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CADAstral ENGINEERING MAPPING TOWN PLANNING

Project: Lot 1844 LIV40662 Subdivision		MPA Job No: R17006	Scale: 1:5000
Title: Proposed Subdivision Layout		Level Datum:	Origin:
Client: Reef Planning		MPA Drawing No: R17006-001	Revision: 1 of 1
C Boundary & Easement amended		10/10/17	SP KN
B Easements Amended		28/8/17	KN
A Original Issue		16/2/17	KN

TECHNICAL MEMORANDUM

Our Ref: K3925-0002

To: Rockhampton Regional Council
From: Jamie Lee – Knobel Consulting
Date: 21st February 2017
Re: PROPOSED SUBDIVISION – 277 YEPPOON ROAD, PARKHURST

ROCKHAMPTON REGIONAL COUNCIL
 These plans are approved subject to the current
 conditions of approval associated with
 Development Permit No. D/19-2017
 Dated 14-12-2017

1.0 Background

Knobel Consulting Pty Ltd have been engaged by Vicki Heilbronn to prepare a flood inundation assessment associated with a proposed residential subdivision located at 277 Yeppoon Road, Parkhurst.

The following sections define the parameters of the sites hydrology and hydraulics. The Rational Method has been applied to define flow rates at and through the subject site.

2.0 Peak Flow Rates

2.1 Coefficient of Runoff

A coefficient of runoff (Cyear) was calculated for the site using the fraction impervious method specified in QUDM. A fraction impervious factor of 0.00 is applied in accordance with the existing layout. This equates to a C10 value of 0.70, taken from Table 4.05.3(b) (QUDM).

2.2 Time of Concentration

Bransby Williams Equation ($t_c = 58L/A^{0.1} \times Se^{0.2}$) from QUDM has been applied for a channel length of 1km at an average slope of 10%, equating to a travel time of 25 minutes.

2.3 Design Flow Rates

Design storm flow rates have been calculated for standard ARI storm events using rainfall intensity values from the BOM-IFD programme. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to calculate the design flow rates for the site.

The calculated existing development peak flows on the subject site are presented in Table 1:

Table 1: Flow Rates

Average Recurrence Interval	ARI	1	10	100
Coefficient of Runoff	C	0.56	0.70	0.84
Area of Catchment (ha)	A	40.13	40.13	40.13
Average Rainfall Intensity (mm/h)	I	55	105	165
Peak Flow Rate (m3/s)	Q	3.43	8.19	15.45

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3.0 Access Easement Inundation

The proposed access easement crosses the existing dam spillway and will be subject to inundation during large rainfall events. Manning's calculation has been used to analyse existing inundation depths and the results are shown in figure 1-4 below.

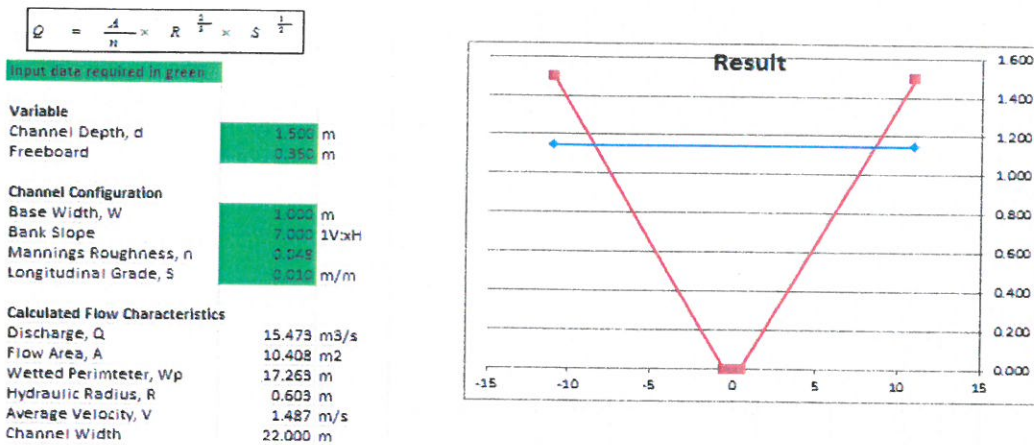


Figure 1: Q100 channel section

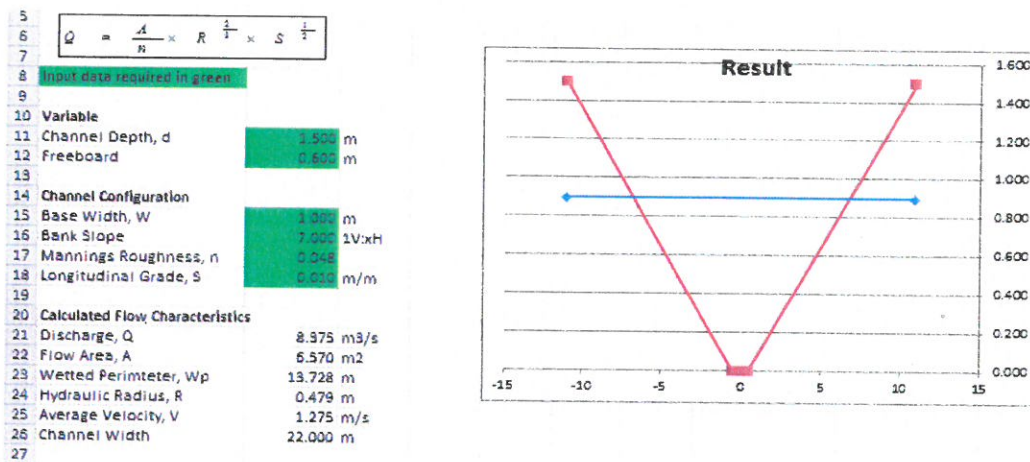


Figure 2: Q10 channel section

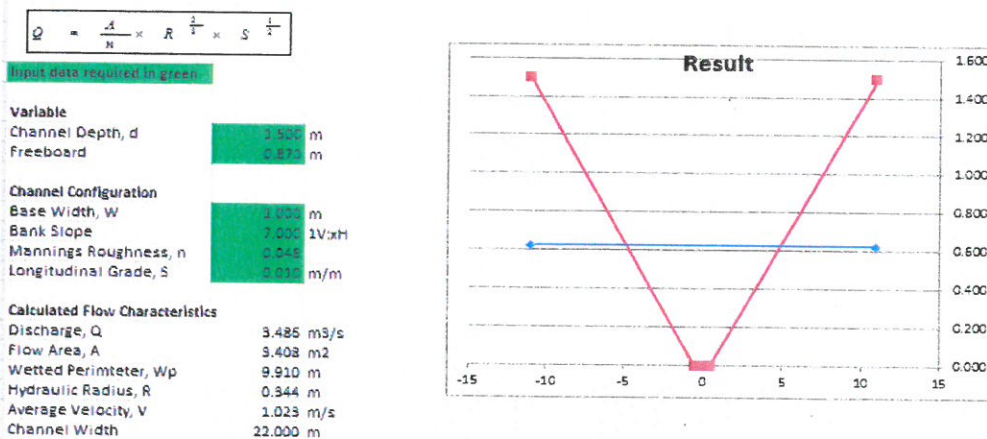


Figure 3: Q1 channel section

4.0 Design Access Inundation

The access easement will be designed to be trafficable in minor events up to the 1 in 1 year rainfall event. This will be achieved via a low flow pipe and concrete spillway. The design will ensure that the maximum period of inundation for all storm events up to the Q100 is 6 hours. A comparison of Q1 peak flows and long duration larger events are shown below.

Table 2: Flow Rates

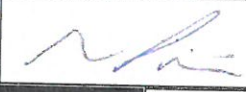
Average Recurrence Interval	ARI	1	10	100
Storm Duration (minutes)	DURATION	25	120	360
Coefficient of Runoff	C	0.56	0.70	0.84
Area of Catchment (ha)	A	40.13	40.13	40.13
Average Rainfall Intensity (mm/h)	I	55	42.5	33.4
Peak Flow Rate (m ³ /s)	Q	3.43	3.31	3.13

It can be seen in the table above that the Q100 6 hour storm event has a peak flow rate less than the Q1 25 minute storm event and therefore a spillway designed to cater for the Q1 25 minute event would have a maximum period of inundation of 6 hours for a Q100 storm.

5.0 Conclusion

The proposed access easement for 277 Yeppoon Road, Parkhurst is subject to inundation by flows discharging from the existing dam. The subject site is located toward the top of the catchment and therefore has a relatively short period of inundation.

It is access easement will be designed to be trafficable in minor events up to the 1 in 1 year rainfall event. This will be achieved via a low flow pipe and concrete spillway. The design will ensure that the maximum period of inundation for major rainfall events up to the Q100 is 6 hours.

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Bushfire Hazard Assessment & Bushfire Management Plan

Reconfiguring one lot into four lot subdivision

Over land situated on Lot 1844 on LIV 40662

277 Yeppoon Road, Parkhurst, Qld, 4702

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Acronyms and Abbreviations

AS 3959 – Australian Standard 3959 Building in Bushfire Prone Areas.

BAL: Bushfire Attack Level indicated in AS3959 for site specific factors.

BHA: Bushfire Hazard Assessment

BMP: Bushfire Management Plan

QFES: Queensland Fire and Emergency Services

QRFS: Queensland Rural Fire Service

RRC: Rockhampton Regional Council

SPP Guideline: Draft State Planning Policy Guideline. State interest-natural hazards. Guidance on flood, bushfire and landslide hazards, December 2013.

SPP Mandatory Requirements: State Planning Policy mandatory requirements: bushfire hazard. Supports the State Planning Policy state interest—natural hazards. Draft: April 2013

NCA 1992: *Nature Conservation Act 1992*

VMA 1999: *Vegetation Management Act 1999*

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Bushfire Hazard Assessment

1 Introduction

The purpose of the Bushfire Hazard Assessment is to determine the level of bushfire hazard with reference to the SPP 1/03 Guideline and provide a Bushfire Management Plan consistent with the Rockhampton Regional Council Bushfire Management Strategies, the Australian Standard AS3959 *Construction of buildings in bushfire-prone areas* (AS3959) and advice from local fire authorities.

Lot 1844 on LIV40662 is the subject of a development application for reconfiguration of a lot. The development proposed is a 1 into 4 lot subdivision. There is one existing dwelling and three proposed dwellings. The subject of this Bushfire Hazard Assessment and Bushfire Management Plan is the proposed reconfigured lot design and proposed building location envelopes on Lot 1844 on LIV40662 for proposed lots 11, 12 and 13.

A plan of the proposed reconfiguration of the lot and building location envelopes with the surrounding roads and access is provided in the appendix (Hoffmann Surveyors - drawing number R17006-001). An extract of this drawing is shown in Figure 3.

1.1 Site Location

The site is described as Lot 1844 on LIV40662 located at 277 Yeppoon Road, Parkhurst, QLD, 4702. The site is located in the Rockhampton Regional Council and is approximately 10 kilometres north north east of Rockhampton. See Figure 1 for the site location.



Figure 1. Site location of Lot 1844 on LIV40662, 277 Yeppoon Road, Parkhurst, QLD, 4702.

1.2 Lot Configuration and Dwelling Locations

The proposed lot reconfiguration and building location envelopes are provided in Figure 2, and surveyors drawing in Figure 4 and in the appendix (Hoffmann Surveyors - drawing number R17006-001).

