

Ministerial Direction	Assessment
3.3 Home Occupations Planning proposals must permit home occupations to be carried out in dwelling houses without the need for development consent	Consistent – In the event that the site is successfully rezoned R2 Low Density Residential, it is recommended that home occupations be listed as a permissible use.
3.4 Integrating Land Use and Transport The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives: (a) improving access to housing, jobs and services by walking, cycling and public transport, and (b) increasing the choice of available transport and reducing dependence on cars, and (c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and (d) supporting the efficient and viable operation of public transport services, and (e) providing for the efficient movement of freight. A planning proposal must locate zones for urban purposes and include provisions that give effect to and are consistent with the aims, objectives and principles of: (a) Improving Transport Choice – Guidelines for planning and development (DUAP 2001), and (b) The Right Place for Business and Services – Planning Policy (DUAP 2001).	Consistent The site is located 750 metres south of King Highway and central Bungendore. The planning proposal will provide additional residential land in close proximity to existing services in the Bungendore town centre. The Site will provide a rational extension of the adjoining R2 Low Density Residential zoned land and will permit the redevelopment of this otherwise underutilised site.
3.5 Development Near Licensed Aerodromes	N/A – The planning proposal does not seek to create, alter or remove a zone or a provision relating to land in the vicinity of a licensed aerodrome.
3.6 Shooting Ranges	N/A – The planning proposal will not affect, create, alter or remove a zone or a provision relating to land adjacent to and/ or adjoining an existing shooting range.
Hazard and Risk	
4.1 Acid Sulfate Soils	N/A – The planning proposal does not provide for an intensification of land uses

Planning Proposal – Majara Street

Ministerial Direction	Assessment
	on land identified as having a probability of containing acid sulfate soils.
4.2 Mine Subsidence and Unstable Land	N/A – Site not located within a Mine Subsidence District.
4.3 Flood Prone Land	N/A – The site is not located on land identified as Flood Prone Land, pursuant to PLEP 2014.
4.4 Planning for Bushfire Protection The objectives of this direction are: (a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and (b) to encourage sound management of bush fire prone areas.	Consistent – The planning proposal is shown on Council's bushfire map as bushfire prone land 'Class 2' A Bushfire Assessment has been attached with this planning proposal, demonstrating the site can comply with mitigation and protection requirements.
Regional Planning	
5.1 Implementation of Regional Strategies The objective of this direction is to give legal effect to the vision, land use strategy, policies, outcomes and actions contained in regional strategies.	The proposal is inconsistent with this direction however it is argued that the inconsistency is of minor significance and the planning proposal achieves the overall intent of the Sydney-Canberra Corridor Regional Strategy. The proposal has demonstrated consistency with the sustainability criteria and will provide residential land uses within the established Bungendore township. The proposal will assist in meeting the residential housing targets set by the strategy and presents a reasonable and logical expansion of the existing residential zone.
5.2 Sydney Drinking Water Catchments	N/A – Site is not within the Sydney drinking water catchment.
5.3 Farmland of State and Regional Significance on the NSW Far North Coast	N/A – Site not within the NSW far north coast.
5.4 Commercial and Retail Development along the Pacific Highway, North Coast	N/A – The site is not located in the vicinity of the existing and/or proposed alignment of the Pacific Highway.
5.5 Development in the vicinity of Ellalong, Paxton and Millfield	Revoked
5.6 Sydney to Canberra Corridor	Revoked
5.7 Central Coast	Revoked

Ministerial Direction	Assessment
5.8 Second Sydney Airport: Badgerys Creek	N/A – Site not located in the vicinity of any future second Sydney airport at Badgerys Creek.
5.9 North West Rail Link Corridor Strategy	N/A – Site not located in Hornsby Shire Council, The Hills Shire Council and Blacktown City Council.
Local Plan Making	
6.1 Approval and Referral Requirements The objective of this direction is to ensure that LEP provisions encourage the efficient and appropriate assessment of development.	Consistent – The planning proposal will not modify approval and referral requirements for future Development Applications on the site.
6.2 Reserving Land for Public Purposes	N/A – The proposal seeks to rezone land from IN2 Light Industrial to R2 Low Density Residential, which does not result in a net reduction of land for public space.
6.3 Site Specific Provisions	Does not apply.
Metropolitan Planning	
7.1 Implementation of A Plan for Growing Sydney	N/A - Not within the Strategy area.
7.2 Implementation of Greater Macarthur Land Release Investigation	N/A – Not within the area to which the direction applies.

