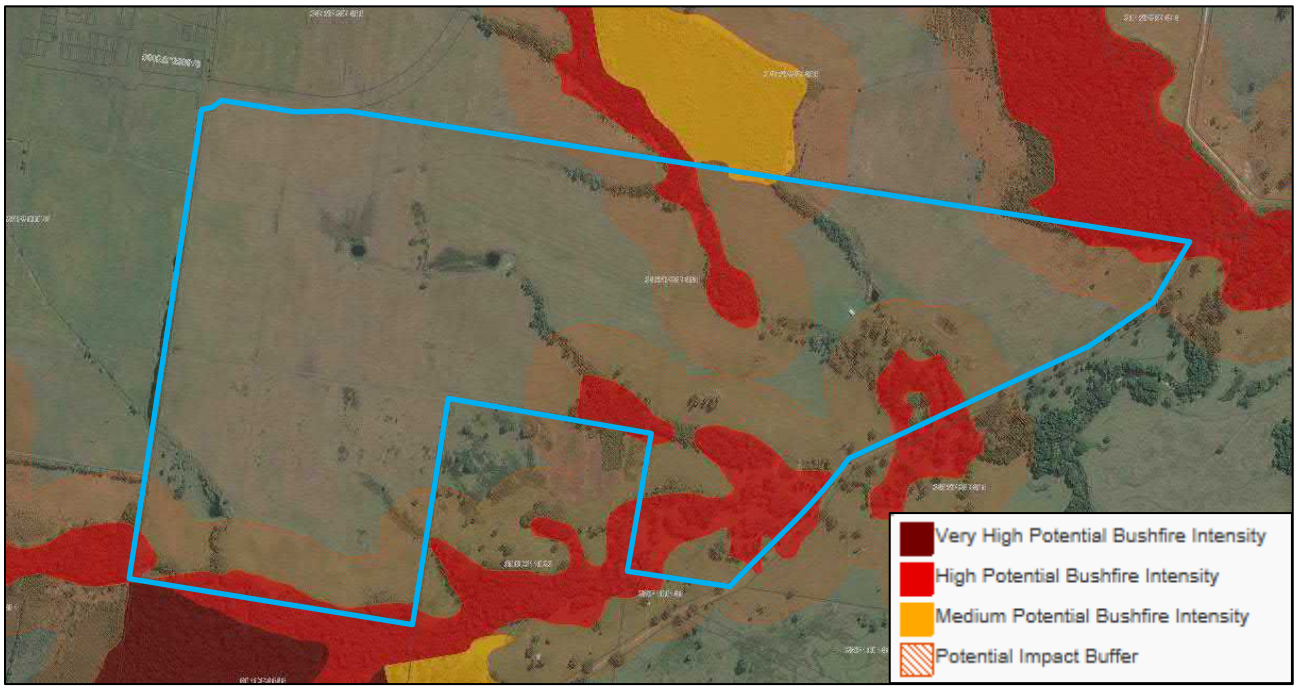


Plate 2 – SPP Bushfire Prone Area Mapping

The SPP mapping captures additional bushfire prone areas on the site compared to that shown on the Sunshine Coast Council's Bushfire Hazard Overlay Map. Under Chapter 2, Part 1, Section 8,

Item 4(a) of the *Planning Act 2016*, where there is an inconsistency between a State Planning Policy and local government planning instrument, the State Planning Policy applies over the local planning instrument. Therefore, the SPP Bushfire Prone Area mapping prevails as the most current hazard mapping and with respect to the trigger for assessment under Council's Bushfire Hazard Overlay Code.

1.4 Development Proposal

Area C of the Palmview Master Planned Area will be developed in line with the Palmview Structure Plan vision which intends that the site will ultimately accommodate 1,190 new dwellings, a local activity centre, educational establishment as well as district recreation and sports parks and environmental open space. Area C has 17% of the land use entitlements of the overall Palmview Structure Plan Area which includes Harmony (Area A) and the Area B land holdings.

Development in Palmview is intended to contribute to the creation of a high-quality lifestyle with a diversity of housing choices available to meet all life stages and affordability. Development in Palmview is also intended to provide for the protection and enhancement of waterways, wetlands, bushland and the Mooloolah River floodplain such that a network of green open space is established providing an attractive setting for neighbourhoods. The intent of the development is to provide a variety of residential housing types and lot sizes that aim to satisfy consumer choice, housing affordability, population growth and sustainable urban development corridors.

The Indicative Master Plan for Area C has been prepared by Innovative Planning Solutions and is attached as Appendix 1 to this report.

2 Site Description

2.1 General

The site comprises an area of approximately 128 hectares which has been historically utilised for cattle grazing and other agricultural pursuits and is therefore largely devoid of woody vegetation. Isolated patches of regrowth vegetation occur within the site extents and are commonly associated with drainage lines. Riparian vegetation associated with Sippy Creek abuts the north-eastern boundary with open Eucalypt forest located adjacent to the sites south-western boundary.

Plate 3 depicts the site's position in the landscape and the extent of pre-existing development. It is noted the land parcels to the west and north of the site are to be developed for Areas A and B respectively of the Palmview Structure Plan Area.

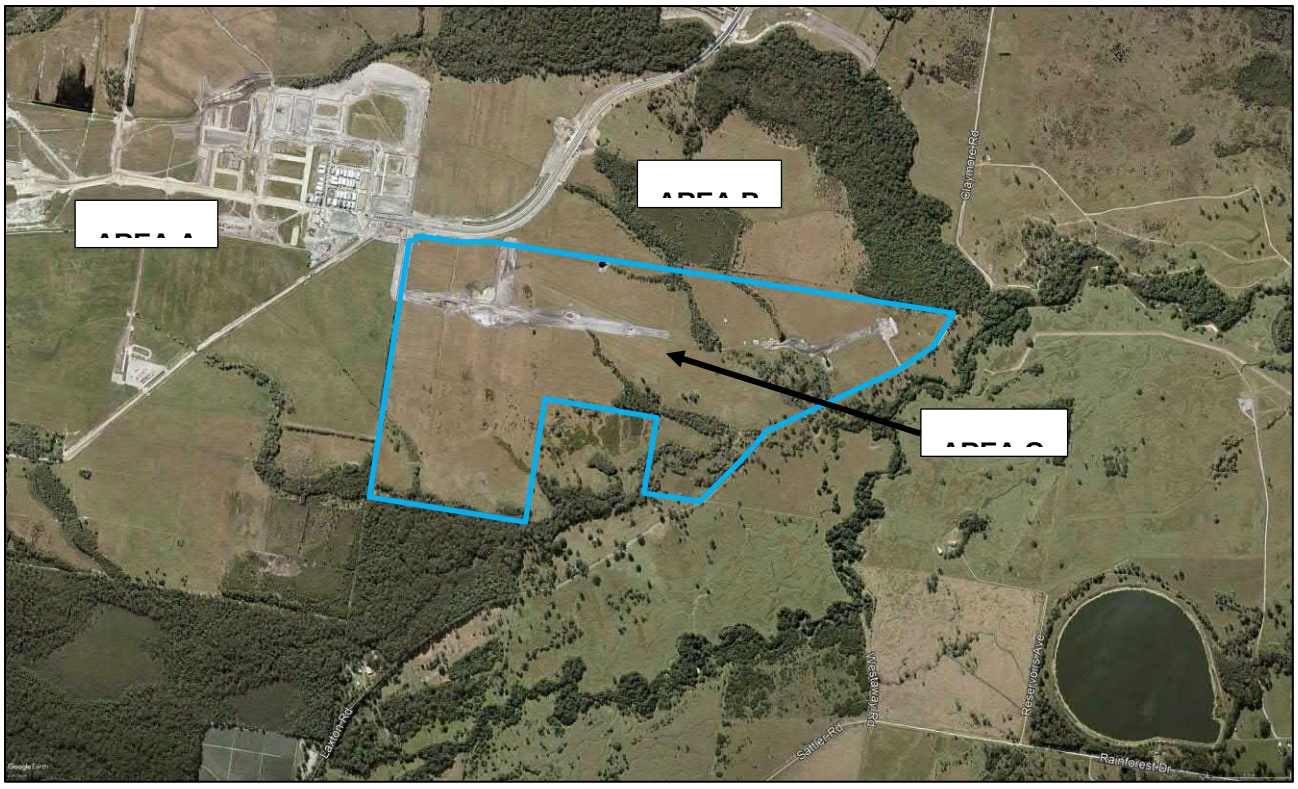


Plate 3 – Site Context (Source: Google Earth)

2.2 Topography

The site and immediately surrounding landscape features predominantly flat (0 - <5° slope) and low-lying land (2 - 10m AHD) positioned on the Mooloolah River alluvial floodplain. Several ephemeral drainage lines occur within low-lying areas of the site and Sippy Creek traverses adjacent to the sites north-eastern boundary. Plate 4 depicts topography conditions within and adjacent to the site.