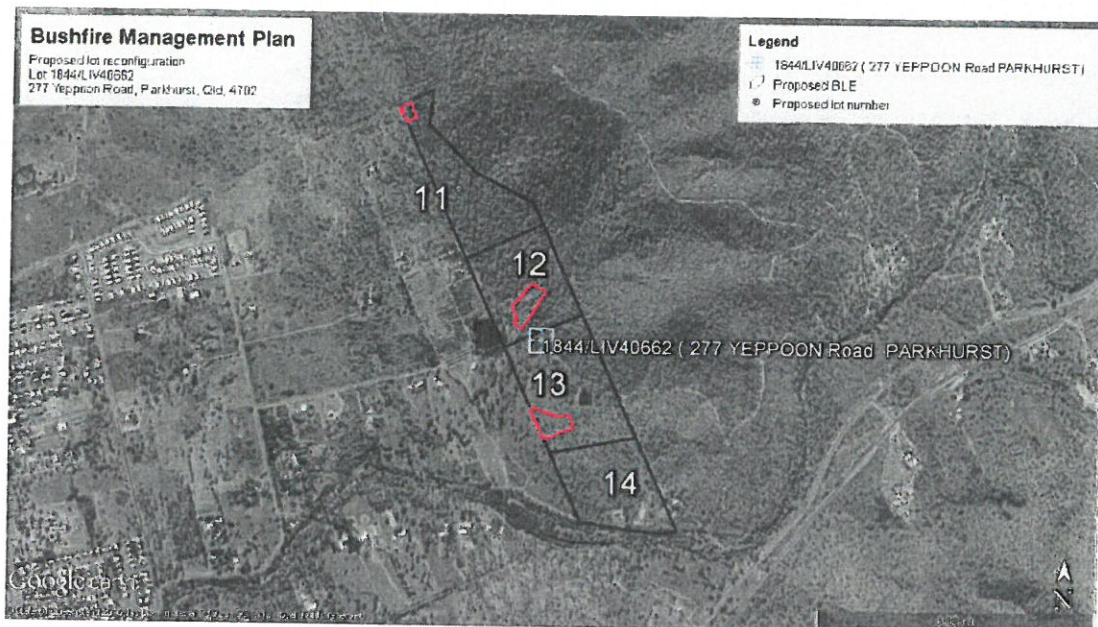


Figure 2. Proposed lot reconfiguration with proposed building location envelopes on Lot 1844 on LIV40662.

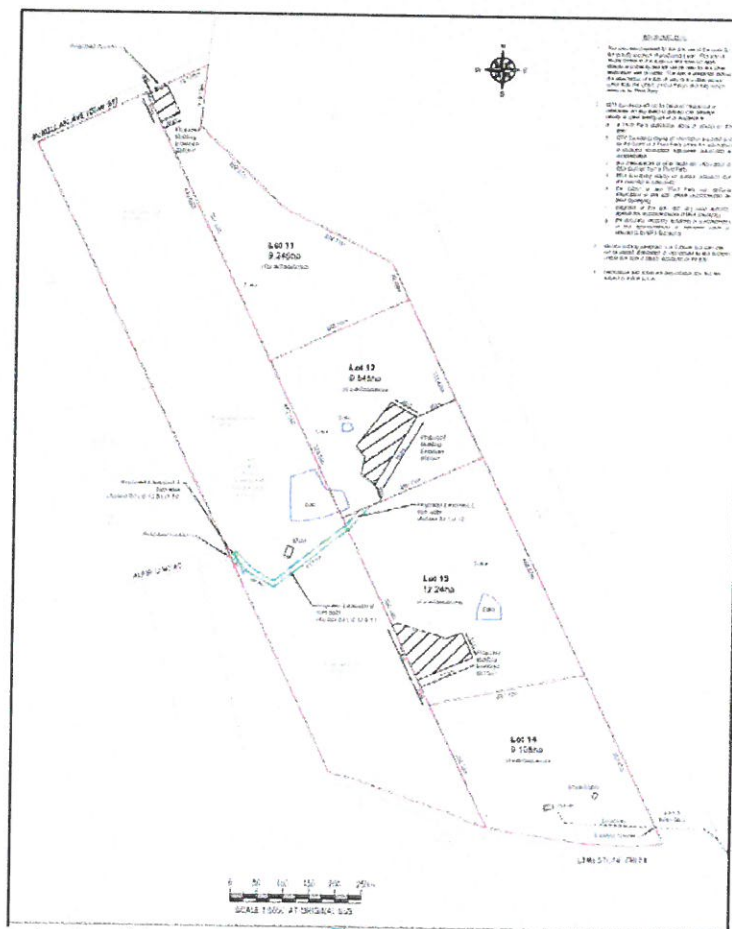


Figure 3. Surveyors drawing of the proposed reconfiguration and location of building location envelopes on Lot 1844 on LIV40662.

1.3 Surrounding Landscape

The subject lot is located on the lower western slopes of adjacent hilly terrain. Land to the west is generally flat and largely cleared. Surrounding vegetation is primarily ironbark woodland (RE 11.12.1/11.11.15) on slopes, within previously cleared grassland ground cover on granite. Vegetation includes patches of semi-evergreen vine thicket (RE 11.12.4) on the hill crest to the east. Surrounding land use is hobby farms, orchards and undeveloped land parcels and conservation areas.

1.4 Weather

The following data was obtained from the Bureau of Meteorology (http://www.bom.gov.au/climate/averages/tables/cw_039083.shtml) for Rockhampton Weather Station.

Mean annual rainfall is 812.9 millimetres. Highest rainfall periods are between December to March. Temperatures above 29 degrees Celsius are October to March. The prevailing winds are predominately southeast but during spring and summer late afternoon northeast winds are recorded. An easterly wind frequency of 10 - <20% occurrence is recorded in the location (http://www.bom.gov.au/cgi-bin/climate/cgi_bin_scripts/windrose_selector.cgi). During winter and early spring the high pressure systems of the sub-tropical ridge can be far enough north to replace the southeast trades with south westerly winds (<http://www.bom.gov.au/qld/rockhampton/climate.shtml>).

The risk of fire in the area is related to regular seasonal conditions. Dry warm south-east and north-east winds coinciding with low rainfall and low humidity represent the highest risk of bushfire in the area. Overall weather conditions between September and December represent the highest risk of bushfire in the area.

1.5 RRC Bushfire Hazard Mapping

The RRC Bushfire Hazard methodology uses vegetation, slope and aspect scores weighted with the FFDI and factors in climate change for 2050. Hazard ranges from low to high are: buffer area, medium, high and very high.

The RRC Planning Scheme *Bushfire Hazard Overlay Map OM4—41 Parkhurst* indicates a Very High Hazard area traversing the subject lot with a buffer area over the balance of Lot 1844/LIV40662 (see Figure 5).

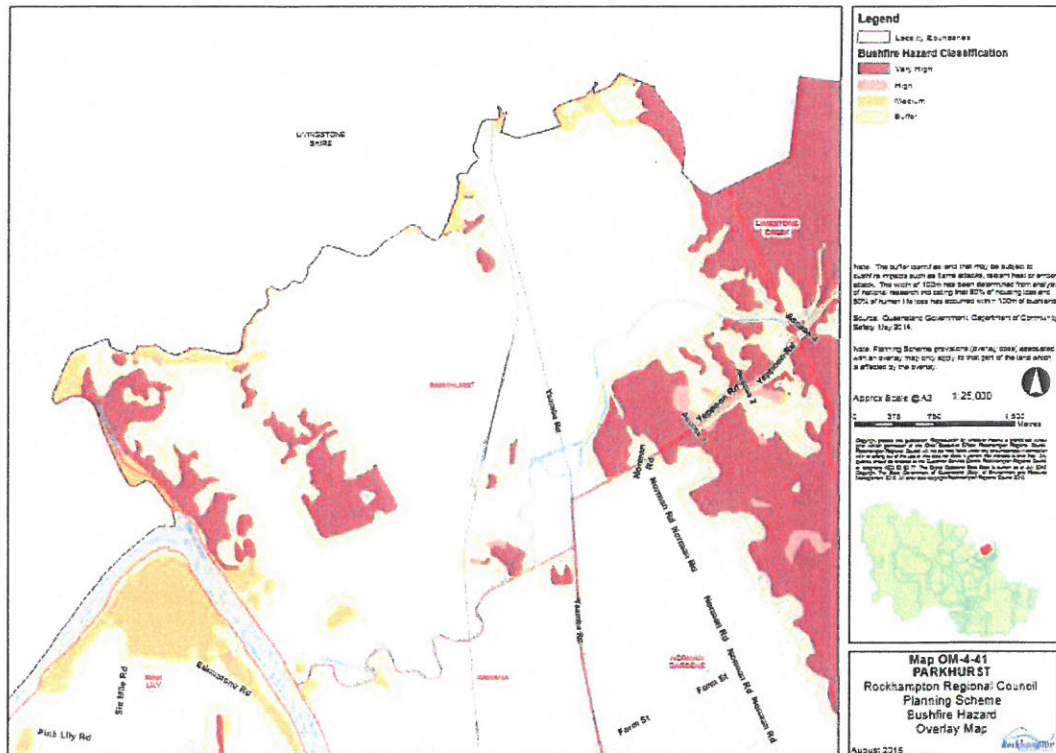


Figure 4. The RRC Bushfire Hazard Overlay map showing the location of the subject lot in relation to RRC bushfire hazard categories.

2 Materials & Methods

Bushfire hazard is assessed with reference to the RRC SC6.5 Bushfire Management Planning Scheme Policy and the SPP 1/03 guideline.

Construction requirements and minimum dwelling setback distances are given with reference to the AS3959, RRC Bushfire Policy, site specific conditions and advice received from rural fire authorities.

Vegetation structural description is taken from the Australian Standard 3959. Vegetation density scales (very sparse, sparse, medium, dense etc.) are from Melzer (2011). Vegetation heights and degree of slope are calculated using a Suunto clinometer. A Suunto compass is used to determine aspect. Field data is recorded with Android software 'Open Data Kit' using an electronic version of the *fuel assessment field work form v3* (Hines et. al., 2010).

3 Results

The following site specific hazard assessment includes vegetation, slope, aspect and any other natural or manmade features of relevance located within 100 metres of a dwelling site. The site specific hazard assessment is considered with respect to vegetation density, species and extent and how natural or manmade features interact with the hazard to modify risk. This provides a measure on the level of risk presented to the dwelling from wildfires at a more detailed local scale.

3.1 Site Vegetation

Vegetation on the subject lot consists of woodlands of ironbark with lemon-scented gum and bloodwood associated. Semi-evergreen vine thicket is located on steep slopes in the eastern portion of the site. Canopy density around BLEs was sparse to medium and canopy height ranged between 15 to 17 metres.

Understory vegetation was very sparse with scattered wattle, soap bush and weedy vines commonly occurring. Lantana was generally sparse to isolated and low. Understorey canopy density was very sparse to a height of 1.5-3 metres.

The ground layer was predominantly sparse grasses to heights of 0.15 and 0.75 metres where guinea grass occurred.

Figure 5 shows an aerial view of typical vegetation cover over the site with orchards and clearing in the neighbouring allotment to the east.