5.3 Section C – Environmental, Social and Economic Impact

5.3.1 Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats will be adversely affected as a result of the proposal?

If the Site contains critical or threatened species or their habitat, it will be necessary to carry out an assessment of significance in accordance with section 5A of the EP&A Act and the *Threatened Species Conservation Act 1995*.

A desktop review of the ACT Commissioner for Sustainability and Environment indicates that the following plant and animal species occur in the (former) Palerang council area:

- Twenty-seven plant species in the council area are listed as endangered or vulnerable in NSW and/or nationally; and
- Fifty-one vertebrate animal species recorded in the former Palerang Council Area are listed as endangered or vulnerable. They include 16 mammals, 23 birds, seven amphibians, three reptiles and two fish.

Historically the site has been cleared of native vegetation and used for grazing. The site comprises very poor quality grazed grass which has resulted in significant loss of natural habitat for native plants and animals.

As identified in the Land Use Strategy and Structure Plan, the subject site is not located in an area of High or Medium conservation value (DECC). A desktop study was undertaken on NSW

office of Environment and Heritage BioNet, the website for the Atlas of NSW Wildlife, which did not identify any species sightings on the subject land.

An extract from the Terrestrial Biodiversity Map (Sheet BIO_004, Figure 19) from the PLEP 2014 broadly designates the Site as containing biodiverse land. As previously discussed, the Site comprises cleared and grazed pasture which is highly disturbed and has very little biodiversity value. As a result, it is anticipated that the rezoning will result in a negative net impact on the existing environment.



Figure 17: Broad scale Identification of High and Medium Conservation Value Areas

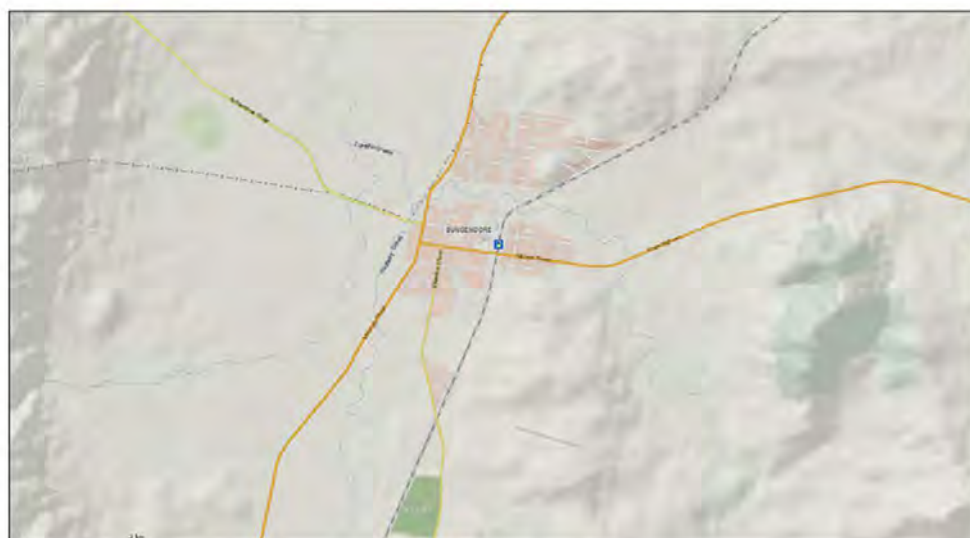


Figure 18: NSW BioNet Map



Figure 19: Extract from the Terrestrial Biodiversity Map PLEP 2014

5.3.2 Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be mitigated

This section outlines an assessment of the key considerations of the planning proposal as described in the preceding sections of this report, and including:

- Drainage;
- Bushfire;
- Traffic and Access;

Drainage

A drainage assessment report has been prepared by SMEC in relation to the Site and surrounds in order to demonstrate that the rezoning of the subject site will not adversely impact the existing characteristics of the catchment.