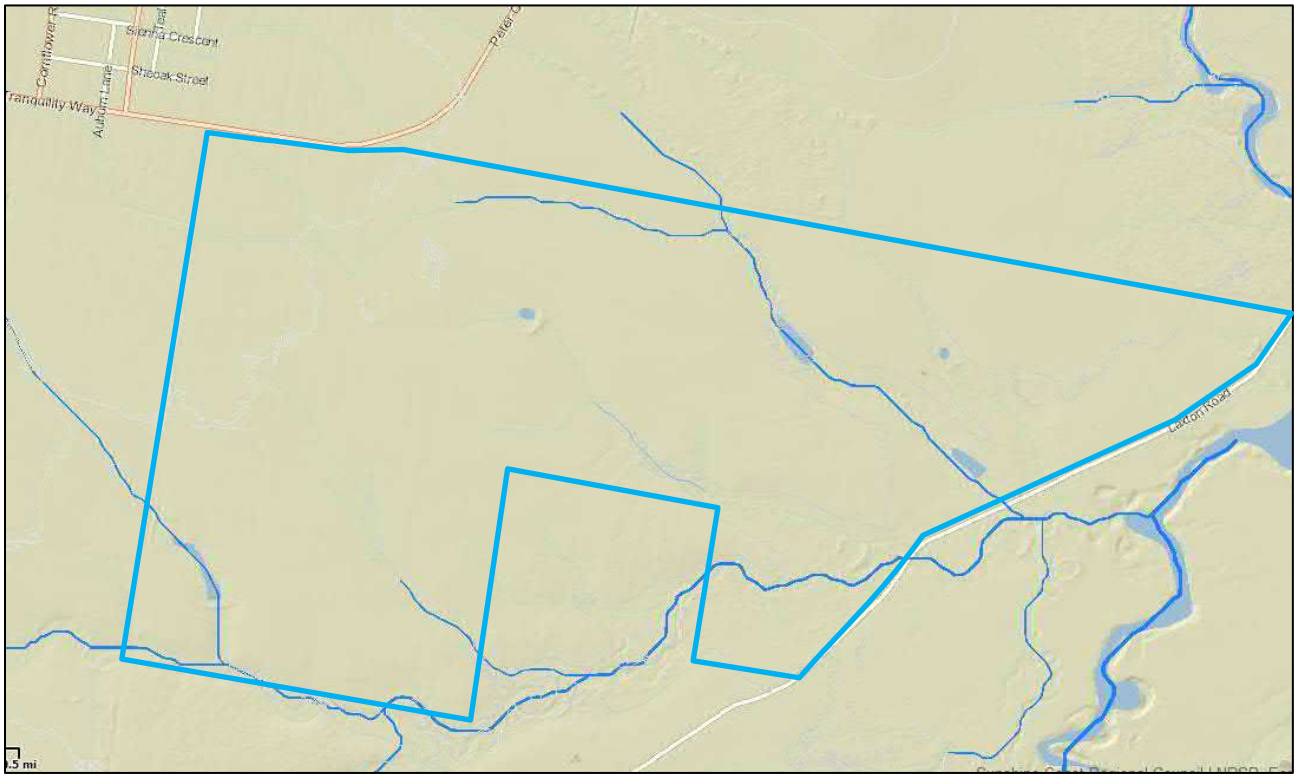


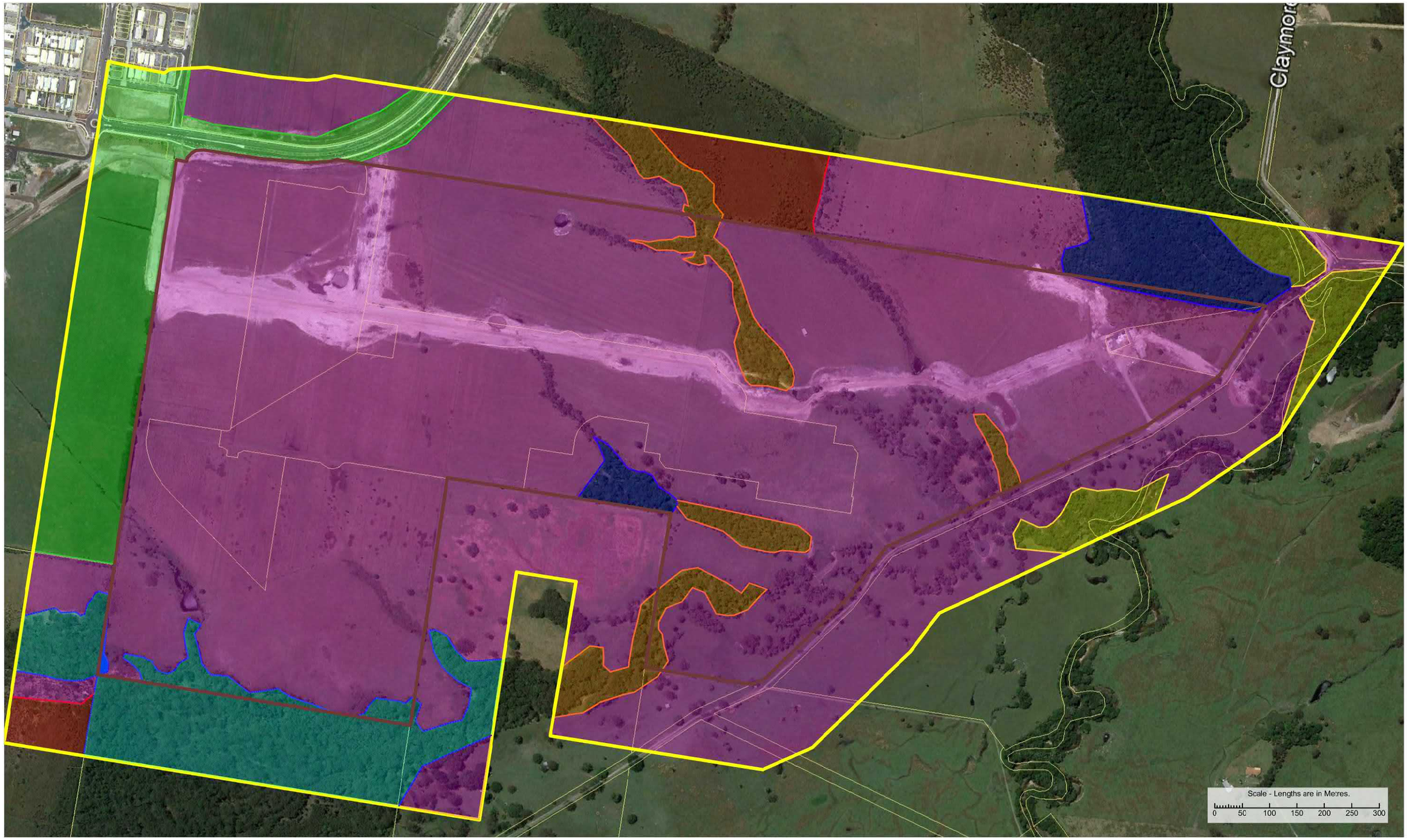
Plate 4 – Site Topography (Source: SCC Mymaps)

2.3 Vegetation

The following vegetation hazard classes (classified in accordance with Leonard & Opie (2017)) were identified within the assessment area in November 2018:

- Vegetation Hazard Class 22.1 – Melaleuca Open Forests on Seasonally Inundated Coastal Swamps;
- Vegetation Hazard Class 9.1 – Moist to dry eucalypt open forests on coastal lowlands and ranges;
- Vegetation Hazard Class 8.1 – Wet eucalypt tall open forest;
- Vegetation Hazard Class 29.3 – Heathlands and Associated Scrubs and Shrublands;
- Vegetation Hazard Class 40.4 – Continuous Low Grass or Tree Cover;
- Vegetation Hazard Class 41.4 – Discontinuous Low Grass or Tree Cover; and
- Vegetation Hazard Class 3.1 – Notophyll Vineforest

The vegetation characteristics of each vegetation hazard class are described in the following sections, while Figure 1 depicts the distribution of observed vegetation communities within the site and within 150m of the site.



KEY

- ASSESSMENT SITE
- 100M BUFFER TO SITE
- VHC 22.1 - MELALEUCA OPEN FORESTS ON SEASONALLY INUNDATED LOWLAND COASTAL SWAMPS
- VHC 8.1 - WET EUCALYPT TALL OPEN FOREST
- VHC 9.1 - MOIST TO DRY EUCALYPT OPEN FOREST ON COASTAL LOWLANDS AND RANGES
- VHC 29.3 - HEATHLANDS AND ASSOCIATED SCRUBS AND SHRUBLANDS
- VHC 40.4 - CONTINUOUS LOW GRASS OR TREE COVER
- VHC 41.4 - DISCONTINUOUS LOW GRASS OR TREE COVER
- VHC 3.1 - NOTOPHYLL VINE FOREST

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BUSHFIRE HAZARD ASSESSMENT AND MANAGEMENT PLAN
AREA C - PALMVIEW MASTER PLANNED AREA
LAXTON ROAD, PALMVIEW

FIGURED DIMENSIONS TO BE READ IN PREFERENCE TO SCALING.

SCALE: SEE INSERT | DRAWN: R.C. | FIGURE 1
DATE: 28.02.2020 | SHEET NO: 1 OF 3 | TITLE: VEGETATION UNITS

2.3.1 Vegetation Hazard Class 22.1 – Melaleuca Open Forest

Vegetation Hazard Class 22.1 (VHC 22.1) is present as several small units which flank drainage lines throughout the assessment area. The canopy layer within VHC 22.1 has attained an average height of 16m and is dominated by *Melaleuca quinquenervia* (broad-leaved paperbark) with *Eucalyptus tereticornis* (Queensland blue gum)*, E. robusta* (swamp mahogany) and *Lophostemon suaveolens* (swamp box) also present. The mid-storey is generally dominated by juvenile *M. quinquenervia* with areas of localised *M. sieberi* dominance to the south of the site. The understorey is characterised by a dense association of sedges, *Blechnum indicum* (bungwahl fern) and *Lomandra longifolia* (mat rush).

VHC 22.1 was observed to be generally consistent with the description for Regional Ecosystem (RE) 12.3.5 which is described as *Melaleuca quinquenervia* open forest on coastal alluvium. VHC 22.1 generally occurs within the assessment area as advanced regrowth rather than mature remnant vegetation.

Fire management guidelines

SEASON: Late summer to mid-winter (after rain). INTENSITY: Planned and occasional unplanned burns (typically of higher intensity) influence the ecology of melaleuca ecosystems. INTERVAL: Heath 8-12 years, Sedge 12-20 years, Mixed grass/shrub 6-20 years. STRATEGY: Aim for a 25-70% burn mosaic (in association with surrounding ecosystems, as melaleuca ecosystems often just occur in patches or along natural drainage lines). Fires may, depending on the conditions and type of vegetation, burn areas larger than just the melaleuca ecosystem. Ensure secure boundaries from non-fire-regime adapted ecosystems. Consider the needs of melaleuca ecosystems based on understorey (i.e., heath dominated, sedge dominated or mixed grass/shrub) when planning burns. High soil moisture (or presence of water on the ground) is required, as avoidance of peat-type fires must be maintained. ISSUES: Fire regimes for melaleuca ecosystems require further fire research. Melaleuca forests are fire-adapted, but too high an intensity or frequent fire will slow or prevent regeneration and lead to lower species richness (since these communities contain numerous obligate seed regenerating species that require sufficient fire intervals to produce seed). High intensity fires may kill trees and lead to whipstick regeneration. Too frequent fire may result in a net loss of nutrients over time from an already nutrient poor system. Fire associations are significantly influenced by understorey composition. Melaleuca communities with a heath understorey should burn in a similar way to coastal heath (8-12 years). Sedge understorey communities will burn in association with the surrounding ecosystems (so will often burn with them but sometimes not, such that these communities have a slightly less fire frequency). Mixed understorey communities burn in a similar way to dry sclerophyll, in association with the surrounding dry sclerophyll, though somewhat less frequently due to the additional moisture present in melaleuca communities (State of Queensland 2020).

Plate 5 depicts typical conditions within VHC 22.1 which has a potential fuel load of 28.4 t/ha (Leonard & Opie 2017).

Plate 5 – Characteristic vegetation within VHC 22.1

2.3.2 Vegetation Hazard Class 9.1 – Moist to dry eucalypt open forests on coastal lowlands and ranges

The majority of Vegetation Hazard Class 9.1 (VHC 9.1) was observed within the Sippy Creek riparian corridor to the north-east of the site and within the freehold allotment adjoining the south-western extent of the site. Only small and isolated units of VHC 9.1 were observed within the site. VHC 9.1 was observed to consist of a mixed open Eucalypt forest with areas of localised canopy species dominance reflecting the geological and topographic variations of the underlying landform. Dominant canopy species include *Eucalyptus pilularis* (blackbutt), *Syncarpia glomulifera* (turpentine), *E. racemosa* (scribbly gum) and *E. tindaliae* (Tindale's stringybark). *Corymbia intermedia* (pink bloodwood) and *C. gummifera* (red bloodwood) were present as sub-dominant canopy species. The average canopy height within VHC 9.1 is 26m. The midstorey is sparse to mid-dense and dominated by Acacia species, *Baeckea frutescens* (weeping Baeckea) and juvenile canopy trees. The understorey of the offsite units of VHC 9.1 was dominated by a dense association of native shrub species including *Acacia complanata* (flat-stemmed wattle), *Banksia spinulosa* (golden candles), *Leptospermum spp.* and sedges such as *Caustis blakei* (fox tail sedge). The understorey of the onsite units of VHC 9.1 is disturbed by livestock and generally dominated by sparse grasses and low shrubs.

VHC 9.1 was observed to be generally consistent with the description for Regional Ecosystem (RE) 12.3.11 which is described as *Eucalyptus tereticornis +/- Eucalyptus siderophloia, Corymbia intermedia open forest on alluvial plains usually near coast*. VHC 9.1 generally occurs within the assessment area as advanced regrowth rather than mature remnant vegetation.

Fire management guidelines

SEASON: Summer to late autumn. INTENSITY: Low. INTERVAL: 3-6 years. STRATEGY: Aim to burn 40-60% of any given area. Spot ignition in cooler or moister periods encourages mosaics. ISSUES: Control of weeds is a major focus of planned burning in most areas. Maintain ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas.

Plate 6 depicts typical conditions within VHC 9.1 which has a potential fuel load of 30 t/ha (Leonard *et al*., 2014).

Plate 6 – Characteristic vegetation within VHC 9.1

2.3.3 Vegetation Hazard Class 29.3 – Heathlands and Associated Scrubs and Shrublands

Vegetation Hazard Class 29.3 (VHC 29.3) is restricted to two small units; one adjacent to the site's northern boundary and the other adjacent to the south-west corner of the site. VHC 29.3 was observed to exhibit a low canopy height of approximately 1m with occasional *M. quinquenervia* emergents to a height of 6m. The community is characterised by a dense association of shrubs, ferns, grasses, sedges and herb species. Dominant species include *Melaleuca thymifolia* (thyme honey myrtle), *Banksia robur* (swamp Banksia), *Xanthorrhoea fulva* (wallum grasstree), *Hakea actites* (wallum Hakea), *Leptospermum spp.* and *Baeckea frutescens* (weeping Baeckea). VHC 29.3 was observed to be generally consistent with the description for RE 12.3.13 which is described as closed heathland on seasonally waterlogged alluvial plains.

Fire management guidelines

SEASON: Late summer to winter. INTENSITY: Moderate (to high; due to the inherent characteristics of highly flammable vegetation). INTERVAL: 8-20 years. STRATEGY: Aim for a burn mosaic of 40-80%. Ensure planned burn conditions are conducive to maintaining integrity of the landscape (i.e., use good soil moisture, recent rainfall and standing water on the ground). ISSUES: Intervals at the upper end (12-20 years) of the recommended regime may be desirable

to counteract detrimental impacts of a high intensity fire over 100% of landscape. This vegetation often contains obligate seed regenerating species and as such, the application of frequent fire may reduce species richness if the intervals between fire are not sufficient for plants to produce seed (State of Queensland 2020)

Plate 7 depicts typical conditions within VHC 29.3 which has a potential fuel load of 20.1 t/ha (Leonard *et al*., 2017).

Plate 7 – Characteristic vegetation within VHC 29.3

2.3.4 Vegetation Hazard Class 40.4 – Continuous Low Grass or Tree Cover

Vegetation Hazard Class 40.4 (VHC 40.4) is the dominant Vegetation Hazard Class within the assessment area and is characterised by unmanaged pasture grasslands with low density woody vegetation (including mature *E. tereticornis* individuals and sparse regrowth of *M. quinquenervia*). This vegetation hazard class is host to low and discontinuous fuel loads, however, where left unmanaged, is prone to grassfires.

Plate 8 depicts typical conditions within VHC 40.4 which has a potential fuel load of 5 t/ha (Leonard *et al*., 2017).

Plate 8 – Characteristic vegetation within VHC 40.4

2.3.5 Vegetation Hazard Class 41.4 – Discontinuous Low Grass or Tree Cover

Vegetation Hazard Class 41.4 (VHC 41.4) includes all non-vegetated and sparsely vegetated areas with discontinuous fuel loads that are characterised by built infrastructure, regularly mown grass areas, landscaped gardens and areas of low-density woody vegetation.

Plate 9 depicts typical conditions within VHC 41.4 which has a potential fuel load of 3 t/ha (Leonard *et al*., 2017).

Plate 9 – Characteristic vegetation within VHC 41.4

2.3.6 Vegetation Hazard Class 3.1 – Notophyll Vineforest

Vegetation Hazard Class 4.1 (VHC 3.1) is restricted to two small units; one adjacent to the site's northern-eastern boundary flanking Sippy Creek, and another other adjacent to the eastern site boundary flanking the Mooloolah River. VHC 3.1 was observed to exhibit an average canopy height of approximately 24m with a typical riparian vine forest community characterised by canopy species such as *Waterhousea floribunda* (weeping lily pily), *Livistona australis* (cabbage tree palm) and *Cryptocarya* species over a generally sparse understorey. VHC 3.1 was observed to be generally consistent with the description for RE 12.3.1 which is described as gallery rainforest (notophyll vine forest) on alluvial plains.