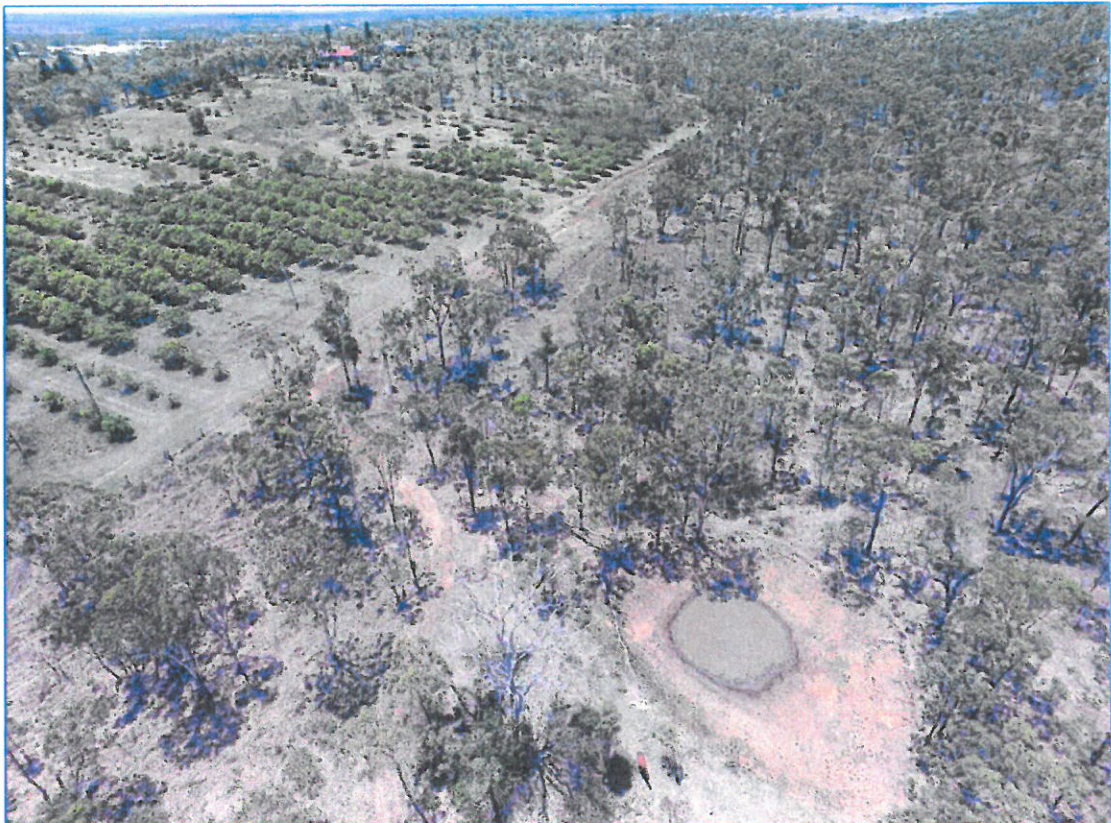
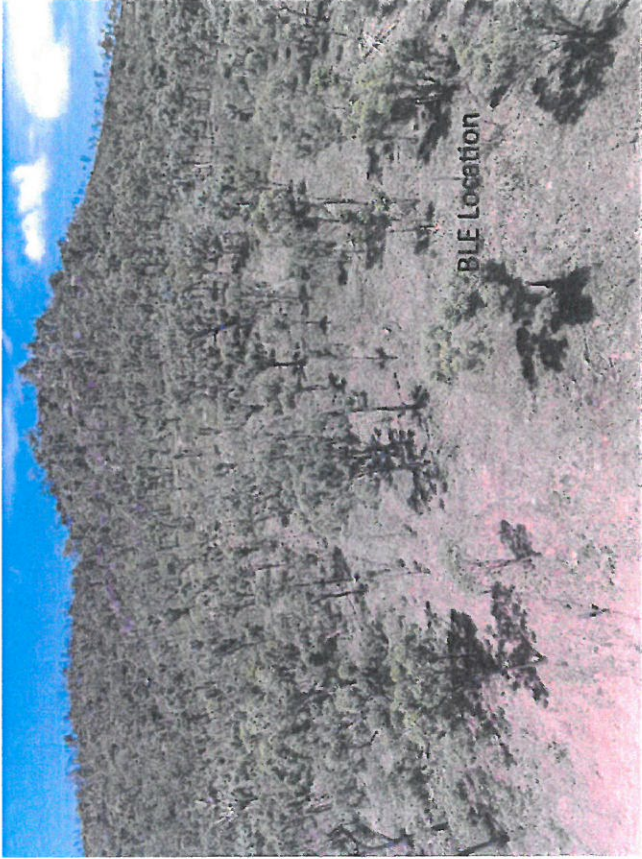


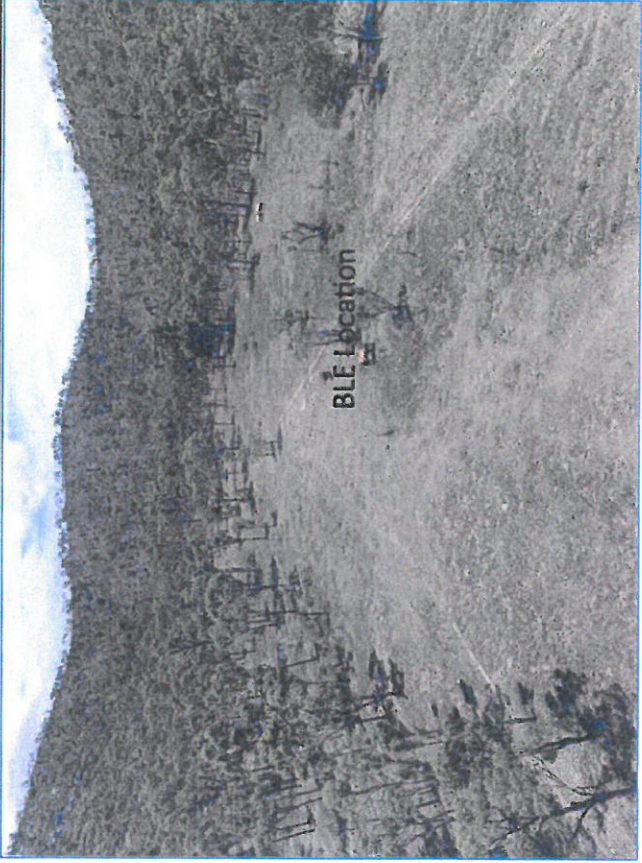
Figure 5. An aerial view (100m altitude) showing representative vegetation cover adjacent to proposed building envelopes. View is over proposed lot 12 looking north-east. Photograph taken February 2017.

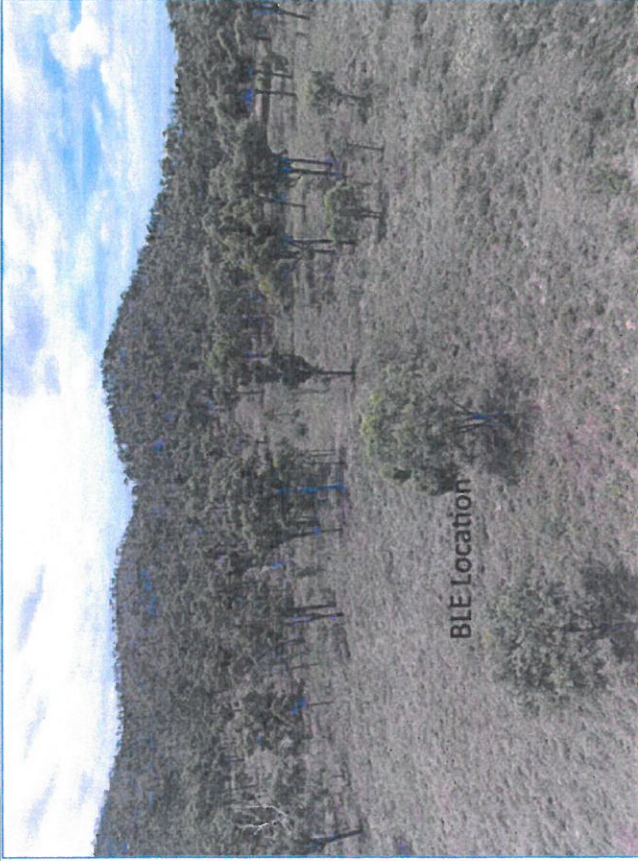
Proposed BLE's are all located within previously cleared areas that are adjacent to the western boundary of the subject lot. These locations provide the least risk locations on the site since they are located adjacent to extensive cleared areas to the east and on the lower slopes of the adjacent hill.

See Table 1 for detailed site assessments for proposed lots 11 to 13.

Table 1. Results for proposed Lots 11-13 for land situated over Lot 1844 on LIV40662, 277 Yeppoon Road, Parkhurst, Qld, 4702.

	Vegetation	Notes
Lot 11 Aspect: West Slope: upslope (0°)	Canopy species: Ironbark, Lemon scented gum and scattered Bloodwood on upslope. Patches of semi-evergreen vine thicket on hill top. Canopy height: 15m Canopy density: Sparse to Medium Mid species: Wattle, Soap bush, Snake weed, Lantana and scattered dry rainforest species. Mid height: 1.5-3m Mid density: Very Sparse Ground species: Tussock grass with scattered Guinea grass. Ground height: 0.15-0.75m Ground density: Sparse to Medium	Vegetation category: Woodland cleared with scattered trees and grass. Dry rainforest uphill. No recent fire evidence
		

<p>Lots 12 Aspect: North east Slope: upslope (0°)</p>	<p>Canopy species: Ironbark, Lemon scented gum and scattered Bloodwood on upslope. Semi- evergreen vine thicket on hill top. Canopy height: 17m Canopy density: Sparse to Medium Mid species: Wattle, Soap bush, Snake wee, Lantana and scattered dry rainforest species. Mid height: 1.5-3m Mid density: Very Sparse Ground species: Tussock grass with scattered Guinea grass Ground height: 0.15-0.75m Ground density: Sparse to Medium</p>	<p>Vegetation category: Woodland cleared with scattered trees and grass. Grazed low grasses with scattered snake weed and flannel weed to height 0.05m. No recent fire evidence</p>
		

<p>Lot 13 Aspect: East Slope: upslope (0°)</p>	<p>Canopy species: Ironbark, Lemon scented gum and scattered Bloodwood on upslope. Semi- evergreen vine thicket on hill top. Canopy height: 17m Canopy density: Sparse to Medium Mid species: Wattle, Soap bush, Snake wee, Lantana and scattered dry rainforest species. Mid height: 1.5-3m Mid density: Very Sparse Ground species: Tussock and Guinea grass with snake weed and flannel weed. Ground height: 0.15-0.75m Ground density: Medium</p>	<p>Vegetation category: Woodland cleared with scattered trees and grass. No recent fire evidence</p>
		

3.2 Hazard Assessment

The primary hazard within 100m of the development area is woodlands on low to steep slopes with largely westerly aspects. Slopes in relation to BLE location and the hazard are primarily upslope (see Figure 7).

Proposed allotments are on relatively gently sloping land with surrounding woodland of ironbark. Once clearing for development has occurred, the primary hazard will consist of woodlands on low to steep slopes to the east, and north where vegetation is contiguous with lot 11. The northerly vegetation is effectively level with lot 11.

Hazard from the west is greatly reduced by existing clearing and mango orchards.



Figure 6. An overview of proposed lots 11-13 in relation to the surrounding vegetation hazard.

Figure 7 shows Hines *et. al.* (2010) classification of vegetation layers as potential surface fuel loads. Hines *et. al.* provides an assessment of surface fuel hazard on a 5 step scale from low to extreme. The combined hazard rating for each layer provides an estimate of tons/ha of surface fuel load.

Canopy & Bark

Bark types includes Ironbark, Bloodwood and Lemon scented gum. These bark types are considered a low (lemon-scented gum) to moderate hazard (ironbark).

Elevated Fuels

Overall, elevated fuels were very sparse in most areas with isolated individuals and a scattered dry rainforest species component in this layer.

This layer was considered to present an overall low hazard.