The Site relies upon an existing 3m wide drainage easement which has been incorporated in the drainage design for the adjoining subdivision to the south (Majara St Stage 2). This drainage easement is to be upgraded as part of the subdivision works in Stage 2 and will increase the flow capacity.

However, it is relevant to note that in changing the zoning from IN2 Light Industrial to R2 Low Density Residential, the likely runoff will be reduced. Industrial sites are assumed to be 100% impervious due to structures and hardstand areas. Comparatively, the drainage model has assumed the site to have an impervious area of 70%.

Notwithstanding, the model demonstrates that with the upgrades proposed to the easement and the inclusion of detention storage within the future subdivision (subject to separate approval), the future development of the Site for residential purposes will not increase peak flows or adversely impact the characteristics of the catchment. If required, opportunities to increase the detention storage within the Site in order to provide a freeboard in the easement, can be considered in the detailed hydraulic design of the future subdivision.

A full copy report is attached and marked **Annexure 1**.

Bushfire

A Bushfire Hazard Risk Assessment Report was prepared by Bushfire & Excavation Solutions, which provides an assessment of bushfire risk and bushfire protection measures relevant to residential and light industrial land within Lots 3–6 Majara Street Bungendore NSW.

The report makes a series of recommendations and conclusions in relation to the threat of bushfires in the area. A full copy report is attached and marked **Annexure 2**.

The report states that this proposal can comply with *Planning for Bushfire Protection 2006* (PBP 2006), as required under section 100B of the *Rural Fires Act 1997* and section 79BA of the *Environmental Planning and Assessment Act 1979*, subject to the following protection measures:

- APZ management within the subject site.
- Residential bushfire construction in accordance with the provisions of AS 3959-2009.
- Standards relating to the provision of water supplies and utilities required for fire-fighting operations.
- Standards relating to the construction of public roads and emergency access to the site.

The recommended mitigation measures include the maintenance of an Asset Protection Zone; provision of AS 3959-2009 building construction standards; provision of utilities required for fire-fighting; and the provisions of standards relating to public road and emergency access. These measures reasonably address the aim and objectives of PBP 2006 and are consistent within the relative and current bushfire risk to the subject development site.

The proposal is capable of satisfying the intent of the performance criteria of Planning for Bush Fire Protection (PBP) 2006 and as a considered opinion can therefore meet the specific objectives for a residential subdivision development.

Economic

An Economic Study was undertaken by Elton Consulting, which provides an economic analysis of the Palerang LGA. A full copy report is attached and marked **Annexure 4**.

In 2011, 61.4% (i.e. 4,862 persons) of the Palerang's working residents travelled outside of the local government area (LGA) for work. Only 26% of the working residents live and work in the Palerang LGA.

Between 2006 and 2011, there was strong employment growth in Public Administration and Safety sector in the Palerang LGA. Combining with the employment location of residents, the data suggests that a large amount of the residents live in Bungendore and work in the ACT within the public service sector.

The Sydney-Canberra Corridor Regional Strategy 2008 also highlighted that the future potential demand for industrial land (i.e. logistics, warehousing and transport, and manufacturing) was likely to occur in the vicinity of major regional centres (i.e. Queanbeyan) which have access to regional transport infrastructure.

The study also stated that the newly formed Queanbeyan-Palerang Regional Council has an adequate supply of industrial land that is accessible from Bungendore which includes: subdivision of Beard on the ACT/Queanbeyan border, Hume, Fyshwick, and the proposed future industrial estate of Eastern Broadacre near the suburb of Symonston.

In 2015, a land valuation was released on the behalf of the Valuer General for the purpose of rating and taxing purposes. The report indicated that some of the larger blocks in Bungendore Village have been subdivided recently, while others are subject to development application consideration. Larger R2 Low Density Residential zoned land recorded a 1.42% increase to 2014 values, whilst over the period 2012-2015 these blocks recorded a 0.96% overall increase.