Fire management guidelines

STRATEGY: Do not burn deliberately. Protection relies on broad-scale management of surrounding country. May need active protection from wildfire in extreme conditions or after prolonged drought. Planned burns should not create a running fire into vine forest. Ensuring conditions of good soil moisture and moisture of litter in surrounding communities will limit fire behaviour/intensity. ISSUES: Fire sensitive and not normally flammable. Some preliminary work suggests rainforest seedling germination from planned burning activities will assist the establishment of seedlings in newly burnt areas, especially due to smoke. There may be issues with lantana and other weeds from fire and other disturbance. Remnants may be limited by frequent fire at the margins; this requires further research.

Plate 10 depicts typical conditions within VHC 3.1 which has a potential fuel load of 4.5 t/ha (Leonard & Opie 2017).

Plate 10 – Characteristic vegetation within VHC 3.1

2.4 Off-site Vegetation

Vegetation units of VHC 9.1 – Moist to dry eucalypt open forests and VHC 8.1 – Wet eucalypt tall open forest are present to the south-west and north-east of the site respectively. These offsite vegetation units were observed to host high fuel loads typically associated with open Eucalypt forests. An approximately 11ha vegetation unit containing VHC 22.1 (Melaleuca communities) and VHC 29.3 (heath communities) is located adjacent to the centre of the northern boundary. The Palmview Area A residential development is located to the north-west of the site and exhibits very low fuel loads. The remaining landscape surrounding the site has predominantly been cleared for agricultural land uses and exhibits open pastureland with scattered woody vegetation containing discontinuous fuel loads. Plate 11 depicts the extent of vegetated areas and hence existing potential forest fire pathways onto the site.

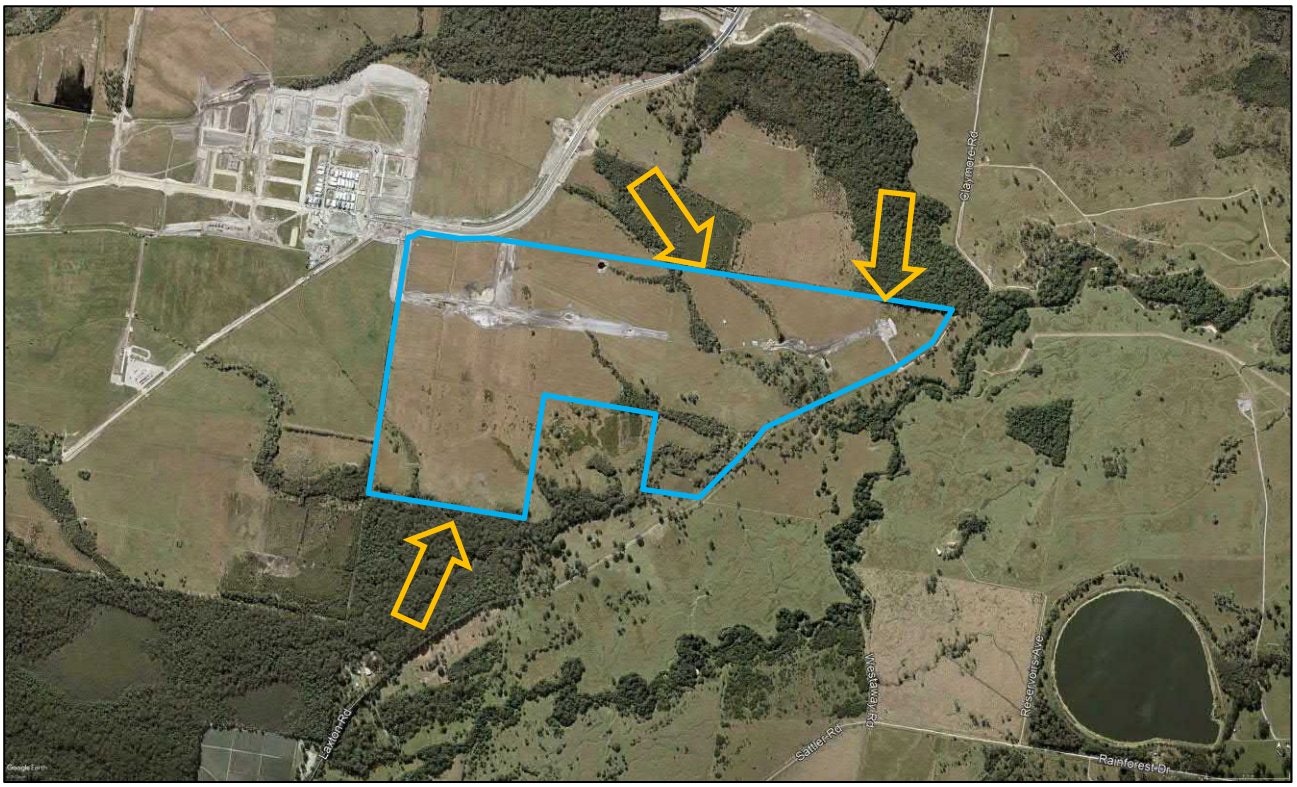


Plate 11 – Available direct forest fire pathways (Image source: Google Earth)

3 HAZARD ASSESSMENT

3.1 Hazard Assessment Methodology

A site-specific bushfire hazard assessment is required to be prepared to assess the degree of bushfire hazard acting on a site captured within a mapped Designated Bushfire Hazard Area. The methodology used to prepare the SPP mapping is described in *A new methodology for State-wide mapping of bushfire prone areas in Queensland* (Leonard *et al*., 2014) which is also referenced in the *Bushfire Resilient Communities - Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire' (October 2019).* The preparation of site-specific hazard maps is described in these documents and is referenced as a Local Hazard Area Map. Preparation of a Local Hazard Area Map has been undertaken for the site using the methodologies from the above sources.

3.2 Local Hazard Area Map

A Local Hazard Area Map was prepared by adopting the following methodology:

- Categorizing the vegetation within the site in accordance with the vegetation hazard classes derived from Leonard *et al*. (2017);
- Subdividing the identified vegetation hazard classes into bushfire hazard sub-units based on slope differences and vegetation hazard classes. All upslope and across slope vegetation units are allocated an underlying slope of 1 degree;
- Assigning Potential Bushfire Intensity classes to the sub-units;
- Using the patch and corridor filtering process to amend the bushfire hazard sub-units[1]; and
- Application of 100m Potential intensity buffers to the amended sub-units to derive an overall Local Hazard Area Map.

Table 1 details the Potential Bushfire Intensity classes and their corresponding potential fire-line intensity (KW/m) values as prescribed within Leonard *et. al.* 2017.

Table 1: Potential Bushfire Intensity classes and corresponding Potential Fire-line Intensity ranges

Potential Bushfire Intensity	Potential Fire-line Intensity
1. Very high	40,000+ kW/m
2. High	20,000 – 39,999 kW/m
3. Medium	4,000 – 19,999 kW/m

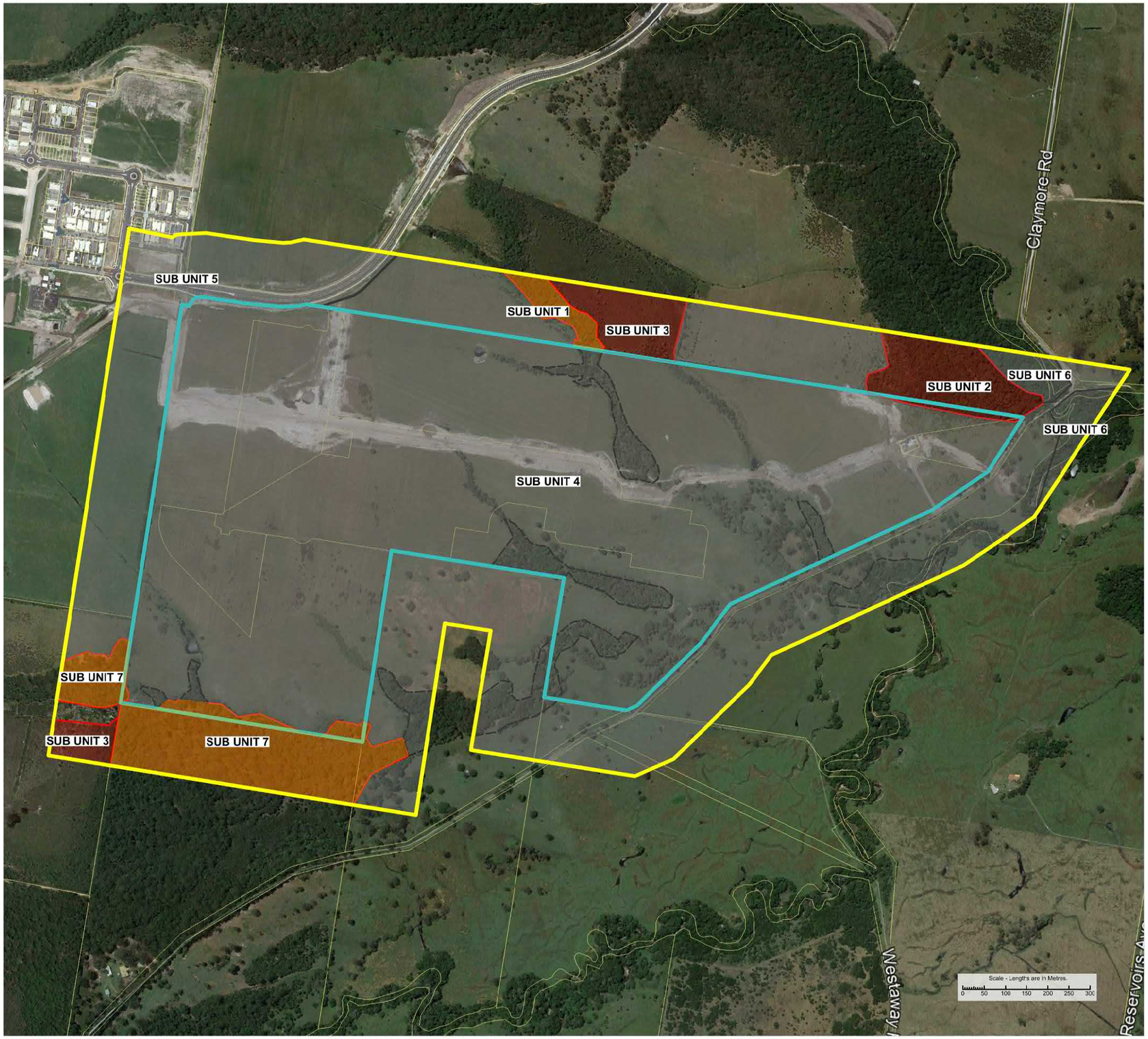
The pre-development sub-unit Local Hazard Area Map is presented in Figure 2 with the resultant Local Hazard Area Map presented in Figure 3. Based on the Figure 3 Local Hazard Area Map, Area C is affected by Medium and High Potential Bushfire Intensity areas flanking the north and south-west site boundaries as well as Potential Impact Buffers which extend approximately 100-120m into the site from the identified Potential Bushfire Intensity areas. The Figure 3 Local Hazard Area Map is to supersede the existing broadscale SPP mapping attributed to the site.

[1] The patch and corridor filtering process to remove or downgrade hazard levels of small patches and narrow corridors involves the following three stages:

- Merging small patches of a single Vegetation Hazard Class less than 0.5 ha;
- Merging small Vegetation Hazard Class patches between 0.5 and 1 ha with higher or moderate fuel loads (greater than 8 tonnes/ha); and
- Removing narrow corridors of vegetation less than 50m wide through a process of patch erosion and dilation. These small patches are merged with surrounding vegetation by allocating a patch to the Vegetation Hazard Class that is most common to the patch boundary (Leonard *et al*., 2014).

Construction of a post development Local Hazard Area Map is impracticable at this time. Insufficient detail is available on the final vegetative form (hence fuel loading) of the Environmental Transition Areas flanking parts of the development footprint to enable prescriptive vegetation hazard classes to be applied and therefore fireline intensity classes to be assigned. Given the inherent site slopes present and the anticipated rehabilitation composition of the conservation areas, which are to replicate the applicable pre-clearing regional ecosystems, it can however be presumed that no additional vegetation hazard classes will arise and therefore the site would continue to be affected by the same class of Potential Bushfire Intensity areas.

Consequently, with consideration given to the impact of site clearing in combination with rehabilitation of the conservation areas flanking the development footprint, all neighbourhood residential areas are anticipated to be located in either a Potential Impact Buffer (where located within 100m of the forest/heathland edge), or a non-bushfire prone area.