Near Surface Fuels

Ground plants (near surface fuel) consisting of grazed low grasses with scattered patches of guinea grass to height of 0.75m. Density ranged from sparse to medium.

This layer was considered to present an overall low hazard.

Ground Fuels

Ground litter (surface fuel) was recorded as sparse primarily due to a reduced contribution from sparse upper layers.

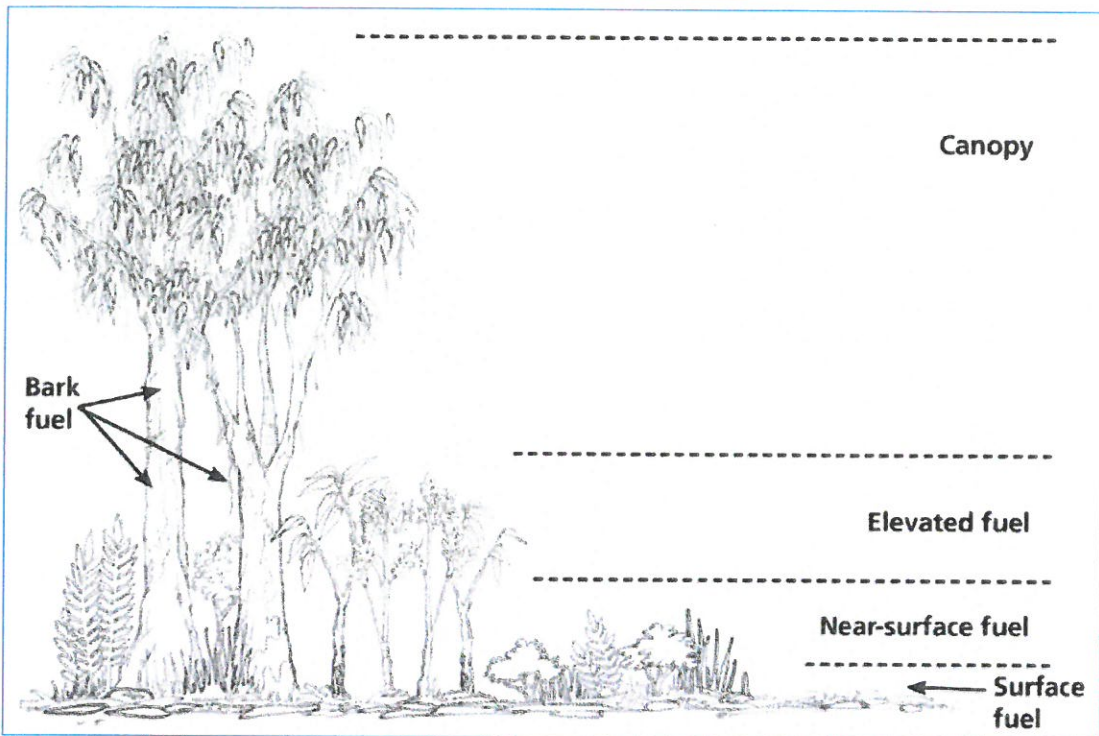


Figure 7. A diagram of various layers of vegetation hazard used in the BAL calculation for surface fuels (taken from Hines et. al., 2010)

3.2.1 Surface Fuel Load Estimate

The median value of indicative fuel loads (t/ha) for each layer of elevated fuel (Hines et. al. 2010) is provided in **Error! Reference source not found..**

Table 2. Results of estimated tons per hectare of the surface fuel loads at the site.

Surface layer	Hazard Rating	Tons/hectare
Bark	Low to Moderate	1
Elevated	Low	1
Near-surface	Low	6-8
Surface	Low	3
Total (t/ha) surface fuels		11-13

Total fuel loads for the site (canopy plus surface) are estimated to be between 10 to 20 t/ha which approximates 'woodland' vegetation types described in AS3959.

3.2.2 Aspect & Slope Hazard

Aspects are generally west. Aspects and associated slopes for the proposed lots are detailed in Table 3. Western to northern aspects are generally considered to be higher in hazard due to seasonal warm north easterly to north westerly winds. However, directions to the west have been cleared substantially reducing hazard from a westerly direction.

Site slope within the development area ranges from 0 to 7.5 degrees. Steeper slopes are present around the development. However, these slopes are uphill relative to the development and therefore assume an effective slope of 0 degrees for the purposes of assessing associated AS3959 Bushfire Attack Levels.

Table 3. Results of the bushfire hazard assessment for vegetation, slope and aspect adjacent to proposed lots 11 to 13.

Lot	Direction of primary hazard	Effective Slope ¹ (degrees)	Adjacent Vegetation Hazard Type	Notes on hazards
11	N, E & S	0 to < 5	Woodland	Nth aspect is bounded by existing road easement. Proposed building location is situated in existing cleared area on moderate slopes to the W. Limited extent of vegetation to the W.
12	N, E & S	0 to < 5	Woodland	Primary woodland hazard is located uphill to the E. Nth aspect is bounded by proposed lot 11 and lot 13 to the Sth. Proposed building location is situated in existing cleared area on gently sloping land. Limited extent of vegetation to the W.
13	N, E & S	0 to < 5	Woodland	Nth aspect is bounded by proposed lot 12 and the proposed access easement. Balance lot is located to the Sth. Proposed building location is situated in existing cleared area on gentle slopes to Nth W. Primary woodland hazard is located upslope and level. Limited extent of vegetation to the West.

1. Effective slope = the AS3959 BAL equivalent slope assessment between the hazard and the BLE.

3.3 Evidence of Fire

There was no evidence of recent fires at the time of the field study.

3.4 Assessed Hazard

With appropriate mitigation, the assessed hazard for proposed lots 11-13 is Low - Medium level bushfire hazard.

The most significant hazard (woodland on steep slopes) is located upslope from the proposed lots. The whole of the development is located downslope from the majority of natural hazards remaining after clearing for development.

Hazard levels are reduced by the location of the development in gentle slopes to up-slopes (effectively 0 degrees) and near the western boundary of the subject lot where substantial clearing has occurred in the adjacent allotment.

3.5 BAL Assessment

The proposed BLE's are located on the gentle lower slopes of a ridgeline to the east and adjacent to the western boundary of the subject lot. The primary hazard is located up hill and in a south to north direction. The Western extent is largely cleared. As such the BLE's are located in the least hazardous areas with close proximity to escape routes.

Vegetation is generally a fairly open 'woodland' category with very open understorey and low grasses in most places. Taller grasses (primarily guinea grass) does occur but was limited in extent at the time of survey.

Vegetation hazard presented by site vegetation and associated features may differ to the broad descriptions provided in the AS3959 vegetation classification. Where this is so, amendments will be provided and noted in the Construction Requirements of the Bushfire Management Plan.

Vegetation has been classified as 'woodland' with reference to the AS 3959. Slope and aspect affecting the proposed BLE locations is not significant due to the low slopes and reduced hazard in westerly directions. Recommendations for appropriate construction standards in relation to fire break widths are taken from Table 2.4.5 of the AS3959 is provided in Table 4.

Table 4. Fire setback ranges and associated BAL construction standards for lots 11, 12 and 13. A dwelling within the specified distance range to hazardous vegetation (woodland) should be constructed to the associated construction standard (BAL) (taken from Table 2.4.5 of the AS3959).

BAL Construction Rating	Dwelling fire buffer Ranges (m)
Aspect & slope range	Upslope aspects and flat land 0°
AS3959 vegetation class	Woodland
BAL-12.5	23-<100m
BAL-19	16-<23m

Bushfire Management Plan

4 Introduction

This Bushfire Management Plan has been developed following the guidelines set out in the State Planning Policy 1/03 Guideline "Mitigating the Adverse Impacts of Flood, Bushfire and Landslide" and the Rockhampton Regional Council Bushfire Management Planning Scheme Policy SC6.5 (2015). Construction standards and associated fire break distances are taken from the AS3959-2009 and associated amendments.

Residents must bear in mind that the site has been classified as having a **LOW to MEDIUM FIRE HAZARD**. Implementation of the Bushfire Management Plan will assist in addressing identified fire hazards on the property and in protecting life and property against bushfire.

Owners should implement all practical measures to prevent the loss of life and property. Measures should incorporate fire safety plans and escape strategies. Any new information additional to the assessment that will assist in the prevention of loss due to fire should also be considered.

Persons on the property should take the greatest caution when there is a risk of fire. In case of fire, immediate contact should be made with the relevant fire authority and all directions and advice should be followed.

The owners must implement and maintain fire management strategies and have a fire management safety plan in the event of fire.

4.1 Site Description

The subject of the Bushfire Management Plan is Lot 1844 on LIV40662 located at 277 Yeppoon Road, Parkhurst, Qld, 4701. See the Appendix for drawings (Hoffmann Surveyors drawing number R17006-001) for the proposed subdivision and proposed building location envelopes.

4.2 Area of Application

The area of application is the identified hazard for 100 metres surrounding the proposed BLE's. The subject site is identified as having a Low to Medium Bushfire Hazard.

The Bushfire Hazard Assessment forms a part of this Bushfire Management Plan.

5 Aims of the Bushfire Management Plan

Specific outcomes addressed in this Bushfire Management Plan are:

1. Development maintains the safety of people and property by:
 - a) Avoiding areas of Very High or High Bushfire Hazard; or
 - b) Mitigating the risk through:
 - Allotment design and the siting of buildings; and
 - Including firebreaks that provide adequate:
 - Setbacks between buildings/structures and hazardous vegetation, and
 - Access for fire-fighting/other emergency vehicles;
 - Providing adequate road access for fire-fighting/other emergency vehicles and safe evacuation; and
 - Providing an adequate and accessible water supply for firefighting purposes.
2. Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on hazardous materials manufactured or stored in bulk.

6 Responsible Agencies

The responsible Fire authority is the Queensland Fire and Rescue Service (QFRS). The Rural Division of the QFRS is responsible for bushfires. The Urban Division of the QFRS is responsible for structural fires.

The Local Authority is Rockhampton Regional Council. It is the responsibility of the Council and the building certifier to ensure that the measures outlined in this Management Plan are in place prior to the occupation of any buildings that are subject to this plan.

7 Expected Fire Behavior

Vegetation Hazard on the site was assessed within the SPP 1/03 MEDIUM HAZARD RANGE.

North east to westerly winds in combination with warm dry weather conditions in late spring to early summer represent the highest risk of bushfire in the area.

Likelihood of fire and fire intensity will depend on fuel accumulation. Fires are likely to be infrequent and usually burn only under severe conditions. Fires may be severe with flame lengths of 15 to 20 metres with little ember attack.

7.1.1 Likely Direction of Bushfire Attack

Aspects to the North and East represent the greatest potential seasonal hazard on this site. However, bushfire attacks from these aspects are mitigated by the upslope vegetation of predominant woodlands. Aspects to the North and South represent a risk as the vegetation is continuous within the subject lot. However this aspect is effectively level and with appropriate mitigation the fire hazard will be reduced from these directions by the relatively gentle slopes. Aspects to the West are lowered due to the substantial existing clearing of vegetation and flat land.

8 Fire Fighting Requirements

8.1 Water supply for firefighting purposes

Adequate water for firefighting purposes is to be provided by either:

1. a reliable reticulated water supply, that has sufficient flow and pressure characteristics for firefighting purposes at all times (minimum pressure and flow is 10 litres a second at 200 kPa; or
2. On-site water storage of not less than 20,000 litres kept full at all times to be located within 30 metres of the dwelling; and
 - 2.1. Water storage tanks are to be constructed of non-combustible materials;
 - 2.2. Are to be accessible at all times to any appliance from the Queensland Fire and Rescue Authority;
 - 2.3. Be provided with a hardstand area suitable for 2 wheel drive heavy vehicles located within 6 metres of the water source;
 - 2.4. All water storage tanks are to have a standard 50 mm ball valve and male 'cam-lock coupling' with a blanking cap attached to the tank in an accessible location to provide water for fire suppression; or
 - 2.5. For underground tanks, an access hole of 200 millimetre diameter (minimum) to allow access for suction lines.