The Valuer General report also found that Bungendore has an insignificant industrial market with 34 properties based in the Village. For the 2014/2015 review period; no sales were recorded resulting in no change to the value levels which are consistent with Queanbeyan LGA.

Similarly, the Queanbeyan LGA has experienced a slight decline in the overall valuation of industrial land with the market remaining quite subdued over the last seven years. In Canberra, there is a surplus of industrial land which has resulted in the decrease in land value over the past 3 years.

The Economic Study concludes that stagnation in number of sales and value for industrial land demonstrates that there is, regionally, little demand for industrial land. If the market condition changes, there is surplus supply of industrial land in Queanbeyan and the ACT to satisfy future demand.

Traffic Impact

A Traffic Impact Assessment Report has been prepared by SMEC Pty Ltd dated December 2016, which assess a hypothetical development scenario of the site and associated traffic generation that would result from the proposed rezoning. A full copy of this report is attached and marked **Annexure 5**.

The development scenario used in the traffic model includes 10 new lots on the subject land (Lot 3 DP 1195030) and three additional lots on the portion of land at Lot 4 DP 1195030, directly adjoining the subject site to the south. Lot 4 DP 1195030 is currently zoned R2 Low Density Residential and is the residual lot in a former subdivision (DA2016.014).

Planning Proposal - Majara Street

The anticipated yield is 10 residential lots on the Site, as coloured blue in the indicative subdivision layout below.



Figure 20: Hypothetical Development Scenario

Based on RMS Trip Generation Rates, the proposed additional 10 residential lots (plus the additional 3 new lots on the adjoining R2 Low Density zoned land) would generate an additional 130 daily trips, including 11 during the AM peak and 14 during the PM peak.

Based on the current network of roads, it is considered that the additional traffic demand is likely to impact three local intersections: north of the site at Majara Street and Malbon Street (Kings Highway) and south-west of the site at Finch Street and Ellendon Street; and at Trucking Yard Lane and Mongolo Street (Kings Highway). However, the expected volume is still below the capacity of King Street, which is 600 vehicles/hour per lane.

A comparison of the current and estimated traffic demand on nearby roads is provided in the table below.

Location	Current		After Development		% ADT Increase
	ADT	Peak Hour	ADT	Peak Hour	
59 Butmaroo Street	345	35	358	36	4%
Ellendon Street (Rutledge – Forster)	1,077	108	1,110	111	3%
121 Ellendon Street	804	80	869	87	8%
64 Ellendon Street	1,480	148	1,513	151	2%
53 Majara Street	337	34	350	35	4%
Molonglo Street (south of Gibraltar)	986	99	1,019	102	3%
Molonglo Street (south of Malbon)	4,923	492	4,988	499	1%
Trucking Yard Lane (east of Kings Highway)	753	75	818	82	9%

Figure 21: Comparison of Traffic Demand - Current and Estimated

Figure 21 shows a comparison of the current and estimated traffic demand and identifies Trucking Yard Lane and Ellendon Street as having the highest proportional increase in daily

traffic at 9% and 8% respectively. The anticipated post development peak hour traffic at 82 vehicles per hour (Trucking Yard Lane) and 87 vehicles per hour (Ellendon Street) remain considerably below the capacity specified by the RMS Guide which allows up to 600 vehicles/h per lane.

The assessment demonstrates that the traffic impact of the proposed residential development on the surrounding network is not significant and the road network has enough spare capacity to accommodate the additional traffic generated by the proposed development.

5.3.3 Has the planning proposal adequately addressed any social and economic effects

As discussed previously, a search of the Office of Environment and Heritage Aboriginal Heritage Information Management System (AHIMS) was undertaken on 15 August 2016. No aboriginal sites were recorded within 200m radius of the subject site.

The site is not in close proximity to ephemeral or reliable water sources, and comprises highly disturbed soils that have been historically used for grazing. Moreover, the residential subdivision of the site to the south has been undertaken without uncovering any evidence of historical Aboriginal occupation. Therefore, it is highly unlikely the Aboriginal objects and/or places will be found on the subject site.