Sub Unit 1

Vegetation Hazard Class#	Potential Fuel Load (t/ha)	Fire Weather Severity (FFDI)	Maximum Landscape Slope (degrees)	Potential Fireline Intensity (kw/m)	**Potential Bushfire Intensity***
VHC 22.1 – Melaleuca Open Forest	28.4	50	1	14,526	Medium

Sub Unit 2

Vegetation Hazard Class#	Potential Fuel Load (t/ha)	Fire Weather Severity (FFDI)	Maximum Landscape Slope (degrees)	Potential Fireline Intensity (kw/m)	Potential Bushfire Intensity*
VHC 8.1 – Wet Eucalypt Forest	35	50	1	36,037	High

Sub Unit 3

Vegetation Hazard Class#	Potential Fuel Load (t/ha)	Fire Weather Severity (FFDI)	Maximum Landscape Slope (degrees)	Potential Fireline Intensity (kw/m)	**Potential Bushfire Intensity***
VHC 29.3 – Heathland	20.1	50	1	31,884	High

Sub Unit 4

Vegetation Hazard Class#	Potential Fuel Load (t/ha)	Fire Weather Severity (FFDI)	Maximum Landscape Slope (degrees)	Potential Fireline Intensity (kw/m)	**Potential Bushfire Intensity***
VHC 40.4 – Continuous Low Grass or Tree Cover	5	50	1	N/A	Grassfire prone/Low

Sub Unit 5

Vegetation Hazard Class#	Potential Fuel Load (t/ha)	Fire Weather Severity (FFDI)	Maximum Landscape Slope (degrees)	Potential Fireline Intensity (kw/m)	**Potential Bushfire Intensity***
VHC 41.4 – Discontinuous Low Grass or Tree Cover	3	50	1	N/A	Low

Sub Unit 6

Vegetation Hazard Class#	Potential Fuel Load (t/ha)	Fire Weather Severity (FFDI)	Maximum Landscape Slope (degrees)	Potential Fireline Intensity (kw/m)	**Potential Bushfire Intensity***
VHC 3.1 – Notophyll Vine Forest	4.5	50	1	1,793	Low

Sub Unit 7

Vegetation Hazard Class#	Potential Fuel Load (t/ha)	Fire Weather Severity (FFDI)	Maximum Landscape Slope (degrees)	Potential Fireline Intensity (kw/m)	**Potential Bushfire Intensity***
VHC 9.1 – Moist to Dry Eucalypt Forest on Coastal Lowlands and Ranges Vine Forest	24.2	50	1	16,879	Medium

From: Leonard, J., & Opie, K., (2017) Estimating the potential bushfire hazard of vegetation patches and corridors – an enhancement of Queensland's methodology for State-wide mapping of bushfire prone areas. CSIRO, Australia.

From: Leonard, J., Newnham, G., Opie, K., and Blanchi. R. (2014) A new methodology for state-wide mapping of bushfire prone areas in Queensland. CSIRO, Australia.

KEY

- ASSESSMENT SITE
- 150m BUFFER TO SITE
- HIGH POTENTIAL BUSHFIRE INTENSITY AREA
- MEDIUM POTENTIAL BUSHFIRE INTENSITY AREA
- LOW POTENTIAL BUSHFIRE INTENSITY AREA
- SUB UNIT REMOVED VIA PATCH/CORRIDOR FILTERING

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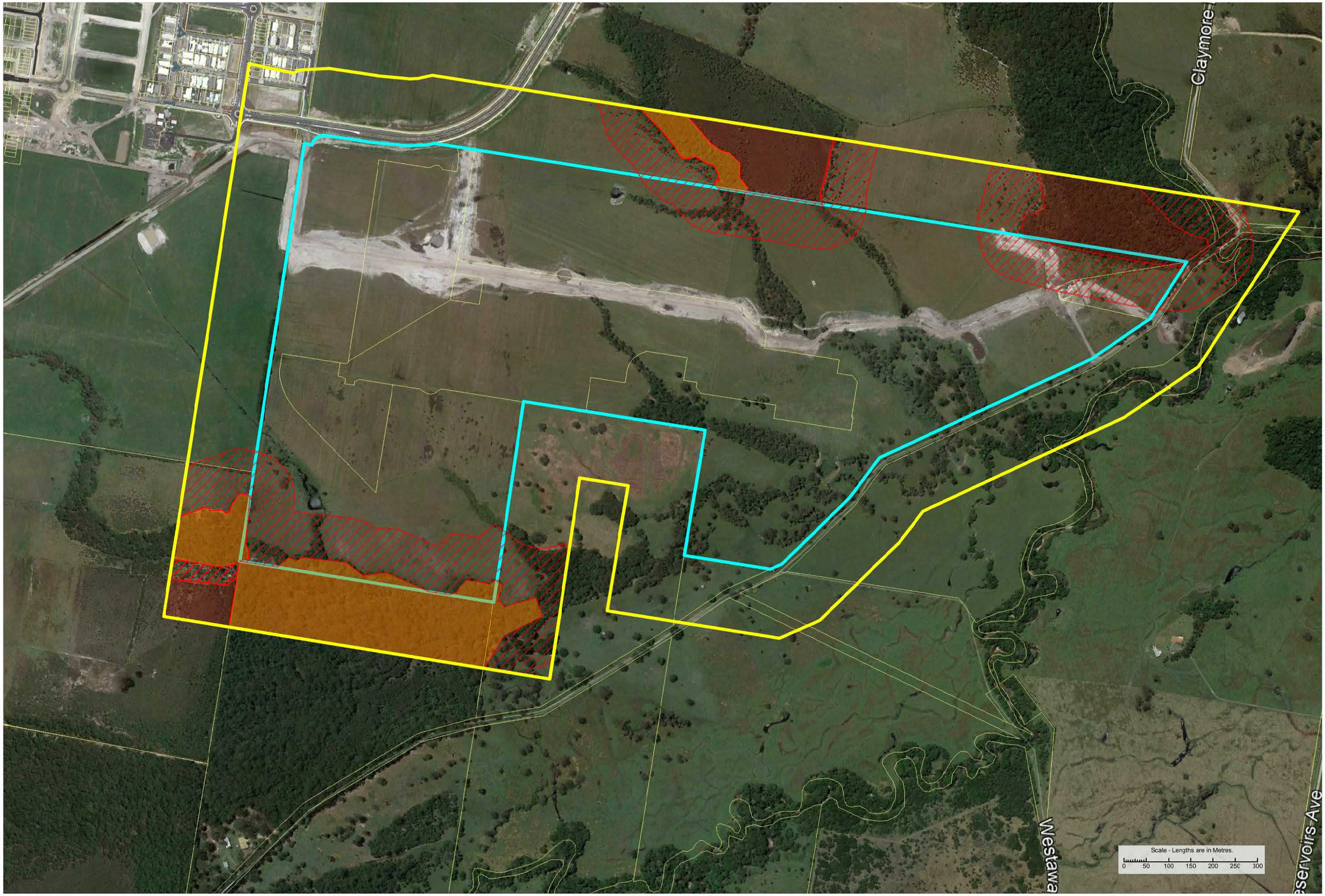
BUSHFIRE HAZARD ASSESSMENT AND MANAGEMENT PLAN
AREA C - PALMVIEW MASTER PLANNED AREA
LAXTON ROAD, PALMVIEW

FIGURED DIMENSIONS TO BE READ IN PREFERENCE TO SCALING.

SCALE: SEE INSERT | DRAWN: R.C. | FIGURE 2
DATE: 28.02.2020 | SHEET NO: 2 OF 3 | TITLE: SUB UNITS



DRAFT - NOT FOR SUBMISSION PURPOSES

North Coast Environmental Services Environmental Management Consultants	PO Box 9566 Pacific Paradise, QLD 4564 P: 07 5450 5984 E: admin@northcoastenv.com.au ABN: 60 625 108 625	BUSHFIRE HAZARD ASSESSMENT AND MANAGEMENT PLAN AREA C - PALMVIEW MASTER PLANNED AREA LAXTON ROAD, PALMVIEW	KEY: ASSESSMENT SITE; 100M BUFFER TO THE SITE; HIGH POTENTIAL BUSHFIRE INTENSITY AREA; MEDIUM POTENTIAL BUSHFIRE INTENSITY AREA; POTENTIAL IMPACT BUFFER	FIGURED DIMENSIONS TO BE READ IN PREFERENCE TO SCALING.	SCALE: SEE INSERT DATE: 28.02.2020	DRAWN: R.C. SHEET NO: 3 OF 3	Figure 3 TITLE: LOCAL HAZARD AREA MAP

3.3 Quantitative Modelling

Quantitative modelling of the potential bushfire conditions that may be experienced within the hazardous vegetation identified on Figure 3 has been undertaken to assist in quantifying the potential severity of impact to the proposed development. The models used comprise industry standard bushfire equations which have been built into the FLAMESOL computer model. FLAMESOL allows numerous input variables to be adjusted including fuel loads, fire danger index, site slope and distance to vegetation. FLAMESOL uses the following algorithms:

- Rate of Spread – McArthur (1973) and Nobel *et al*. (1980)
- Flame Length – NSW Rural Fire Service (2001) and Nobel *et al*. (1980)
- Elevation of Receiver – Douglas and Tan (2005)
- Flame Angle – Douglas and Tan (2005)
- Radian Heat Flux – Drysdale (1999), Sullivan *et al*. (2003) and Douglas and Tan (2005)

Fuel load inputs have been drawn from Leonard *et al*. (2017) based on the calculated potential fuel loads for the dominant hazardous vegetation units flanking the future residential footprints on the site, being VHC 8.1 Wet Eucalypt Tall Open Forest, VHC 22.1 Melaleuca Open Forest and VHC 29.3 Heathland and associated scrubs and shrublands. The output results are shown in Plates 12-15.

FPA AUSTRALIA | FLAMESOL

Calculated January 28, 2020, 4:42 pm (MDc v.4.8)

VHC 8.1

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	50	Rate of spread	1.99 km/h
Vegetation classification	Forest	Flame length	17.15 m
Surface fuel load	31 t/ha	Flame angle	53 °, 63 °, 71 °, 75 °, 76 ° & 83 °
Overall fuel load	35 t/ha	Elevation of receiver	6.6 m, 7.31 m, 7.63 m, 7.63 m, 7.55 m & 6.72 m
Vegetation height	n/a	Fire intensity	36,037 kW/m
Effective slope	1 °	Transmissivity	0.868, 0.846, 0.819, 0.793, 0.78 & 0.721
Site slope	1 °	Viewfactor	0.6057, 0.4478, 0.3035, 0.207, 0.1682 & 0.0455
Flame width	100 m	Minimum distance to < 40 kW/m²	13.99999999999997 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	18.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	27.00000000000011 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	37.40000000000026 m
		Minimum distance to < 10 kW/m²	44.00000000000036 m

Plate 12 – FLAMESOL Modelling for 8.1 Wet Eucalypt Tall Open Forest

Calculated February 28, 2020, 3:55 pm (MDc v.4.8)

VHC 9.1

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	50	Rate of spread	1.35 km/h
Vegetation classification	Forest	Flame length	11.67 m
Surface fuel load	21 t/ha	Flame angle	54 °, 64 °, 72 °, 77 °, 79 ° & 84 °
Overall fuel load	24.2 t/ha	Elevation of receiver	4.55 m, 5.01 m, 5.21 m, 5.2 m, 5.15 m & 4.36 m
Vegetation height	n/a	Fire intensity	16,879 kW/m
Effective slope	1 °	Transmissivity	0.878, 0.861, 0.838, 0.8139999999999999, 0.8 & 0.734
Site slope	1 °	Viewfactor	0.5964, 0.4408, 0.2976, 0.2017, 0.1639 & 0.0447
Flame width	100 m	Minimum distance to < 40 kW/m²	9.699999999999982 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	13.09999999999997 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	19.2 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	27.50000000000012 m
		Minimum distance to < 10 kW/m²	32.9000000000002 m

Plate 13 – FLAMESOL Modelling for 9.1 Moist to dry open forest

Calculated January 28, 2020, 4:44 pm (MDc v.4.8)

VHC 22.1

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	50	Rate of spread	1.5 km/h
Vegetation classification	Forest	Flame length	13.18 m
Surface fuel load	23.4 t/ha	Flame angle	54 °, 64 °, 72 °, 77 °, 78 ° & 84 °
Overall fuel load	28.4 t/ha	Elevation of receiver	5.14 m, 5.66 m, 5.89 m, 5.89 m, 5.81 m & 5.01 m
Vegetation height	n/a	Fire intensity	22,073 kW/m
Effective slope	1 °	Transmissivity	0.875, 0.857, 0.832, 0.8070000000000001, 0.794 & 0.73
Site slope	1 °	Viewfactor	0.5989, 0.4428, 0.2998, 0.2032, 0.1651 & 0.0449
Flame width	100 m	Minimum distance to < 40 kW/m²	10.89999999999998 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	14.69999999999996 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	21.40000000000003 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	30.40000000000016 m
		Minimum distance to < 10 kW/m²	36.20000000000024 m

Plate 14 – FLAMESOL Modelling for VHC 22.1 Melaleuca Open Forest

Calculated January 28, 2020, 4:47 pm (MDc v.4.8)

VHC 29.3

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	50	Rate of spread	4.46 km/h
Vegetation classification	Scrub	Flame length	10.85 m
Surface fuel load	14.5 t/ha	Flame angle	54 °, 64 °, 73 °, 78 °, 79 ° & 85 °
Overall fuel load	20.1 t/ha	Elevation of receiver	4.23 m, 4.66 m, 4.87 m, 4.85 m, 4.78 m & 4.02 m
Vegetation height	m	Fire intensity	46,358 kW/m
Effective slope	1 °	Transmissivity	0.88, 0.864, 0.841, 0.8169999999999999, 0.804 & 0.737
Site slope	1 °	Viewfactor	0.5976, 0.4404, 0.2959, 0.2004, 0.1627 & 0.0445
Flame width	100 m	Minimum distance to < 40 kW/m²	8.999999999999984 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	12.19999999999997 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	17.99999999999999 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	25.9000000000001 m
		Minimum distance to < 10 kW/m²	31.10000000000017 m

Plate 15 – FLAMESOL Modelling for VHC 29.3 Heathland and associated scrubs and shrublands

Table 2 compares the bushfire output results for each vegetation hazard class assessed.

Table 2 - Modelled Bushfire Output Comparison

VHC	Flame Length (m)	Rate of Spread (km/hr)	Fire Intensity (kW/m)
8.1 Wet Eucalypt Tall Open Forest	17.15	1.99	36,037
9.1 Moist to dry open forest	11.67	1.35	16,879
22.1 Melaleuca Open Forest	13.18	1.5	22,073
29.3 Heathland	10.85	4.46	46,358

The output results infer VHC 29.3 Heathland communities represent the most hazardous vegetation type in the assessment area with respect to fireline intensity (46,358 kW/m) and rate of spread (4.46 km/hr) whilst VHC 8.1 Wet Eucalypt Tall Open Forest represents the fuel type most likely to exhibit the greatest flame lengths at 17.15m.