8.2 Roads and Dwelling Access

See Figure 8 for access to proposed BLE's. The proposed BLE for each allotment are also indicated in the appended drawing Hoffmann Surveyors drawing number R17006-001. Access routes are as follows:

1. Lot 11 has direct access to McMillan Avenue;
2. Lot 12 has access to Alfred Road via a proposed easement through Lot 485 on LIV40112. The internal drive will be approximately 170m long;
3. Lot 13 has access to Alfred Road via an easement through Lot 485 on LIV40112. The internal drive will be approximately 280m long. Consequently, a passing bay will be required consistent with requirements indicated in Section 8.2;
4. The proposed easement through Lot 485 on LIV40112 will be approximately 280m long. Consequently, a passing bay will be required consistent with requirements indicated in Section 8.3.

An agreement for mutual emergency access between Lot 11 and Lot 12 is recommended to provide an additional escape direction from lot 11 and lot 12. This could consist of an unlocked gate between the two proposed lots. Each owner would be responsible for their portion of any access track. There was an access track along the western boundary at the time of survey.

8.3 Driveways & Tracks

Driveways to the house site are to:

1. Be constructed to a standard so that they are accessible by 2 wheel drive QFES fire fighting vehicles in all weather conditions and capable of accommodating a vehicle of 15 tonnes;
2. Consist of a 3.5m wide formed road with a clearance height of 4.8 metres and hazardous vegetation cleared for a width of 2 metres either side of the driveway.
3. Fire trails where provided are to be kept in a condition suitable for 4 wheel drive vehicles and otherwise to the satisfaction of QRFS.

In addition, driveways greater than 200 metres must:

4. Have a passing bay for firefighting appliances at no less than 200 metres distant from either the dwelling or access road;
 - 4.1. for the easement over Lot 485 on LIV40112 no less than 200m distant from either Alfred Road or the lot 13 western boundary;
5. Have a turning circle with a minimum radius of 8m (including roll-over kerbs if they are provided) no further than 50m from the dwelling. Other solutions using T or Y heads of specified dimensions are also appropriate. See Figure 9 for example turnaround areas;

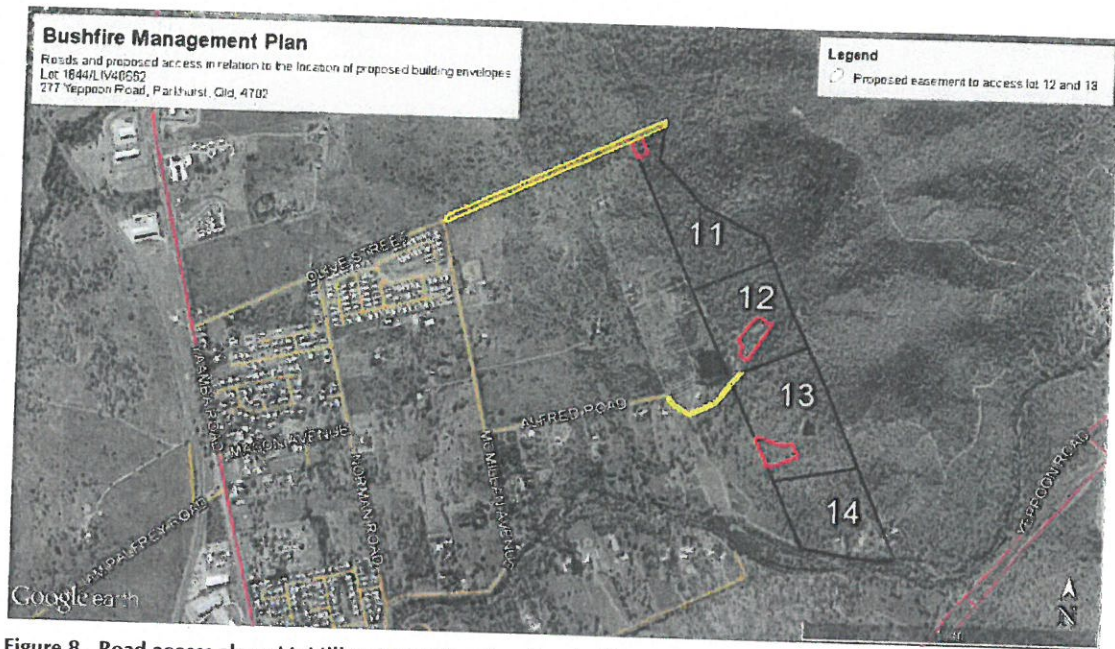


Figure 8. Road access along McMillan Ave (Olive Street) and Alfred Road to proposed allotment design.

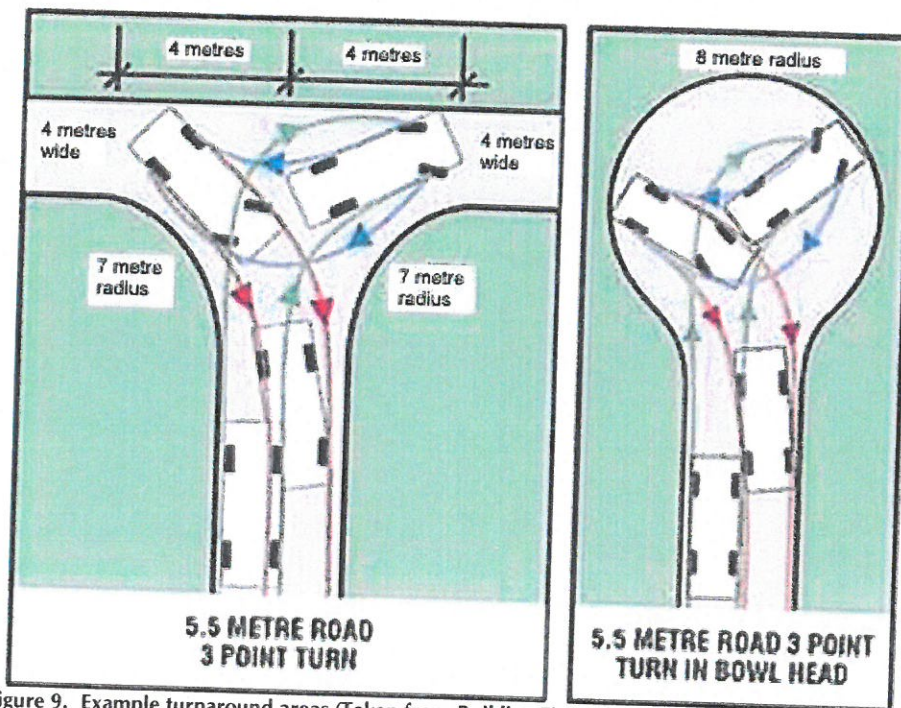


Figure 9. Example turnaround areas (Taken from *Building Fire Safety Management Tool & Advisory Notes*, State of Queensland (Queensland Fire and Emergency Services) 2015). Emergency turnarounds do not have to comply exactly with the above drawings but should be dimensioned to facilitate an emergency services vehicles turning radius.

8.4 Firebreaks & Buffers

8.4.1 Fire Breaks (Setbacks).

1. The dwelling should be sited so that minimum firebreaks (Setback Zones) between hazardous vegetation and the dwelling indicated in Table 5 are achieved:

Table 5. Hazard setback distances and associated BAL construction standards for dwellings on proposed lots 11-13. A dwelling within the specified distance range to hazardous vegetation (woodland) should be constructed to the associated construction standard (BAL) (Table 2.4.5 of the AS3959).

Bushfire Attack Level (BAL) construction standards and associated fire break ranges (m) for slopes of 0-5°			
Notes	Minimum AS3959 Construction Standard	BAL	Minimum distance range from hazard (metres)
Firebreak widths and associated standards and construction	BAL—12.5		23- <100m
	BAL—19		16- <23m

8.4.2 Fire lines & Trails

Maintain any additional firebreaks to the following standards:

1. No less than 6 metres wide and slashed or poisoned on a regular basis such that vegetation is kept at a maximum height of 200 millimetres; and
2. Fire trails where provided, are to be kept in a condition suitable for 4 wheel drive vehicles and to the satisfaction of the fire Brigade.

8.4.3 Landscaping

1. The dwelling should be located so that it is:
 - a) 10 meters from any retained vegetation strips or small areas of vegetation;
 - b) Retained trees in the Setback Zone (fire break as specified in Table 5) should provide a non-continuous canopy with a total canopy cover of less than 10%; and
 - c) All dead and damaged timber is to be removed within the Setback Zone.
2. Lawns and Gardens within 10m width surrounding the dwelling are to be kept at no greater than 50mm in height;
3. Grassed areas and lawns for a further 10m are to be kept at no greater than 150mm;
4. The balance of the setback zone will be kept in a hazard reduced state: free of weeds (particularly lantana and guinea grass) and grasses at no greater than 200mm high; and
5. Landscaping trees within 10m of residences should be fire resistant species. No tree or shrub should be in contact with or overhang buildings.

9 Construction Standards

The dwelling will conform to the following requirements:

1. The dwelling is to conform to Australian Standards AS 3959 – 2009 in association with the hazard setback zone indicated in Table 5;
2. All guttering and downpipes will be manufactured in non-combustible materials; and
3. The dwelling will have non-combustible gutter guards on all guttering.

10 Warning and Evacuation Procedures and Routes

The internal access road for lot 11 leads from McMillan Ave (Olive Street), south to the proposed dwelling. The internal access road for lot 12 and 13, leads from Alfred Road, east to the proposed dwellings.

An agreement for mutual emergency access between Lot 11 and Lot 12 would provide an additional escape direction for both of these lots. This could simply consist of an unlocked gate between the two proposed lots. Each owner would be responsible for their portion of any access track. There was an access track in this location at the time of survey.

Owners should establish a Fire Safety Plan and Emergency Evacuation Plan for the event of fire including all suitable evacuation routes from their land and dwelling for fire from all potential directions.

In the event of a fire, dialling 000 obtains emergency assistance.

10.1 Purchaser/Resident Education and Awareness Programs

Each owner should be provided with a copy of this Fire Management Plan with an alert placed either on the title or Council rate searches that the Fire Management Plan is in existence and is to be made available to subsequent owners. The hazard ratings are to be placed on council plans and / or rate notices.

Owners should read and be familiar with the information contained in this report. Owners are responsible for maintenance of fire reduction measures on the site to reduce the risk of fire. Owners should establish a Fire Safety Plan and Emergency Evacuation Plan in the event of fire.

Owners should establish a Fire Safety Plan and Emergency Evacuation Plan for the event of fire including all suitable evacuation routes from their land and dwelling for fire from all potential directions. In the event of a fire, dialling 000 obtains emergency assistance.

Residents should maintain regular contact with the Rockhampton Fire Brigade for local information updates and check the Queensland Rural Fire Service website (www.ruralfire.qld.gov.au) for any updated fire safety guides and further information.

Examples of Fire Safety Plans include the *Rural Property Fire Management Guide* and 'Plan Act Survive' - *Bushfire Survival Plan*.

Additional recommendations to reduce fire risk around the dwelling are provided in Table 6.