The subject site has not been identified as a heritage item in the PLEP 2014 or the Office of Environment & Heritage register.

The proposal would result in an additional 10 lots which equates to a population of 27 people, based on the average household size (per dwelling) of 2.67 (Profile ID, 2016). This represents an increase of 0.17% when compared to the current population (i.e. 15,897 people). Therefore, it is unlikely that the planning proposal would have significant impact on the existing social infrastructure such as schools and hospital or the existing Bungendore Centre as the rezoning will generate a small amount of population.

The subject site is located within a short drive from Queanbeyan, a major regional centre, that provides regional services, shopping and education, recreation and employment.

Any future development on the subject site will require the payment of Section 94 contributions. The contribution will be directed toward public amenities and services required as a consequence of development. A Section 64 Contribution Plans was also adopted by the Queanbeyan-Palerang Council which levies toward the provision of water, sewerage and stormwater infrastructure.

The planning proposal will have positive economic effects as the rezoning will facilitate residential development on the subject site which will generate construction job opportunities within the Queanbeyan-Palerang LGA.

5.4 Section D – Commonwealth and State Interests

5.4.1 Is there adequate public infrastructure for the planning proposal?

Public infrastructure is already available with significant upgrades occurring as a consequence of surrounding residential development in the immediate locality. The proposed rezoning

would allow further low density residential subdivision to occur and the creation of an additional road to provide access to the subject lots from Majara Street.

5.4.2 What are the views of State and Commonwealth public authorities in accordance with the gateway determination?

Consultation with the following government agencies is anticipated, in the event that gateway approval is received.

- a) NSW Office of Environment and Heritage
- b) NSW Rural Fire Service
- c) NSW Roads and Maritime Services
- d) Transport for NSW
- e) NSW Office of Water
- f) NSW Environmental Protection Authority
- g) Fire and Rescue NSW
- h) NSW Department of Education and Communities
- i) NSW Police
- j) NSW Health
- k) Ambulance Service of NSW
- l) John Holland (Railway Infrastructure)
- m) NSW State Emergency Service

6 COMMUNITY CONSULTATION

The planning proposal will be exhibited for 28 days and is anticipated to generate a minimal amount of local interest within the community, given the nature of the existing land and adjoining land uses.

In addition to an advertisement being placed in the local newspapers, adjoining property owners will be notified and documents will be placed on Council's website.

Further community consultation will be undertaken in accordance with the normal statutory process of notification and exhibition of the Planning Proposal once Gateway Determination is received.

7 PROJECT TIMELINE

Stage	Anticipated completion date
Planning proposal reported to Queanbeyan-Palerang Council	January 2017
Anticipated commencement date (date of gateway determination)	April 2017
Anticipated timeframe for government agency consultation	May and June 2017
Anticipated commencement and completion dates for public exhibition period	July 2017
Anticipated timeframe for consideration of submissions	August 2017
Anticipated date of reports to Council	September 2017
Anticipated date of submissions, Council report and recommendation to the NSW Department of Planning and Environment and to finalise the draft local environmental plan	November 2017
Anticipated date local environmental plan will be amended	December 2017

Planning Proposal – Majara Street

ANNEXURE 1 – PRELIMINARY DRAINAGE ASSESSMENT

Planning Proposal – Majara Street

ANNEXURE 2 – BUSH FIRE RISK ASSESSMENT AND COMPLIANCE REPORT

Planning Proposal – Majara Street

ANNEXURE 3 – PLANNING APPLICATION DRAWINGS

Planning Proposal – Majara Street

ANNEXURE 4 – ECONOMIC STUDY

Planning Proposal – Majara Street

ANNEXURE 5 – TRAFFIC IMPACT ASSESSMENT



Majara Street Planning Proposal

Preliminary Drainage Assessment

6 December 2016



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1. INTRODUCTION

1.1. Scope

This document presents findings of the drainage assessment undertaken for the site located at Lot 3 DP1195030, Bungendore. The purpose of this drainage assessment is to:

- Understand the drainage characteristics of the site and surrounding properties
- Assess changes in peak discharges in the existing downstream drainage easement with the existing, interim and ultimate development scenarios.
- Provide a proposed channel design at the downstream drainage easement to capture design 1% AEP flows.