It is important to note the output results are a product of the input data hence represent a single set of possible bushfire fuel load and weather event scenarios. The 2019/2020 maximum summer temperatures on the Sunshine Coast exceeded the default 34.5ºC ambient temperature model input by several degrees hence more severe bushfire output should not be discounted. Climate change modelling by the Bureau of Meteorology and contained within consecutive IPCC reports consistently predicts the prevalence of hotter and drier weather conditions on the East Coast of Australia, including extended bushfire seasons.

4 BUSHFIRE RISK ASSESSMENT

4.1 General

The following sections provide an overall bushfire risk assessment for the proposed post development conditions which has been prepared generally in accordance with *State Planning Policy – State Interest Guideline – Natural Hazards, Risk and Resilience* (DILGP, 2016) and *AS/NZS ISO 31000:2009 – Risk Management Methodology*.

The bushfire risk assessment details the likelihood that the proposed development will be exposed to bushfire smoke, ember, radiant heat and/or flame attack considering the proximity to bushfire prone vegetation and likely bushfire behaviour. The bushfire risk assessment also assesses the consequences of a potential bushfire acting on the proposed allotments in relation to human health, property loss and environmental degradation. The risk assessment has assumed that all proposed risk mitigation measures detailed in Section 5 of this report are implemented and maintained.

According to AS/NZS ISO 31000:2009, a 'hazard' is defined as a source of potential harm or a situation with a potential to cause loss, whereas a 'risk' is the chance of something happening that will have an impact on objectives measured in terms of consequences and likelihood. The *State Planning Policy – State Interest Guideline – Natural Hazards, Risk and Resilience* (DILGP, April 2016) refers to 'acceptable risk', 'tolerable risk', and 'intolerable risk' which are defined below.

- **Acceptable risk**
    - A risk that, following an understanding of the likelihood and consequences, is sufficiently low to require no new treatments or actions to reduce risk further. Individuals and society can live with this risk without feeling the necessity to reduce the risks any further.
- **Tolerable risk**
    - A risk that, following an understanding of the likelihood and consequences, is low enough to allow the exposure to continue, and at the same time high enough to require new treatments or actions to reduce risk. Society can live with this risk but believe that as much as is reasonably practical should be done to reduce the risks further.
- **Intolerable risk**
    - A risk that, following an understanding of the likelihood and consequences, is so high that it requires actions to avoid or reduce the risk. Individuals and society will not accept this risk and measures are to be put in place to reduce risks to at least a tolerable level.

4.2 Risk of Hazardous Vegetation Within the Site

Figure 3 identifies that multiple High Potential Bushfire Intensity areas encroach only a limited distance into the north-eastern and south-western extents of the site, bordered by 100m wide Potential Impact Buffers. Not discounting this, the majority of the site is located in a non-bushfire prone area.

Narrow units of regrowth VHC 22.1 and VHC 9.1 are present flanking internal drainage lines within the site and were removed as part of the patch and corridor filtering process implemented whilst preparing the Local Hazard Area Map. Leonard identifies that '*patch and corridor filtering is needed to identify and amend the estimated hazard potential of narrow or small patches of vegetation likely to prevent a running fire front from reaching its potential'*. The narrow width and general riparian influence of much of the onsite regrowth vegetation (which is predominantly less than 100m within most of the site) reduces the anticipated hazard associated with these vegetation units. Riparian communities typically exhibit high surface fuel moisture content, low flammability understorey species and discontinuous and fragmented surface fuel loads as a result

of water columns and fuel load displacement during peak flows. These characteristics in association with the linear nature and high perimeter to core ratio of the vegetation unit, infers any fire within these units is likely to achieve only low to moderate bushfire severity and intensity. However, these narrow onsite units of vegetation are contiguous with larger units of offsite hazardous vegetation and therefore represent a potential conduit for bushfire through the site.

The balance of the vegetation within the site comprises grazed grassland with scattered woody vegetation which exhibits low volume and discontinuous fuel loads and is synonymous with the low threat VHC 40.4 – Continuous Low Grass or Tree Cover. In consideration of the above, there is currently considered to be a tolerable level of risk to the site from a bushfire originating from within the site.

It is noted that the plan of development includes approximately 44ha of rehabilitated native vegetation within the development area as defined on the LELPRP Staging Plan 2 presented in the approved Palmview – Preliminary Rehabilitation Site Strategy prepared by Saunders Havill Group (refer Appendix 2). The maturing of these rehabilitated areas will inevitably increase the risk and potential severity of bushfire impact to the site. The rehabilitation corridor through the east of the site may exceed a 100m fire line width and is aligned on a north-west to south-east axis. A fire in the rehabilitated corridor would be anticipated to most likely burn directly along the axis towards the south-east driven by regional west to north-westerly fire weather winds and therefore represents potential to attain maximum potential fire intensity, resulting in increased risk to flanking residential areas.

Consequently, and in consideration of the post development conditions, there is anticipated to be an intolerable level of risk to the areas flanking the central eastern rehabilitation corridor in the absence of risk mitigation strategies.

4.3 Risk from Hazardous Vegetation External to Site

4.3.1 North

Figure 3 identifies that a large vegetation unit synonymous with VHC 8.1 (Wet Eucalypt tall open forest) is present to the north-east of the site associated with the Sippy Creek riparian corridor. This vegetation unit represents a High Potential Bushfire Intensity vegetation unit and exhibits approximately 350m potential fire line width, albeit contiguous with a narrow band of low threat rainforest vegetation of approximately 50m width immediately flanking Sippy Creek on the northern extent of the vegetation unit. Whilst the rainforest vegetation reduces the overall bushfire hazard associated with this unit, the remaining extent of hazardous VHC 8.1 vegetation is sufficient in scale to potentially attain maximum potential fire line intensity prior to intercepting the site. The overall vegetation unit is located upwind in the path of regional north-westerly bushfire winds and therefore a bushfire originating to the north-west exhibits high risk of impacting the northern extent of the site during the fire season.

Figure 3 also depicts a hazardous vegetation unit of approximately 11ha adjacent to the centre of the site's northern boundary. This vegetation unit contains a mosaic of VHC 22.1 (Melaleuca communities) and VHC 29.3 (heath communities), which represent Medium and High Potential Bushfire Intensity vegetation hazard classes respectively. This vegetation unit exhibits a width of approximately 220m at the interface with the site's northern boundary. The overall vegetation unit is located upwind in the path of regional north-westerly bushfire winds and therefore a bushfire originating to in this unit exhibits high risk of impacting the northern extent of the site during the fire season.

The development of adjacent Palmview Areas A & B also includes extensive natural area rehabilitation and revegetation programs as detailed in Plate 15. The widening of the Sippy Creek corridor to 300m width in the far north of Palmview Area A increases the risk of fire moving in an easterly direction through the landscape driven by hot and dry westerly fire winds. The reconnection of the currently fragmented corridor in Palmview Area B to the north of the site with the Sippy Creek fuel load also significantly increases the risk of fire transmission in a southerly direction toward the site from the Sippy Creek hazardous vegetation.

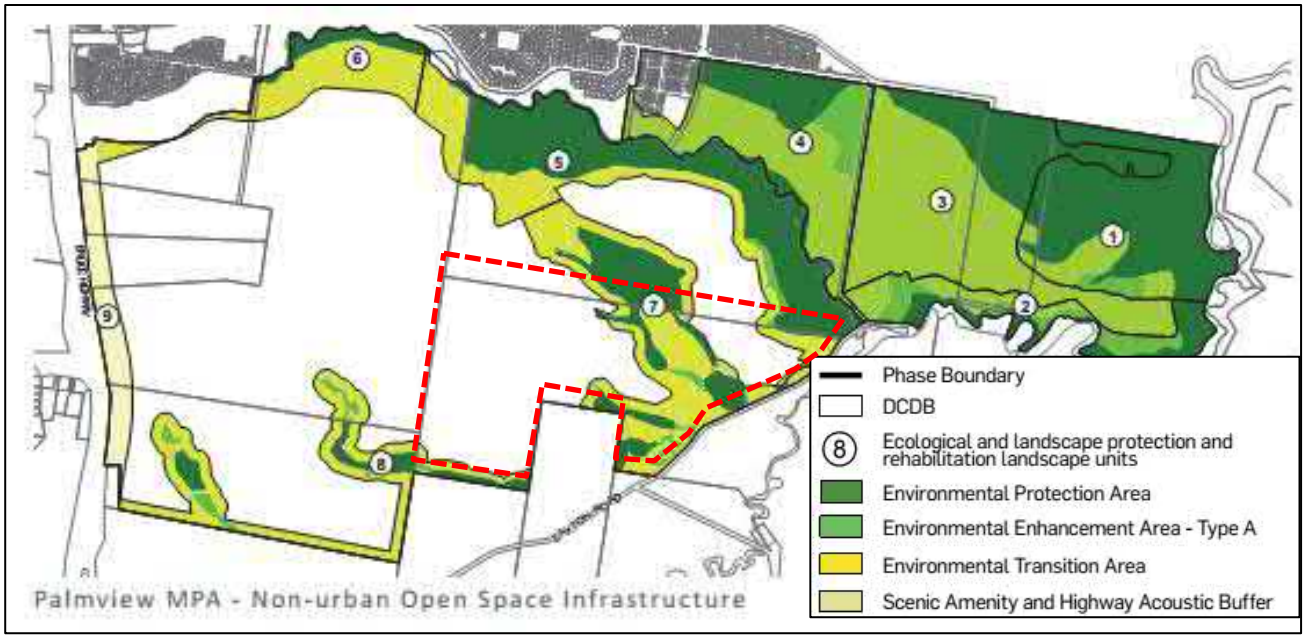


Plate 16 –Palmview Structure Plan Area Rehabilitation Intent (Source: Saunders Havill Group)

Overall, the position, composition and extent of hazardous vegetation to the north of the site post development represents an intolerable level of risk to the site in the absence of risk mitigation strategies.

4.3.2 East

Figure 3 does not identify any hazardous vegetation to the east of the site, therefore there is currently anticipated to be an acceptable level of risk to the site from a bushfire originating from the east.

4.3.3 South

Figure 3 identifies that vegetation synonymous with VHC 9.1 (Moist to dry open forest) is present to the south of the site with a small patch of VHC 29.3 also present. VHC 9.1 represents a Medium Potential Bushfire Intensity vegetation unit and exhibits approximately 600m potential fire line width adjacent to the south-west corner of the site and a potential fire run distance of up to 2 kilometres, commencing from within the Palmview Conservation Park near the Bruce Highway to the south-west of the site. This hazardous open forest vegetation unit therefore represents the potential to support a significant high intensity fire run toward the site.

The risk of a severe fire burning from a southerly direction toward the site would historically and generally be considered low, with the weather conditions required to facilitate a fire from a southerly direction generally associated with cooler land temperatures and rainfall periods. Fires under such conditions are rarely, but not exclusively, associated with hazardous bushfire weather conditions on the Sunshine Coast. Nonetheless, the recent 2017/2018 summer wildfire event at Caloundra South burnt perilously close to the new Aura residential development under dry, south-westerly winds and commenced in immediate proximity to the Bruce Highway. Given the anticipated increase in the number and severity of high bushfire weather days in Australia in the foreseeable future, it is considered prudent to appropriately consider and subsequently mitigate the risk of the southerly adjacent bushfire hazard unit.

Overall, given the extent of hazardous vegetation located to the south of the site there is anticipated to be an intolerable level of risk to the site in the absence of risk mitigation strategies.

4.3.4 West

Figure 3 does not identify any hazardous vegetation to the west of the site. The Harmony Palmview Area A residential community is currently under construction to the west. Plate 15 identifies one small linear riparian rehabilitation area flanking the south-west corner of the site. Therefore, limited hazardous fuels loads are anticipated to exist post development to the west of the site hence there is anticipated to be an acceptable level of risk to the site from a bushfire originating from the west.

5 BUSHFIRE MANAGEMENT PLAN

5.1 General

The following sections describe the bushfire risk reduction measures to be incorporated into the proposed development to reduce the risk of bushfire impact to people and property to a level anticipated to be deemed acceptable to society. This assessment has been based on the post-development conditions within the site based on the Plan of Development and the anticipated post-development/post rehabilitation conditions throughout the site and adjoining lands (i.e. Palmview Areas A & B) to ensure the cumulative impact of rehabilitation is not discounted.

Implementation of the identified measures is not implied nor intended to advocate that building occupants remain on the site during a bushfire event, nor that people and property will be protected from bushfire impact. The measures are intended to reduce the potential severity of bushfire impact to the development and not prevent bushfire impact.

The scope of referenced management measures have been derived from:

- Bushfire Hazard Overlay Code 2014. *Sunshine Coast Planning Scheme 2014*. Sunshine Coast Council;
- SC6.7 Planning Scheme Policy for the Bushfire Hazard Overlay Code. *Sunshine Coast Planning Scheme 2014*. Sunshine Coast Council;
- Department of Infrastructure, Local Government and Planning's *State Planning Policy – State interest guidance material –Natural hazards, risk and resilience – Bushfire (December 2019);*
- Queensland Fire and Emergency Services. (2018). *Planning for Bushfire Resilient Communities;*
- *Australian Standard 3959-2018 Construction of Buildings in Bushfire Prone Areas* (AS3959 (2018)).

Under Chapter 2, Part 1, Section 8, Item 4(a) of the Planning Act 2016, where there is an inconsistency between a State Planning Policy and local government planning instrument, the State Planning Policy applies over the local planning instrument. Therefore, the bushfire management design criteria detailed in the relevant Assessment Benchmarks of the *State Planning Policy –State interest guidance material –Natural hazards, risk and resilience – Bushfire (December 2019)* supersede the equivalent design criteria listed in the SCC Bushfire Hazard Overlay Code (i.e. separation requirements, water supply requirements, fire break trail design etc) .