Table 6. Hazard Reduction Measures: The following recommendations provide additional measures to reduce hazards around the dwelling

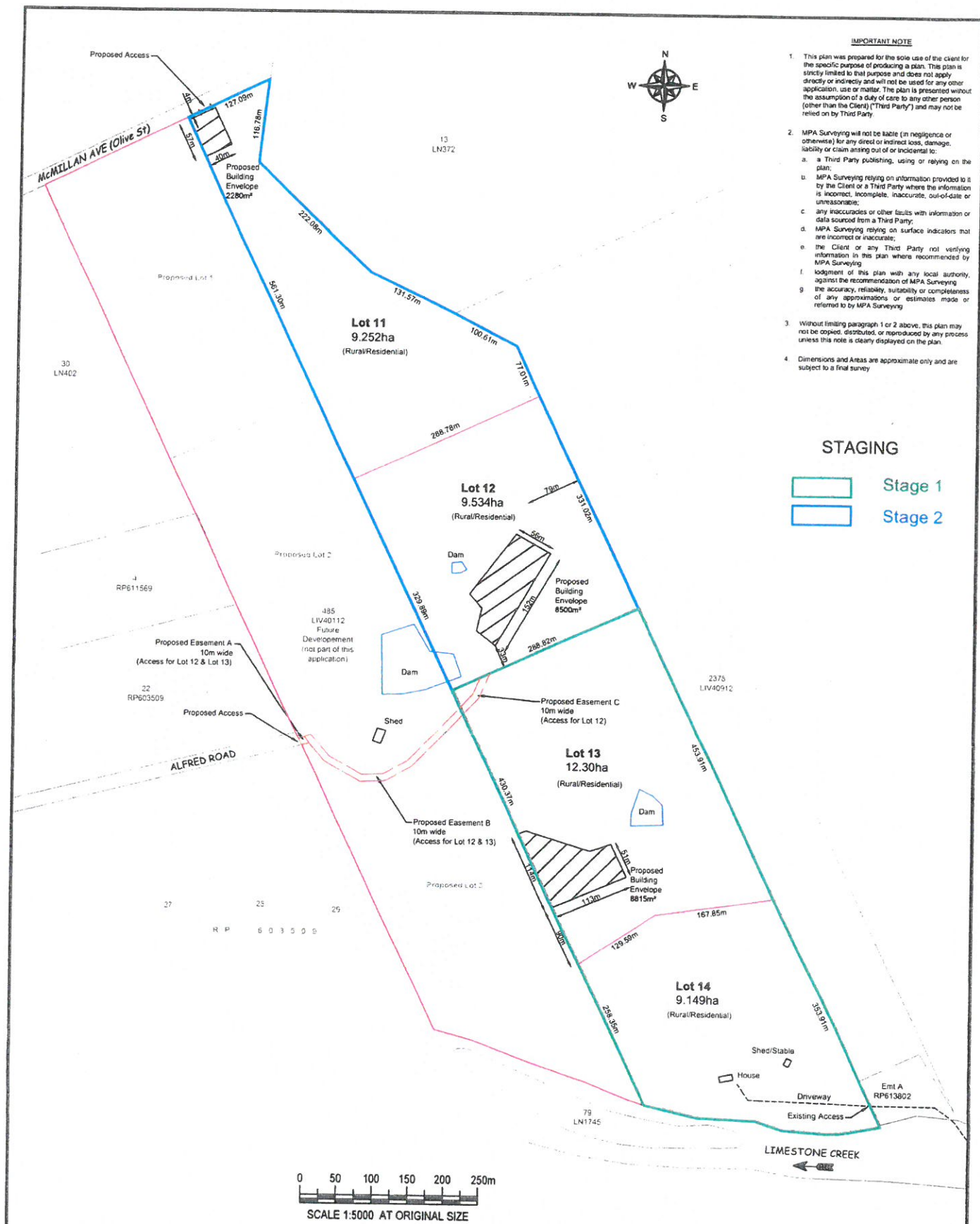
Category	Issue	Action
Buildings	Maintenance: Buildings and Grounds	<ul style="list-style-type: none"> • Clear overhanging trees and shrubs from dwellings and associated structures; • Point LPG gas tank relief valves away from dwellings; • Store flammable items well away from dwellings (e.g. woodpiles, boxes, paper); • Secure roof and clean gutters of dry leaf debris to eliminate an ignition source for embers; • Clear fuels around the house for at least 20 metres; • Trim under fences and remove overgrown bushes and plants; • Ensure surrounding grassed areas are trimmed and well-watered; and • Install non-flammable gutter guards.
Water	Water Supply and firefighting equipment	<ul style="list-style-type: none"> • The development is within eighty (80) metres of a hydrant with a reticulated water supply or • Water sources for firefighting may include an accessible dam or tank with fire brigade tank fittings, a swimming pool, bore water etc. These sources should be provided with all-weather access; • All structures should be provided with a garden hose with metal fittings attached to the water supply at all times. The hose is should be of sufficient length to reach all sides of a building; and • Regularly check that firefighting equipment is operational.
Hazard Reduction	Close proximity of buildings to hazardous vegetation Hazard reduction:	<ul style="list-style-type: none"> • Trees should be located at a sufficient distance away from dwellings so that when fully mature, branches do not overhang the eaves of the house. • Create a fuel reduction zone adjacent to a dwelling. Remove hazardous vegetation. Do not cause erosion when reducing potential fuel loads in these areas. • Within the hazard reduction zones, hazardous understory vegetation (dry sclerophyll species) should be removed within the setback zone of all structures. These can be replaced with fire resistant species.
Landscaping	Growth of grasses and other fire prone vegetation in disturbed and cleared areas	<ul style="list-style-type: none"> • Remove hazardous grasses and undesirable regrowth from buffer areas; and • Maintain all safety buffer areas free of weeds and tall grasses to maximum heights set out in this Bushfire Management Plan.
	Landscaping species	<ul style="list-style-type: none"> • Plant fire resistant trees and shrubs; • Avoid using palm trees and ferny leaved trees near the dwelling. These species are susceptible to burning. • Ensure only evergreen species are planted; and • Landscaped vegetation within building setback zones should be of a low fire hazard. Rainforest species local to the area and fire resistant species are preferred.

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12 Appendix

Hoffmann Surveyors Drawing number R17006-001



**HOFFMANN
SURVEYORS**



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Rockhampton Longreach Blackall CADASTRAL ENGINEERING MAPPING TOWN PLANS

Project: 1844 LIV40662 Subdivision		BPA Job No: R17006		Scale: 1:5000 at A3	
Title: Proposed Subdivision Layout		Level Datum:		Origin:	
Client: Reel Planning		BPA Drawing No: R17006-001		Revision: C	
				Sheet: 1 of 1	
C	Boundary & Easement amended	10/10/17	SP	KN	KM
B	Easements Amended	29/3/17	KN		
A	Original Issue	16/2/17	KN		
Rev.	Reason for Issue or Amendment	Date	Drawn	Checked	Surveyed

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ROCKHAMPTON REGIONAL COUNCIL

These plans are approved subject to the current
conditions of approval associated with

Development Permit No. D/19-2017

Dated 14-12-2017

Regulated Vegetation Impact Assessment and Mitigation

RaL 1 lot to 4 on Lot 1844 on LIV40662

For Vicki Heilbron

Publication Details

Title: Regulated Vegetation Impact Assessment and Mitigation
RaL 1 lot to 4 on Lot 1844 on LIV40662

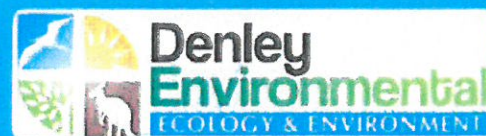
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1 Background

Lot 1844 on LIV40662 is the subject of a development application for reconfiguration of a lot. The development proposed is a 1 into 4 lot subdivision. There is one existing dwelling and three proposed dwellings. The subject of this vegetation impact assessment is the proposed reconfigured lot design and proposed building location envelopes on Lot 1844 on LIV40662 for proposed lots 11, 12 and 13.

A plan of the proposed reconfiguration of the lot and building location envelopes with surrounding roads and access is appended (Hoffmann Surveyors - drawing number R17006-001). An extract of this drawing is shown in Figure 2.

1.1 Site Location

The site is described as Lot 1844 on LIV40662 located at 277 Yeppoon Road, Parkhurst, QLD, 4702. The site is located in the Rockhampton Regional Council and is approximately 10 kilometres north north east of Rockhampton. See Figure 1 for the site location.

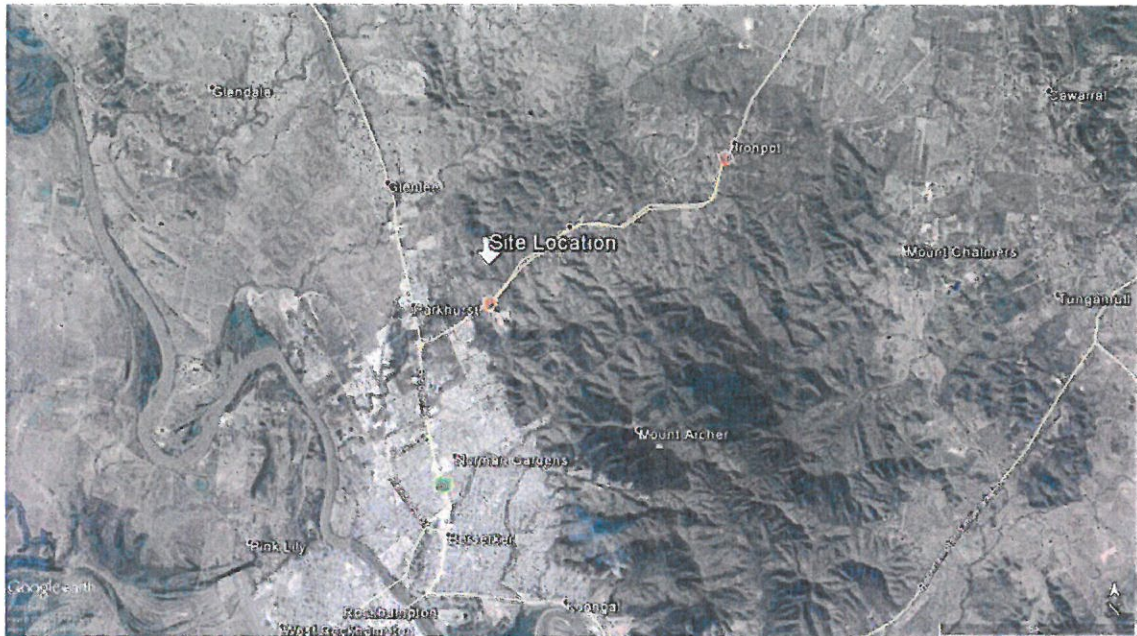


Figure 1. Site location of Lot 1844 on LIV40662, 277 Yeppoon Road, Parkhurst, QLD, 4702.

1.2 Lot Configuration and Dwelling Locations

The proposed lot reconfiguration and building location envelopes are provided in Figure 2 and appended surveyors drawing.