1.2. Project Data and Sources

A number of sources have been used to obtain data for the project. The following data was used in this study

- Detailed topographical data and stormwater drainage network data was supplied by SMEC Canberra on January 2016
- Shuttle Radar Topography Mission (SRTM) Digital Elevation Models (DEM) dataset
- Rainfall estimates were calculated using the procedures outlined within Book 2 of Australian Rainfall & Runoff (AR&R) and data from the Bureau of Meteorology's (BoM) website and
- Aerial Imagery of the study area was sourced from BingMap.

All geographically referenced data for this project has been sourced on Map Grid of Australia 1994 Zone 55 projection horizontally and Australian Height Datum (m AHD) vertically.

1.3. Assumptions and Limitations

The following assumptions were adopted during this study:

- As shown in Figure 1, the extent of detailed topographical data coverage is not sufficient for the hydraulic model boundary. SRTM dataset has been used to compensate for areas that do not have detailed topographical data coverage. The accuracy of the vertical component of the SRTM data is +/- 15m, as such this data does not accurately reflect terrain conditions within Bungendore. More accurate data is required to improve the model at these areas during further design stages;
- Although not reflected in aerial imagery (refer to Figure 1), it is understood that Majara Street Stage 1 has completed construction at the time of this study and incoming flows have been redirected towards the west onto Ellendon Street. The extent of these works are out of the detailed topographical data coverage, and have been represented using "Zshape" files within the hydraulic model;
- Details of the existing downstream drainage easement were provided by SMEC Canberra on March 2016 and show a V-drain with 760mm wide concrete base, and side slopes of 1:8 and 1:4 on either side confined within a 3m wide space;
- Details of the existing downstream concrete channel were provided by SMEC Canberra on November 2016 and show a rectangular drain approximately 3m wide and 0.5m deep;
- As advised by SMEC Canberra in November 2016, the design crossfall of the King Street Industrial Estate will be sloped towards the North, therefore only contributing 20% AEP flows into the existing drainage easement.
- The key design criteria assumed with the current study are summarised in Figure 1 and Table 1.



Figure 1 Study Area

Table 1 Summary of Key Design Criteria

Criteria	Requirements
Drainage Easement	Ultimate development flows to be contained within the downstream drainage easement

2. STUDY AREA

2.1. Existing Condition

The site is located on Lot 3 DP1195030, bounded by Majara Street on the East within the town of Bungendore, New South Wales. The land on which Stage 2 is to be developed is not identified as Flood Prone Land, pursuant to PLEP 2014. It has been proposed to rezone land on this lot from light industrial to low density residential to enable development of the Majara Street Stage 3 subdivision, which sits on both Lot 3 DP1195030 and Lot 4 DP1195030. The entire site of Majara Street Stage 3 subdivision has an approximate area of 1.9 ha and comprises disturbed grassland.

Majara Street Stage 1 subdivision, located further South of the site currently has been developed as low density residential land. The Majara Street Stage 1 subdivision site has an upstream catchment with an approximate area of 21 ha. It has been assumed in the current study that all flows draining into Majara Street Stage 1 subdivision have been directed towards the west onto Ellendon Street.

A 3m wide drainage easement is located on the West adjacent to the site. Figure 2 below shows the existing site conditions reflected within this study.



Figure 2 Existing Flow Regime

2.2. Interim Developed Condition

Stage 2 of the Majara Street subdivision is also proposed as a low density residential development, which will serve as an extension of the current Majara Street Stage 1 subdivision. The entire site of the Majara Street Stage 2 development will be regraded to be free from inundation and it is intended to divert flows that currently drain through the site towards the downstream drainage easement without impacting surrounding properties.