The bushfire risk reduction measures to be considered generally relate to the following elements:

- Asset Protection Zones and hazardous vegetation setbacks;
- Residential building construction standards;
- Water supply;
- Fire breaking trails;
- Roads; and
- Landscaping and natural area regrowth.

5.2 Asset Protection Zones and hazardous vegetation setbacks

Asset Protection Zones (APZ) provide a defensive tool to assist in the reduction of potential bushfire impact to people and property situated in bushfire prone areas. For illustrative purposes, Plate 16 depicts the concept of an APZ flanking a dwelling in bushfire prone areas.

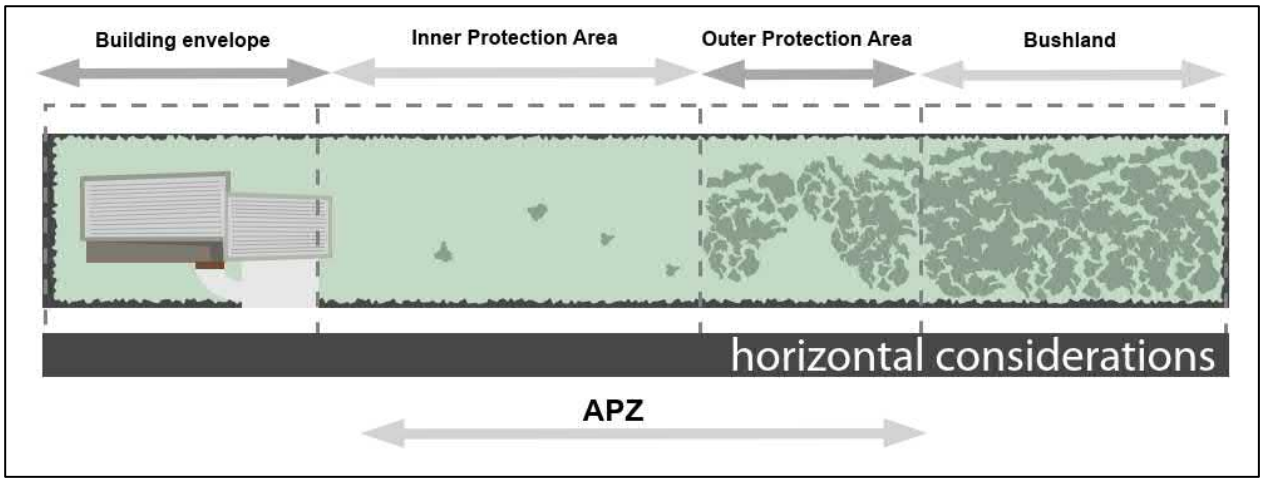


Plate 16 – Asset Protection Zones (NSW PBP 2018)

The assessment area has been determined to be affected by Medium and High Potential Bushfire Intensity Areas and Potential Impact Buffer areas, hence provision of adequate separation between the proposed built infrastructure and the adjoining hazardous vegetation is deemed appropriate. The provision of adequate building separation from the hazardous vegetation is required to provide a reasonable level of safety to site occupants and emergency services staff.

The small residential allotment sizes proposed within the future development precludes the ability to provide dedicated asset protection zones internal of residential lot boundaries. Therefore, the development must rely upon sufficient separation being provided external of individual allotments within communal open space and road networks, as is common with modern master planned communities.

The development is only at the neighbourhood planning phase of the project and therefore no specific allotment configurations and/or road hierarchy plans are available to review. Consequently, this assessment makes recommendations on the dimension of asset protection zones required to be applied between future built infrastructure and flanking hazardous vegetation units in order to satisfy the current SPP Bushfire 2019 Assessment Benchmark 4 separation requirements. It is noted the SPP requirements supersede the SCC Sunshine Coast Planning Scheme Bushfire Hazard Overlay Code requirements regarding separation hence no assessment against the SCC requirements has bene undertaken.

5.2.1 SPP Bushfire 2019 Assessment Benchmark 3 – Vulnerable Use Separation

Certain types of uses and occupants are more vulnerable to the effects of bushfire attack. This vulnerability can be due to factors including social circumstances, communication difficulties, greater potential for health impacts (particularly impacts from smoke), reduced and dependent mobility, or the need for high levels of care. These *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 (QFES 2019). For the purposes of assessment against the SPP Bushfire 2019, *vulnerable uses* comprise the following:

- childcare centre, community care centre, detention facility, educational establishment, hospital, nature-based tourism, relocatable home park, rooming accommodation, residential care facility, resort complex, retirement facility, tourist park (QFES 2019).

Assessment Benchmark 3 requires that *Vulnerable uses are not established or intensified within the bushfire prone area unless:*

- *there is an overriding need in the public interest for the new or expanded service the development provides;*
- *there are no other suitable alternative locations within the required service catchment, and*
- *site planning can appropriately mitigate the risk (for example, siting ovals for an educational establishment between the hazardous vegetation and structures).*

Where *vulnerable uses* are established or intensified within the bushfire prone area they are to achieve a target radiant heat threshold impact of <10kW/m² in accordance with Section 9.4 in *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'* (Queensland Fire and Emergency Services (2019).

Note – Under the National Construction Code (NCC) certain buildings that support vulnerable uses, such as schools, hospitals and aged care facilities, are not required to be constructed to withstand bushfire attack (i.e. do not need to comply with AS 3959-2018). Because of the increased level of risk associated with vulnerable uses, such uses should be located outside of bushfire prone areas

5.2.2 SPP Bushfire 2019 Assessment Benchmark 4 –Non vulnerable Use Separation

Assessment Benchmark 4 of the *State Planning Policy – state interest guidance material* states:

Development supports, and does not hinder, disaster management response or recovery capacity or capabilities. Where reconfiguring a lot creating lots of 2000 square metres or less:

To ensure emergency access and operational space for firefighters the subdivision layout results in lots that are sited so that they are separated from the closest edge to the adjacent medium, high or very high potential bushfire intensity area by a distance that achieves a radiant heat flux level of 29 kilowatt per square metre or less at:

1. The building envelope, if identified at RaL stage, or

2. Where a building envelope is not identified, at all the lot boundaries.

Compliance with Assessment Benchmark 4 can be attained where all non-vulnerable use allotments (i.e. residential) are sufficiently separated from the adjacent forest and heathland hazard so that a radiant heat flux level at any point on the building or envelope does not exceed 29 kW/m². It is noted that no building envelopes are identified on the Neighbourhood Plans. It is deemed acceptable to assume that the minimum building to boundary setbacks applicable under the Palmview Structure Plan will be enacted on the lots and therefore the assessment of separation can be measured from the forest hazard edge to the regulated minimum building to boundary setback line on the adjacent lots.

5.2.3 Radiant Heat Flux Setbacks

Determination of the setbacks required to satisfy Assessment Benchmark 3 and 4 can be identified from the quantitative modelling output presented in Section 3.3 herein. The output results from Plates 12-15 can be used to identify the setback requirements to achieve the <10kW/m² and <29 kW/m² radiant heat flux SPP requirement for each VHC as shown in Table 3.

Table 3 – Radiant Heat Flux Setbacks to secure <10kW/m² and <29kW/m²

VHC	Slope (º)	<10kW/m² (metres to building)	<29kW/m² (metres to building)
VHC 8.1 Wet Eucalypt Tall Open Forest	1º	44	18.8
VHC 9.1 Moist to Dry Open Forest	1º	32.9	13.09
VHC 22.1 Melaleuca Open Forest	1º	36.2	14.69
VHC 29.3 Heathland	1º	31.1	12.19

* Source – Flamesol Minimum Distance calculator

The future lot design and road network design for Area C will need to be devised with due consideration given to achieving the setbacks identified in Table 3 for vulnerable and non - vulnerable uses.

A maximum separation of 18.8m is required (VHC 8.1) to satisfy the <29kW/m² separation requirements for all VHC's listed in Table 3. Therefore, provision of a standard 2 lane perimeter road coupled with open space road reserve (typically host to a footpath) about the perimeter of the development footprint which flanks hazardous vegetation would likely be sufficient to satisfy Assessment Benchmark 4 for the entire Area C footprint.

In the instance where no suitably wide road interface is proposed between residential lots and adjacent hazardous vegetation, adequate separation can be achieved via the installation of a 20m wide fire break trail designed and constructed to SPP Bushfire 2019 standards. This 20m separation coupled with minimum rear boundary building setbacks (assume 1.5m) offers a total separation of approximately 21.5m, which would satisfy the <29kW/m² separation requirements for all VHC's listed in Table 3.

Any development works in the separation zones listed in Table 3 must satisfy the 'low threat' criteria defined in Section 2.2.3.3 Low threat and non-vegetated areas of AS 3959:2018, and the Asset protection zone criteria defined in Assessment Benchmark 7 of Natural hazards, risk and resilience - Bushfire State Planning Policy – state interest guidance material 2019, in order to maintain/facilitate compliance with Assessment Benchmark 4

5.3 Water Supply

The availability of a reliable water supply for firefighting purposes is a vital tool in the defence of bushfire impact. The site is to be connected to a reticulated water supply which will have a minimum pressure and flow of 10 litres a second at 200kPa.

The water supply design for Area C is to satisfy Assessment Benchmark 4 of the SPP Bushfire 2019, which requires the road network and fire hydrants are designed and installed in accordance with:

1. 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

2. The Road Planning and Design Manual 2nd edition, Department of Transport and Main Roads, 2013.

Note: when relevant, the superseding versions will apply.

To ensure adequate access to the water supply at appropriate locations throughout the development site, and in accordance with AO9.4 of Councils Bushfire Hazard Overlay Code, fire hydrants are to be positioned along the perimeter roads, or fire breaks where no roads are present, adjacent to proposed conservation reserves at not more than 100 metres apart.

5.4 Fire Breaking Trails

The provision of fire breaks and fire trails within a site located in a bushfire prone area offers an important bushfire defence measure to assist in reducing the risk and severity of bushfire ingress onto and through a site. Various peripheries of the proposed development will be exposed to hazardous vegetation and therefore inclusion of fire breaks and fire trails to suppress fire movement, and to access the perimeter of the hazardous vegetation, represents a critical bushfire impact reduction measure.

It is generally expected the proposed road network will separate all areas of hazardous vegetation from future built infrastructure. The location of formed roadways between the built areas of the development and the adjoining hazardous vegetation provides a highly accessible fire break to reduce the risk of direct flame contact to buildings and other infrastructure, and to access bushland edges for fire suppression control. No fire break measures are therefore required where roads will interface the development areas with adjacent bushland, existing and or proposed.

A lack of a road interface will necessitate the installation of a 20m wide fire break trail between the residential lots and the adjacent open space areas to facilitate access to the hazard in accordance with SPP Bushfire 2019 Assessment Benchmark 4. The relevant SPP fire break trail specifications are described in Assessment Benchmark 4 Table 4 which has been reproduced below as Plate 17.

It is noted a fire break trail could occur within the flanking component of the ETA as long as it is not unencumbered by a MSES 50m buffer revegetation requirement.

Parameter	Provisions
Width	Contains a width of at least 20 metres including: 1. A **trafficable area** (cleared and formed): a. with a minimum width of 4 metres that can accommodate a rural firefighting vehicle b. with no less than 4.8 metres vertical clearance from canopy vegetation c. with no adjacent inhibiting embankments or retaining walls 2. A **working area** each side of the trafficable area: a. with a minimum width of 3 metres each side b. cleared of all flammable vegetation greater than 0.1 metre in height 3. The **balance** (i.e. 10 metres width) managed vegetation area: a. sited to separate the trafficable area from adjacent mapped medium, high or very high potential bushfire intensity areas managed vegetation b. comprising managed vegetation clear of major surface hazards.
Access	Access is granted in favour of the local government and Queensland Fire and Emergency Services Note – This access is commonly granted in the form of an easement that is to be maintained by the grantor.
Egress	Contains trafficable vehicle routes in to low hazard areas, every 200 metres

Table 4 – Fire trail and working area design parameters

Plate 17 - SPP Bushfire 2019 Assessment Benchmark 4 Table 4 Fire trail specifications

5.5 Roads

New developments in bushfire prone areas should be serviced by safe access/exit points for both occupiers and emergency services personnel. It is noted that no formal road network plan was available for assessment at the time of preparation of this report. The vehicular access points to and from Area C are expected to be initially serviced by Peter Crosby Way from the north western boundary which will provide quick access to the Sunshine Motorway Arterial Link, to either Mooloolaba in the east or the Bruce Highway in the west. Additional sub-arterial roads will be constructed as the Estate continues to be developed as defined in the sequencing plan presented in Plate 18 (extracted from OPM P7) .

Major transport infrastructure elements	Relative sequence of provision of infrastructure	Description of sequencing of development and the major transport infrastructure elements
Claymore Road Link	1	This link is provided before any development is carried out in the Palmview Master Planned Area.
Southern Road Link	2	This link is provided before the earlier of the following:- (a) the traffic volumes using Claymore Road (measured immediately south of the Sippy Creek crossing) exceed 22,000 vehicle movements per business day over a continuous 30 day period; or (b) a development approval for the development of the 4,000th Equivalent Dwelling in the Palmview Master Planned Area.
Springhill Drive/ University Way Link	3	This link is provided:- (a) after the provision of the following:- (i) Claymore Road Link; (ii) Southern Road Link; and (b) before a development approval for the development of the 5,000th Equivalent Dwelling in the Palmview Master Planned Area.
Southern Road Link Upgrade	4	This link is provided before a development approval for the development of the 6,500th Equivalent Dwelling in the Palmview Master Planned Area.
Western Service Road Access via Pignata Road	5	The local road network in Area A is to be planned to accommodate a future district collector street to the Western Service Road.