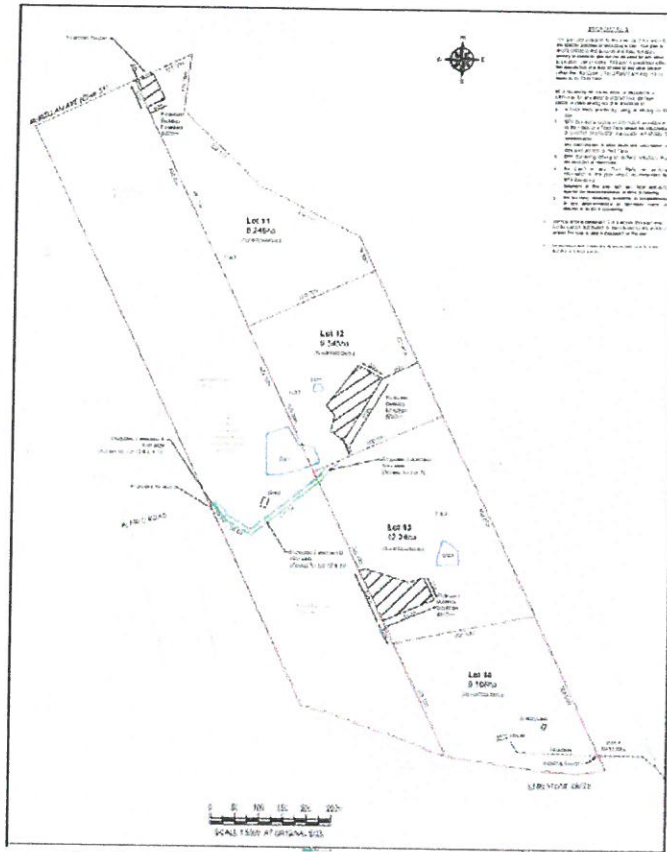


Figure 2. Surveyors drawing of the proposed reconfiguration and location of building location envelopes on Lot 1844 on LIV40662.

2 Vegetation and Associated Impacts

The proposed development includes the creation of three new common boundaries within the subject lot and three Building Location Envelopes (BLE). The new configuration is referred to as lots 11 to 14. Lot 14 will contain the existing dwelling. Lots 11 to 13 include new BLE's and new common boundaries.

Clearing associated with the development is related to:

- Lot 11: a BLE and a common boundary.
- Lot 12: A BLE and two common boundaries
- Lot 13: A BLE and a common Boundary

An easement is proposed through the adjacent lot to the west (Lot 485 on LIV40112) however this will be located within non-remnant vegetation.

2.1 Regulated Vegetation Impacts

The Vegetation Management Supporting Map shows affected vegetation as RE 11.12.4 and a mixed polygon of RE 11.12.1/11.11.15 (50:50). See Figure 4.

Total clearing of regulated vegetation is 1.6Ha, consisting of:

- 0.48Ha of RE 11.12.4; and
- 1.12Ha of RE11.12.1/11.11.15 (50:50).

The location of potential Regulated Vegetation clearing on each lot is shown in Figure 4.

A first order watercourse is located across the boundary between lots 12 and 13. See Figure 3.

2.2 Site Vegetation

A site verification of vegetation indicated the location for RE 11.12.4 was not correct. This RE is present but located near the top of the range to the east of the subject lot. Vegetation within this polygon was RE11.12.1/11.11.15.

Site vegetation canopy was dominated by *Eucalyptus crebra* and *Corymbia citriodora* with *Corymbia* spp. (bloodwoods) associated. Vegetation on Lot 11 is a mixed woodland of *E. crebra*, *C. citriodora* and bloodwoods, not SEVT (RE 12.11.4).

Tallest vegetation adjacent to the proposed building envelopes was 17 metres for lots 12 and 13 and 16 metres for lot 11. A generic bushfire buffer of 27 metres was used to determine potential impacts. The associated Bushfire Management Plan (Denley Environmental, March 2017) provides hazard reduction distances in accordance with the Australian Standard 3959.



Figure 3. Location of a first order watercourse across the boundary of proposed lots 12 and 13.

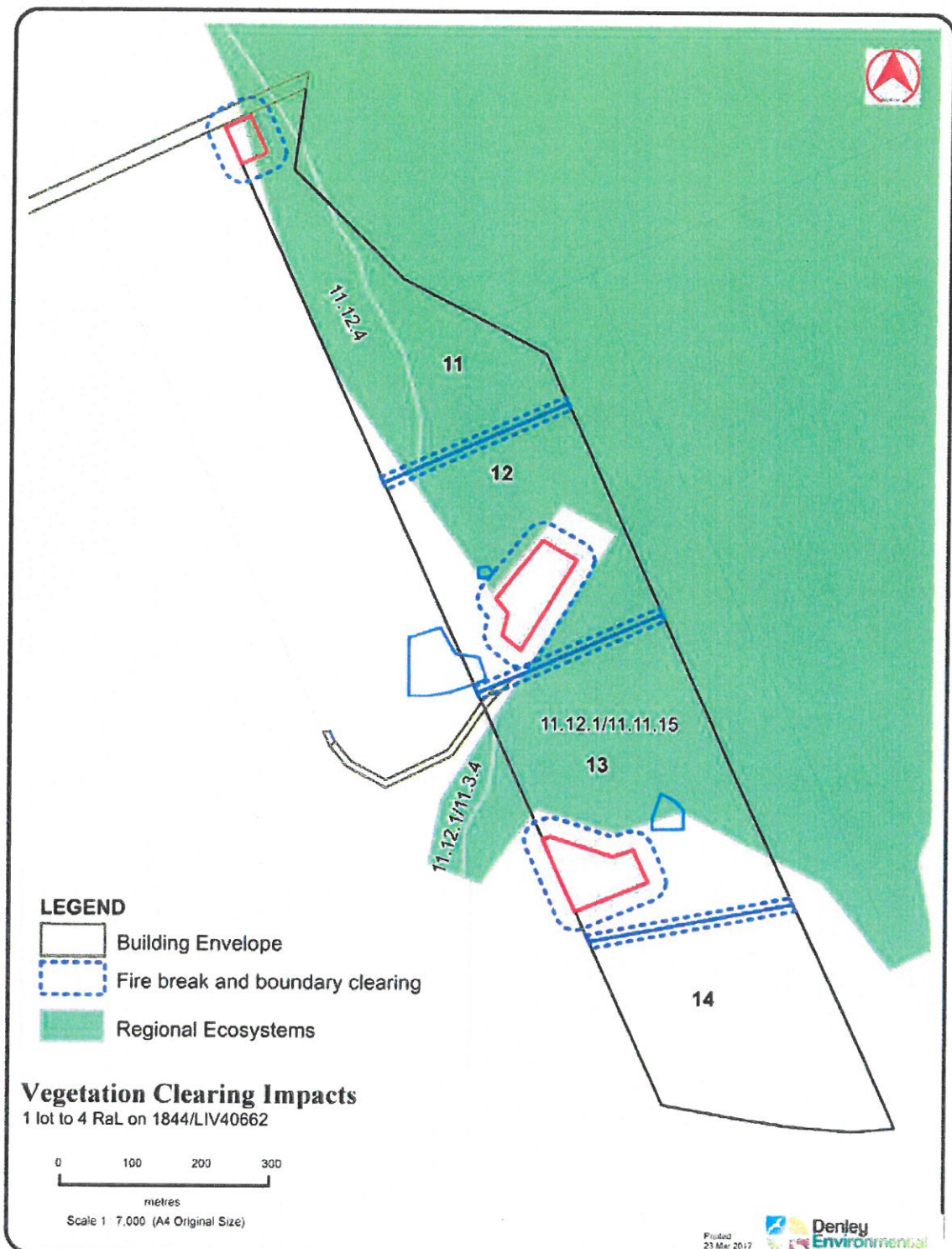


Figure 4. Map of clearing areas. The diagram shows the location of proposed BLEs in relation to regulated vegetation. Blue dashed lines represent maximum potential proposed BLEs in relation to regulated vegetation. Blue dashed lines represent maximum potential clearing areas which are: 10m either side of a common boundary and 27m around BLE's

2.3 Essential Habitat

Figure 5 provides the location of Essential Habitat in relation to the subject lot. Building envelopes and associated clearing for bushfire hazard are located to avoid impacts to Essential Habitat (see Figure 4).

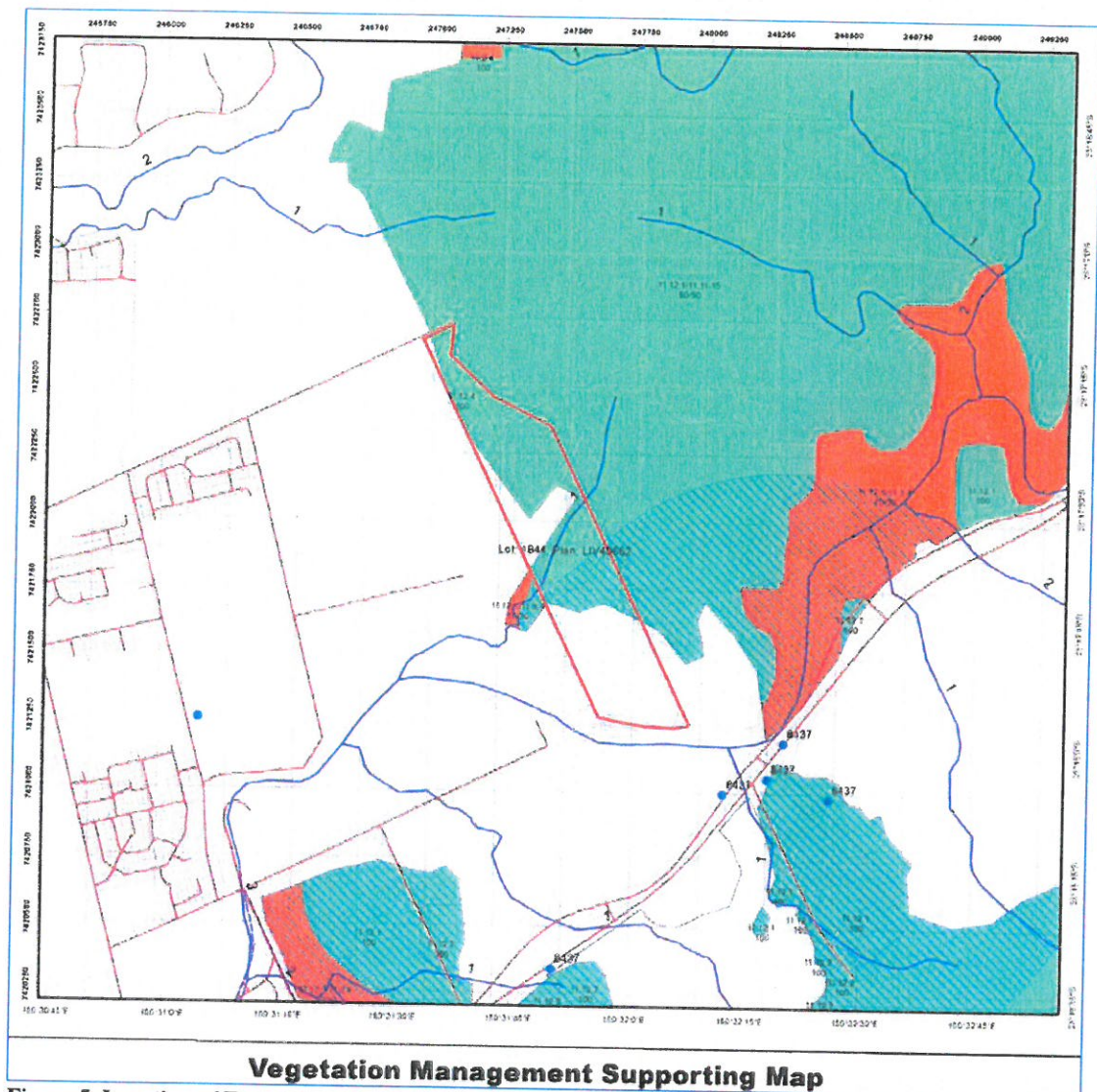


Figure 5. Location of Essential Habitat on the subject lot. Modified from the Vegetation Management

3 Queensland Vegetation Management State Code

The subject lot is located within the Brigalow Belt Subregion, Marlborough Plains.

Vegetation densities are defined in the Regional Ecosystems Description Database as *Sparse* for RE 11.12.1 and RE 11.11.15 and *Dense* for RE 11.12.4.

The subject allotment is 40.88 hectares. Remaining regulated vegetation is 22.214 hectares constituting 54.3% of the allotment area. Potential clearing of regulated vegetation associated with the development proposal is 1.6 hectares which will reduce total regulated vegetation cover over the subject lot to 50.4%.

3.1 Table 8.1.3 Clearing to avoid and minimise impacts

PO1 Clearing to avoid and minimise impacts

Building envelopes have been located to take advantage of existing cleared areas and to avoid impacts to Essential Habitat located on the site.

Proposed access is via public roads, existing property roads and through not remnant vegetation

PO2 Clearing on land where compliance notice, enforcement notice, exchange area or offsets exists

There is no compliance notice, enforcement notice, exchange area or offsets over the subject lot.

PO3 No clearing of vegetation as a result of the material change of use or reconfiguration of a lot

Limited clearing will occur.

PO4 Clearing that could already be done under an exemption

Clearing is associated with the Development Application.

3.2 Table 8.1.4

PO1 Limits to clearing

Clearing is limited to the extent that is necessary for establishing a necessary fence, firebreak, road or vehicular track, and for constructing necessary built infrastructure.

PO2 Wetlands

There are no natural wetlands located on or near the subject lot.

PO3 Watercourses

The watercourse located on the subject site is Stream Order 1. The stream is located within Regional Ecosystems RE 11.12.1 / RE 11.11.15 (50:50). Both of these Regional Ecosystems are defined as *Sparse*. Clearing associated with the shared boundary will be no greater than 20 metres wide which is consistent with *Sparse* vegetation categories indicated in Table 1 of the Queensland Vegetation Management State Code.

PO4 Connectivity (public safety and relevant infrastructure)

Regulated vegetation within the lot is located on the western extent of a large expanse of remnant vegetation. Total potential clearing will consist of 1.6 hectares of regulated vegetation. Remaining remnant vegetation cover after clearing will be 50.4% of the subject lot.

Clearing associated with the proposed development will not:

occur in areas of vegetation that are less than 10 hectares

reduce the extent of vegetation to less than 10 hectares

occur in areas of vegetation less than 100 metres wide

reduce the width of vegetation to less than 100 metres or

occur where the extent of vegetation on the subject lot is reduced to or less than 30 per cent of the total area of the lot.

PO6 Soil erosion

The application is a development application where a local government is the assessment manager.

PO7 Salinity

Clearing does not occur in or within 200 metres of a discharge area or recharge area and clearing will be less than 2 hectares.

PO8 Conserving endangered and of concern regional ecosystems

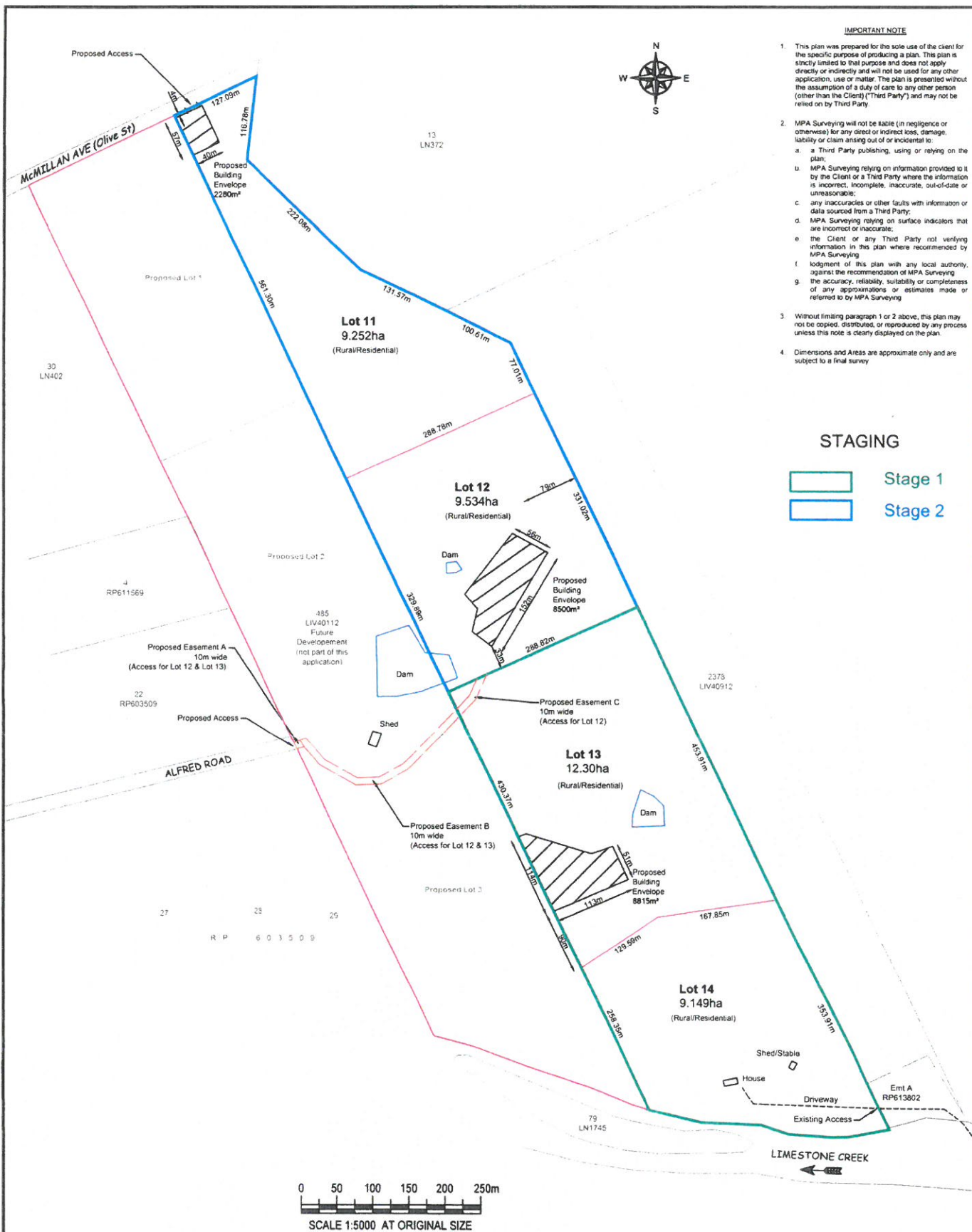
Clearing will not occur within endangered or of concern regional ecosystem.

PO9 Essential habitat

Essential habitat is present within the subject lot. However, clearing will not occur within the essential habitat area.

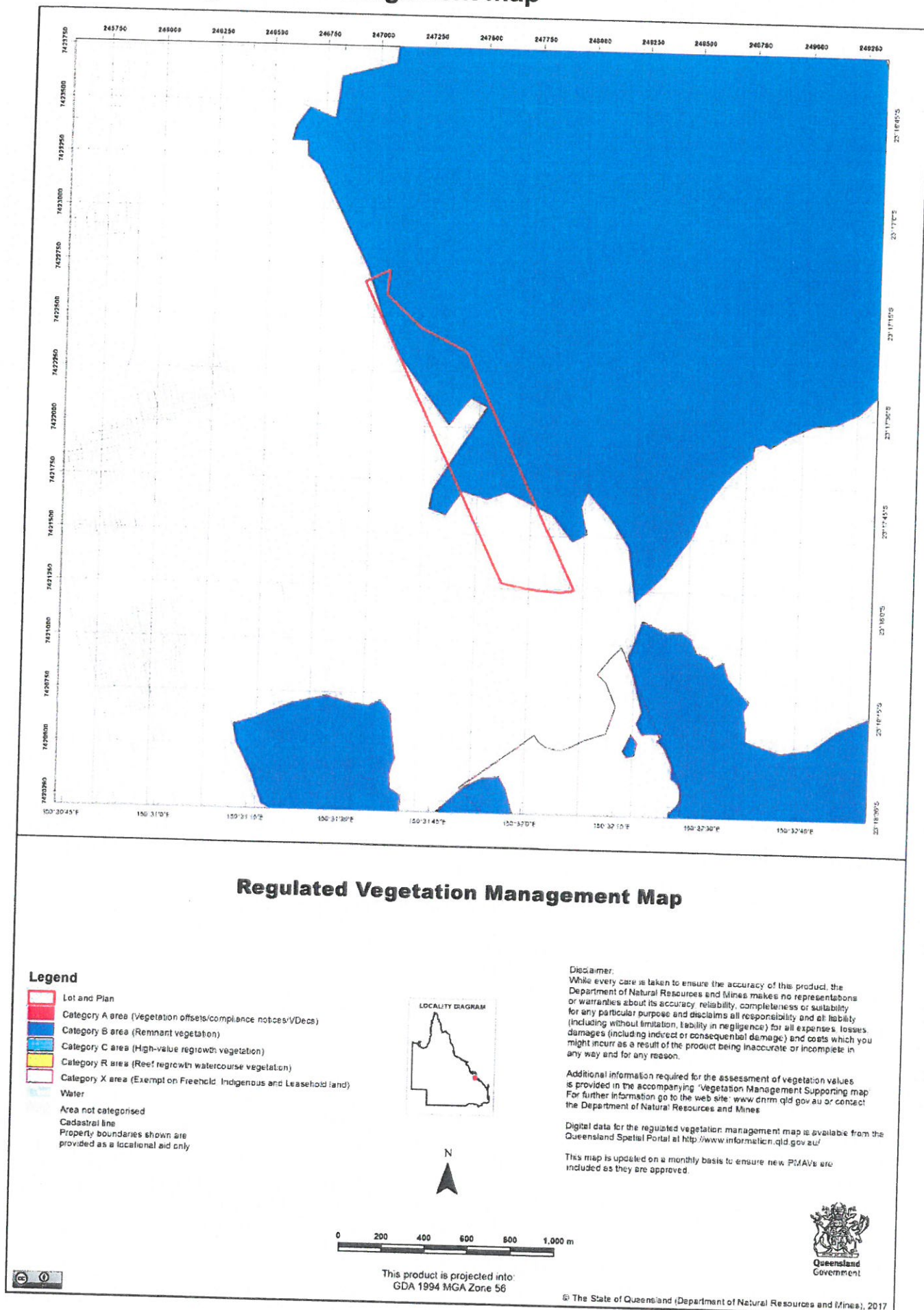
PO10 Acid sulfate soils

Clearing will not occur in land zone 1, land zone 2 or land zone 3.



HOFFMANN SURVEYORS Head Office 37 Withers St, Rockhampton, QLD 4701 P 07 4922 3534 www.hoffmannsurveyors.com.au Rockhampton Longreach Blackall CADASTRAL ENGINEERING MAPPING TOWN PLANNING		Project: Lot 1844 LIV40662 Subdivision Title: Proposed Subdivision Layout Client: Reel Planning		MPA Job No: R17006 Level Datum: Origin MPA Drawing No: R17006-001 Revision: C Sheet: 1 of 1		Scale: 1:5000 at A3 Co-ord System:	
C	Boundary & Easement amended	10/10/17	SP	KN	KN		
B	Easements Amended	29/3/17	KN				
A	Original Issue	16/2/17	KN				
Rev.	Reason for Issue or Amendment	Date	Drawn	Checked	Surveyed		

5.1 Regulated vegetation management map



5.2 Vegetation management supporting map