Note: Equivalent Dwelling or ED is the measure of the demand for the number of vehicle trips equivalent to that generated by a Dwelling calculated for the relevant development type worked out by Council using the demand generation rates.

Plate 18 – Area C Transport Sequencing Plan OPM P7)

The width and form of the sub-arterial connections provides for safe emergency access and egress opportunities to the site with generally only very low risk of access becoming constrained in a fire event.

Vehicular access and egress throughout the internal areas of the site are to be designed to provide continuous access with very few terminating, or cul-de-sac roads proposed, which accords with best practise fire management road design principles.

Several perimeter roads are expected to interface Environmental Transitions Areas hence users of the roads may be potentially exposed to future increased risk of bushfire impacts (i.e. radiant heat and direct flame contact). In accordance with Assessment Benchmark 4 of the SPP Bushfire 2019, and to ensure safe access and egress for urban fire-fighting vehicles, the future road network plan and subdivision layouts are to:

- Include a two-lane sealed perimeter road clear of hazardous vegetation separating lot boundaries from adjacent medium, high or very high potential bushfire intensity areas and that is connected to the wider public road network at both ends and at intervals of no more than 200 metres.

5.6 Future Landscaping & Regrowth

A detailed Local Ecological and Landscape Protection and Rehabilitation Plan is to be prepared for the development and will include, in part, the ecological restoration design of sections of the Environmental Transition Areas. The ecological rehabilitation (i.e. revegetation) within the Environmental Transition Area will facilitate the potential to develop a contiguous flammable pathway between the Environmental Protection Areas (mostly existing vegetation units) and the perimeter of the developed areas on the site.

To reduce the potential for increased bushfire impact and risk on the site as a result of future regrowth and landscaping works within the site, it is recommended any edge treatments t(i.e. revegetation) to the Environmental Transition Area adjacent to roads, streets and fire breaks maximises the use of locally indigenous, low flammability species which can assist with intercepting embers, smoke and radiant heat emanating from a fire burning in the adjacent the hazardous vegetation.

Suitable low flammability, open forest flora that can be used on the edge of the drier elevated parts of the Environmental Transition Area could comprise, but not be limited to, *Banksia, Leptospermum, Callistemon, Allocasuarina, Lomandra, Ficinia, Xanthorrhoea, Carex* spp. Suitable larger trees could include *Corymbia intermedia* (Pink Bloodwood), *Eucalyptus tereticornis* (QLD Blue Gum) and *Eucalyptus racemosa* (Scribbly Gum). Wetter areas can be planted with local wetland and vineforest species including *Waterhousea floribunda, Tristaniopsis laurina, Elaeocarpus spp., Melaleuca spp., Baumea spp., Archontophoenix cunninghamiana, Syzygium* and *Acmena* spp. and even *Eucalyptus conglomerata* (Swamp Stringybark - Endangered NC Act & EPBC Act).

To ensure appropriate species selection is undertaken it is recommended that the supervising bushfire consultant reviews and comments on the LELPRP being prepared to guide the rehabilitation of the Environmental Transition Areas adjacent to residential areas within the site. The supervising bushfire consultant should also be consulted during the design of any landscaping areas situated between residential areas and retained bushland areas to ensure they are delivered as a low fuel load zone as intended.

5.7 Prescribed Burning

Prescribed burning (or controlled burning) is defined as:

"The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives. It is undertaken in specified environmental conditions" (AFAC 2012).

While the objectives for prescribed burning will vary, they broadly fall into the following two principal categories of burning:

- *To modify fuel characteristics (quantity and arrangement) so as to reduce potential fire behaviour and impacts (intensity, rate of spread and spotting potential) when bushfires subsequently occur. This category of burning is commonly referred to as fuel reduction burning or hazard reduction burning; and*
- *For a specific land/resource management or ecological outcome. While the purpose of these types of burns varies, they are generally categorised as land management and/or ecological burning (AFAC 2016).*

Prescribed burning can be applied to the native vegetation resources contained within Palmview Area B public estate in order to reduce fuel load accumulation hence risk of more intense fire events impacting the estate, its occupants and attending QFES staff.

Prescribed burning can also be applied from an ecological management perspective, by . '*Applying specific fire regimes over time to stabilise a vegetation community in a particular state, trigger succession to a new state, or provide an advantage or disadvantage to a particular suite of species' (AFAC 2016).* Many Australian ecosystems have developed in response to certain fire regimes including the vegetation found within Area C, albeit the pre-European fire regime acting on this vegetation has certainly likely changed to that which it experienced under aboriginal management.

The recommended frequency for ecological burn application to the regional ecosystems found in the Palmview Area B bushland is described in vegetation hazard class descriptions presented in Section 2.3 herein.

The recommended frequency for fuel load reduction burn application to the regional ecosystems found in the Palmview Area C bushland, where proposed, should be collaboratively determined by QFES and Sunshine Coast Regional Council with consideration given to the recommended frequency for ecological burn application, in order to mitigate unforeseen changes to ecosystem structure and floristics.

Undertaking prescribed burning in close proximity to urban areas host to high density populations has become a contentious issue. Human inhalation of smoke can trigger numerous negative physiological responses and present significant risk to immunocompromised individuals and particularly young infants and the elderly. Prescribed burns have been excluded from many bushland reserves positioned close to human settlement as reducing the risk to human health has been deemed a priority compared to the value gained from an ecological perspective and even a bushfire risk reduction perspective. Unfortunately, this has led to significant fuel load accumulation in bushland areas, both small and large in scale, adjoining many built up urban areas.

Determination of whether to apply prescribed burning practices to the native vegetation resources contained within Palmview Area C public estate, and indeed adjoining Areas A and B, is a decision that rests with the landowner/manager, which moving forward will be Sunshine Coast Regional Council.

Note, the post development fuel load conditions evaluated in this report have assumed mature vegetation hazard class fuel loads in line with those prescribed by Leonard et al 2017.

6 Australian Standard 3959-2018 Construction of Buildings in Bushfire Prone Areas

Building works within Designated Bushfire Prone Areas identified on Council's Planning Scheme Bushfire Hazard Overlay Map triggers building design assessment under AS3959 (2018), which provides minimum construction requirements for new dwellings and building alterations in designated Bushfire Prone Areas.

The construction requirements are intended to improve the performance of buildings subjected to burning debris, radiant heat or flame contact. Building works in designated bushfire prone areas must be built to the Bushfire Attack Level (BAL) construction standard relevant to the building site as identified by the AS3959 (2018) methodology. The BAL system is based on the potential exposure of the site (the dwelling) to heat flux exposure thresholds, expressed as kW/m^2. Table 3.1 of AS3959 (2018) describes the various BAL's, their associated heat flux exposure thresholds and levels of exposure.

TABLE 3.1

BUSHFIRE ATTACK LEVELS AND CORRESPONDING SECTIONS FOR SPECIFIC CONSTRUCTION REQUIREMENTS

Bushfire Attack Level (BAL)	Classified vegetation within 100 m of the site and heat flux exposure thresholds	Description of predicted bushfire attack and levels of exposure	Construction Section
BAL—LOW	See Clause 2.2.3.2	There is insufficient risk to warrant specific construction requirements	4
BAL—12.5	≤12.5 kW/m^2	Ember attack	3 and 5
BAL—19	>12.5 kW/m^2 ≤19 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 and 6
BAL—29	>19 kW/m^2 ≤29 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 and 7
BAL—40	>29 kW/m^2 ≤40 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames	3 and 8
BAL—FZ	>40 kW/m^2	Direct exposure to flames from fire front in addition to heat flux and ember attack	3 and 9

Under the NCC 2019, all future Class 1, 2, 3 and associated Class 10 building works located in the SCC Bushfire Hazard Overlay will be required to satisfy the AS 3959:2018 construction requirements.

The degree of building separation required to satisfy the SPP Bushfire December 2019 Assessment Benchmark 4 <29kW/m² radiant heat separation criteria has been identified in Section 3.3 herein. Where adopted, this separation offers the opportunity for all residential lots to secure a maximum BAL 29 construction standard, notwithstanding any changes that occur to the AS prior to building certification stage.

Bushfire Attack Levels cannot be prescriptively assigned to the site in the absence of confirmed lot positions and building setbacks to hazardous vegetation. BAL assessments are therefore recommended to be undertaken during the design of future RoL Stages thereby accounting for final lot, rehabilitation and road network design, as such will influence the resultant BAL acting on each individual lot.

7 CONCLUSIONS

This Bushfire Hazard Assessment and Management Plan has been prepared to assess the degree of potential bushfire hazard and to prescribe bushfire risk minimisation strategies for Area C of the Palmview Master Planned Area which is formally described as Lot 346 on SP287466, located at Peter Crosby Way, Sippy Creek (referenced hereafter as 'the site').

Local Hazard Maps have been prepared based on pre-development site conditions and are to supersede the existing broadscale SPP mapping attributed to the site. Based on the Figure 3 Local Hazard Area Map, Area C is affected by Medium and High Potential Bushfire Intensity areas flanking the north and south-west site boundaries as well as Potential Impact Buffers which extend approximately 100-120m into the site from the identified Potential Bushfire Intensity areas.

Construction of a post development Local Hazard Area Map is impracticable at this time. Insufficient detail is available on the final vegetative form (hence fuel loading) of the Environmental Transition Areas flanking parts of the development footprint to enable prescriptive vegetation hazard classes to be applied and therefore fireline intensity classes to be assigned. Given the inherent site slopes present and the anticipated rehabilitation composition of the conservation areas, which are to replicate the applicable pre-clearing regional ecosystems, it can however be presumed that no additional vegetation hazard classes will arise and therefore the site would continue to be affected by the same class of Potential Bushfire Intensity areas.

Consequently, with consideration given to the impact of site clearing in combination with rehabilitation of the conservation areas flanking the development footprint, all neighbourhood residential areas are anticipated to be located in either a Potential Impact Buffer (where located within 100m of the forest/heathland edge), or a non-bushfire prone area. Inclusion of hazard reduction measures into the Area C development plan is therefore warranted.

Numerous bushfire reduction measures have been recommended herein, which if adopted, will assist in the protection of people and property during a bushfire emergency. The nominated bushfire reduction measures have been derived from industry standard guidelines including:

- Bushfire Hazard Overlay Code 2014. *Sunshine Coast Planning Scheme 2014*. Sunshine Coast Council;
- SC6.7 Planning Scheme Policy for the Bushfire Hazard Overlay Code. *Sunshine Coast Planning Scheme 2014*. Sunshine Coast Council;
- Department of Infrastructure, Local Government and Planning's *State Planning Policy – State interest guidance material –Natural hazards, risk and resilience – Bushfire (December 2019);*
- Queensland Fire and Emergency Services. (2018). *Planning for Bushfire Resilient Communities;* and
- *Australian Standard 3959-2018 Construction of Buildings in Bushfire Prone Areas* (AS3959 (2018)).

Bushfire is an extremely serious and often unpredictable phenomenon that requires serious preparatory planning and decision making to avoid potential damage to infrastructure and or loss of life. Climate change modelling by the Bureau of Meteorology and contained within consecutive IPCC reports consistently predicts the prevalence of hotter and drier weather conditions on the East Coast of Australia, including extended bushfire seasons.

All recommendations made herein have been formulated based on site conditions at the time of writing and accepted industry standards for hazard assessment and design of management initiatives. Therefore, the findings of this report and the recommendations made herein may not be appropriate in the event that site conditions, bushfire weather conditions and assessment methodologies change in the future, including in the period prior to site occupation.

Implementation of the bushfire mitigation measures referenced herein is not implied nor intended to advocate that residents remain on the site during a bushfire event nor that people and property

will be protected from bushfire impact. The measures are intended to reduce the potential severity of bushfire impact to the development zone and not prevent actual bushfire impact. Site occupants are strongly recommended to seek regular advice from local fire authorities to ensure the recommendations presented in this report remain appropriate in future years. The first call in the event of a bushfire emergency should always be '000'.

7.1 Recommendations

The following primary recommendations are made to improve the level of protection against bushfire impact on the site:

- All future residential buildings are provided appropriate separation to satisfy Assessment Benchmark 4 of the SPP Bushfire 2019 (refer Section 5.2.2 herein);
- All future *vulnerable use* buildings are provided appropriate separation to satisfy Assessment Benchmark 3 of the SPP Bushfire 2019 (refer Section 5.2.2 herein);
- A formal 20m wide fire break trail to SPP Bushfire 2019 specifications is recommended to be provided in all instances where no road interface is proposed between residential and adjacent open space areas;
- The proposed separation design between all future residential lots and post development hazardous bushland areas satisfies the 'low threat' criteria defined in Section 2.2.3.3 *Low threat and non-vegetated areas* of AS 3959:2018, and the Asset protection zone criteria defined in Assessment Benchmark 7 of Natural hazards, risk and resilience - Bushfire State Planning Policy – state interest guidance material 2019; and
- The supervising bushfire consultant is to review the detailed LELPRP and Landscape Plans being prepared for the site to ensure they do not unnecessarily increase the fire risk acting on the site, and in particular the interface of landscape areas with Ecologically Important Areas.
- To ensure safe access and egress for urban fire-fighting vehicles, the subdivision layout includes a two-lane sealed perimeter road clear of hazardous vegetation separating lot boundaries from adjacent medium, high or very high potential bushfire intensity areas. The perimeter is to be connected to the wider public road network at both ends and at intervals of no more than 200 metres. Vehicular access and egress throughout the internal areas of the site is to be designed to provide continuous access with very few terminating, or cul-de-sac roads proposed, which accords with best practise fire management road design principles.
- The water supply design for Area C is to satisfy Assessment Benchmark 4 of the SPP Bushfire 2019, which requires the road network and fire hydrants are designed and installed in accordance with:
    - 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
    - The Road Planning and Design Manual 2nd edition, Department of Transport and Main Roads, 2013.
    - Note: when relevant, the superseding versions will apply.
- To ensure adequate access to the water supply at appropriate locations throughout the development site, and in accordance with AO9.4 of Councils Bushfire Hazard Overlay Code, fire hydrants are to be positioned along the perimeter roads, or fire breaks where no roads are present, adjacent to proposed conservation reserves at not more than 100 metres apart.

8 REFERENCES

AFAC (Australasian Fire and Emergency Service Authorities Council) (2012) Bushfire glossary. Prepared by Rural and Land Management Group for AFAC Agencies (Victoria: Melbourne).

AFAC (2016). National guidelines for prescribed burning operations. Report for National Burning Project – Subproject 4. Australasian Fire and Emergency Service Authorities Council Limited (Melbourne: Victoria)

Bushfire Hazard Overlay Code (2014). Sunshine Coast Planning Scheme 2014. Sunshine Coast Council.

Cruz M.G., Gould J.S., Alexander M.E., Sullivan A.L., McCaw W.L., Matthews S. (2015) *A Guide to Rate of Fire Spread Models for Australian Vegetation*. CSIRO Land and Water Flagship, Canberra, ACT, and AFAC, Melbourne, Vic, 123pp.

Queensland Fire and Emergency Services (2019). Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'. The State of Queensland, Queensland Fire and Emergency Services.

Department of State Development, Manufacturing, Infrastructure and Planning (2019). Natural hazards, risk and resilience - Bushfire State Planning Policy – state interest guidance material. Brisbane, QLD.

Gould, McCaw, Cheney, Ellis & Matthews. (2007). *Field Guide – Fuel assessment and fire behaviour in dry eucalypt open forest.* Ensis-CSIRO, Canberra, ACT and Department of Environment and Conservation, Perth, WA.

Leonard, J., Newnham, G., Opie, K., and Blanchi, R. (2014). A new methodology for state-wide mapping of bushfire prone areas in Queensland. CSIRO, Australia.

Leonard, J. and Opie, K. (2017). Estimating the potential bushfire hazard of vegetation patches and corridors. An enhancement of Queensland's methodology for State-wide mapping of bushfire prone areas. CSIRO, Australia.

NSW Rural Fire Service (2006). – *Appendix 3 Planning for Bushfire Protection.* NSW Government.

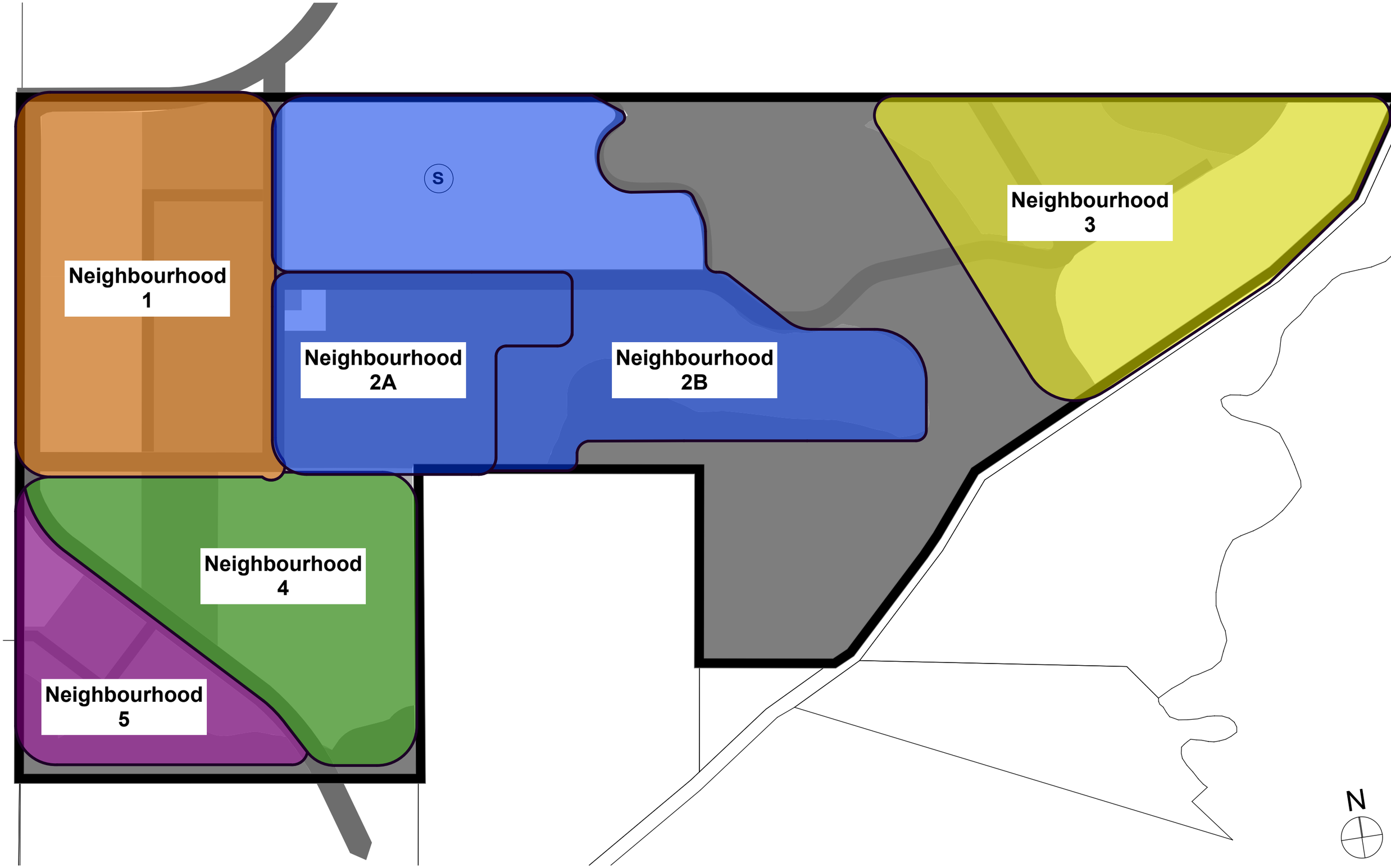
Queensland Herbarium (2016) Regional Ecosystem Description Database (REDD). Version 10.0, (December 2016) (Department of Science, Information Technology and Innovation: Brisbane)

Southeast Queensland Fire and Biodiversity Consortium – *Operational Manual*.

(State of Queensland 2020). https://apps.des.qld.gov.au/regional-ecosystems/details/

Webster. (2002). *The Complete Bushfire Safety Book*. Random House (Aust) Pty Ltd.

APPENDIX 1 – AREA DEVELOPMENT (NEIGHBOURHOOD) PLAN



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Area Development (Neighbourhood) Plan

1:5000 @ A3 / 16 February 2020 / DA.16 (E)

Neighbourhood Stages

Neighbourhood	2				
Stage	2	3	4	6	7
Stage Area (ha) approx.					
Indicative Dwellings per Stage					
IA Obligations	• 1 x 1.5 ha Local Park (delivered as part of Stage 4) • 13.7 ha of Ecological Rehabilitation & Protection Area @ 10 ha of developed area				

LEGEND

- Neighbourhood 2 Boundary
- Local Park
- 400 m Radius from centre of Park
- Pedestrian Linkage
- Bus Route
- Indicative Bus Stops
- 400 m Radius from Bus Stop
- District Collector Road
- Neighbourhood Collector Road

(Other Roads shown are deemed to be Local Access Street or Place.)

- Local Activity Centre (Shop Lot)
- Community Centre
- Energex Substation Site

N

School Site

13.30 ha

30 m wide road

Shop
889 m²

3,006 m²
Community Facility

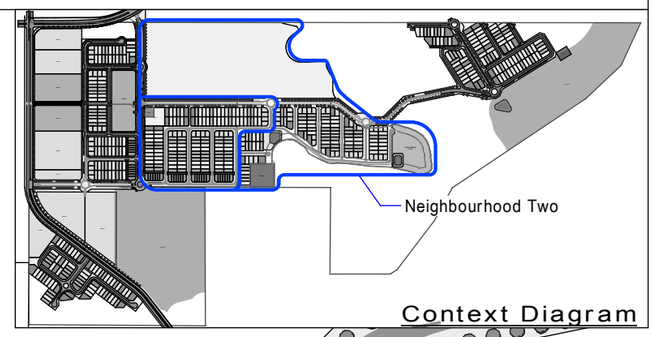
Neighbourhood 2A

Neighbourhood 2B

1.5 ha LOCAL PARK B

(location within Stage 2B to be determined)

Energex Substation
6,013 m²



Context Diagram

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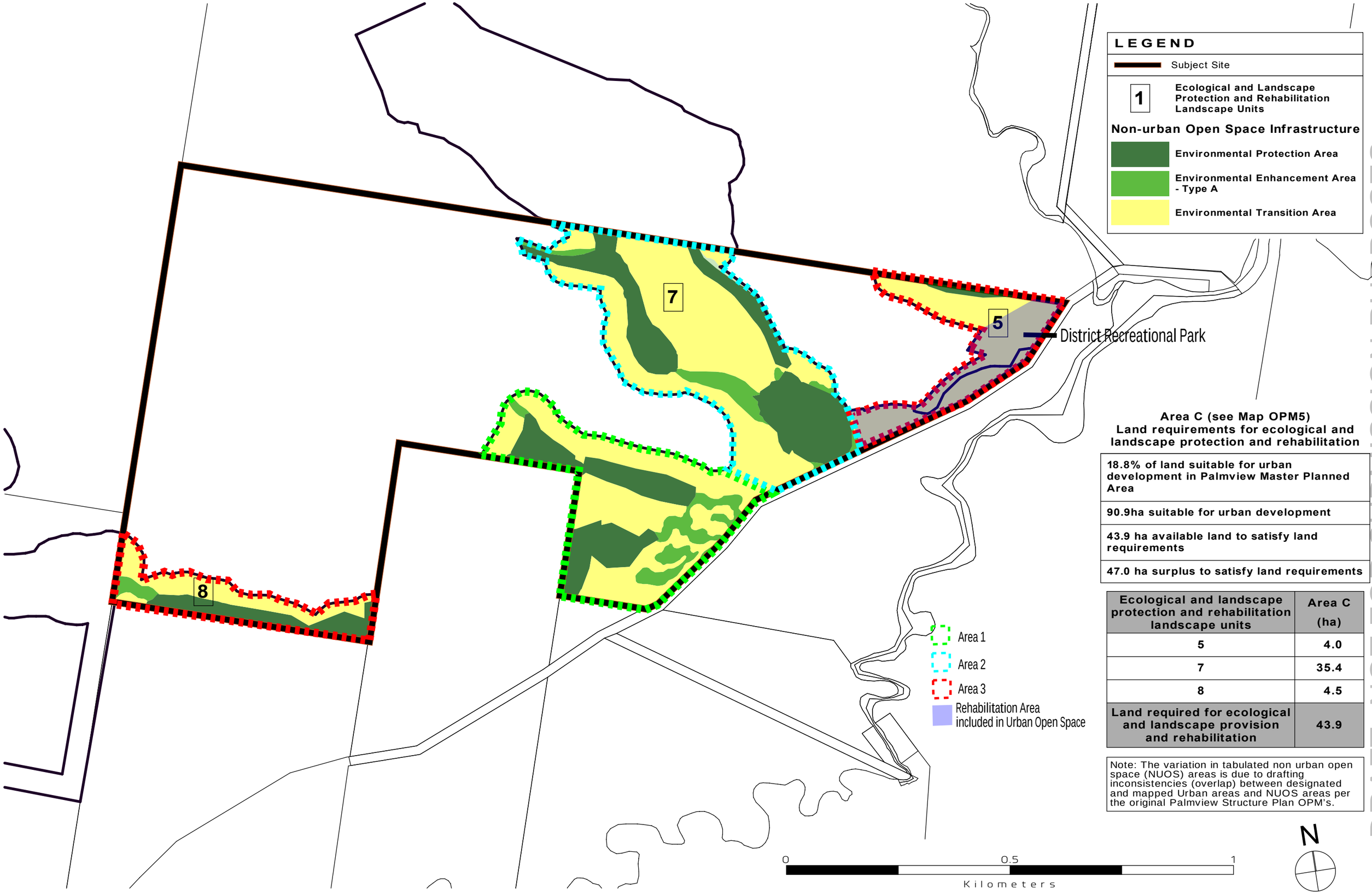
Local Area Development Plan - Neighbourhood Two (A & B)

1:2500, 1:20000 @ A3 / 16 February 2020 / DA.18 (L)

APPENDIX 2 – PALMVIEW – LELPRP STAGING PLAN 2



Area C (see Map OPM5)
Land requirements for ecological and landscape protection and rehabilitation

18.8% of land suitable for urban development in Palmview Master Planned Area
90.9ha suitable for urban development
43.9 ha available land to satisfy land requirements
47.0 ha surplus to satisfy land requirements

Ecological and landscape protection and rehabilitation landscape units	Area C (ha)
5	4.0
7	35.4
8	4.5
Land required for ecological and landscape provision and rehabilitation	**43.9**

Note: The variation in tabulated non urban open space (NUOS) areas is due to drafting inconsistencies (overlap) between designated and mapped Urban areas and NUOS areas per the original Palmview Structure Plan OPM's.