2.3. Ultimate Developed Condition

Subject to approval of the rezoning of land from light industrial to low density residential on Lot 3 DP1195030, the ultimate developed condition will include Majara Street Stage 3 subdivision and King Street Industrial Estate (located on Lot 1 and Lot 2 DP1195030) to the north. It is anticipated that in the future, all Majara Street Stage 2 subdivision, Majara Street Stage 3 subdivision and King Street Industrial Estate sites will be regraded to be free from inundation with flows directed towards the downstream drainage easement. The ultimate development could potentially contain underground stormwater drainage network, however in the current study this is not reflected and only overland flows paths have been considered (Refer to Figure 2).

3. HYDROLOGY ASSESSMENT

Estimations of design event peak discharges contributing to open channel flow paths and transverse drainage structures within the project works have been developed using the Rational Method according to the procedures outlined in AR&R (1987, IEAust). The Rational Method is used to estimate peak flows and is derived from numerous comparisons of rainfall and runoff response in gauged catchments.

The calculated peak discharges for both existing and developed conditions using parameters specified in Table 2 are presented in Table 3.

Table 2 – Rational Method Catchment Parameters

Area	Catchment Area (ha)	Time of Concentration (tc)	Existing C ₁₀	Proposed C ₁₀
King Street	2.96	12.0	0.50	0.90
Majara Street Stage 2	2.68	11.5	0.50	0.75
Majara Street Stage 3	1.91	10.1	0.50	0.75

A C₁₀ value of 0.75 has been adopted for the proposed development at Majara Street Stage 2 and 3 assuming 70% impervious coverage.

Table 3 – Peak Discharge Calculated using Rational Method

AEP (%)	Calculated Peak Discharge (m ³ /s)					
	Majara Street Stage 2		Majara Street Stage 3		King Street Industrial Estate	
	Existing	Developed	Existing	Developed	Existing	Developed
1	0.67	1.00	0.50	0.75	0.74	1.10
10	0.31	0.47	0.23	0.35	0.35	0.62
20	0.25	0.37	0.18	0.27	0.27	0.49

4. HYDRAULIC MODELLING

A 1D/2D hydraulic model was set up for the study area using the TUFLOW software to confirm flow paths, compare peak discharges and identify extents of inundation. The cross drainage network within the railway corridor was modelled using the one dimensional ESTRY component of TUFLOW.

The model was developed to primarily determine the existing drainage characteristics around the site and to further investigate the impact of the proposed development on drainage behaviour throughout the site and surrounding areas. The following sections describe the modelling details and discuss the approach taken in developing the hydraulic model.

4.1. Model Extent and Topography

The TUFLOW hydraulic model covers an area of 77 ha and includes the site, surrounding areas and segments of both Majara Street and King Street. A Digital Terrain Model (DTM) was derived from a combination of detailed topographical data and coarse SRTM and used as a base DEM in the hydraulic model. Additional adjustments to the topography were applied within the hydraulic model to reflect the features from Majara Street Stage 1, not included in the topographical data, and also the proposed development within and surrounding the subject site. It should be noted that downstream of the site, no Lidar data has been provided; this is a limitation of the current model, as inconsistencies in topography are likely to affect present modelling results.

4.2. Time step and Grid size

The subject site and surrounding areas were represented in the 2D domain using a grid cell size of 2m, and a time step of 1 second.

4.3. Roughness

Manning's 'n' roughness coefficients within the model were defined from aerial photography. A roughness map was developed for the site to take into account varying land use and surface covering. Table 4 outlines the Manning's roughness coefficients and associated losses applied within the model.

Table 4 Manning's Roughness Coefficient and Rainfall Losses

Land use Type	Roughness value	Initial Loss (mm)	Continuing Loss (mm)
Rural	0.04	10	2.5
Developed Areas	0.03	0	0
Dense Vegetation	0.08	10	2.5
Road/ Railways	0.025	0	0
Dam/Lakes	0.02	0	0

4.4. Boundary Conditions

Boundary conditions within the model consisted of:

- Direct rainfall on grid over the extents of the model for the 1% Annual Exceedance Probability (AEP) design storm of 60 minutes duration using Zone 2 temporal pattern. The adopted design rainfall losses were optimised to achieve a close match with values obtained from the conducted FFA.
- Downstream boundaries using HQ (stage-discharge) were applied to the hydraulic model at the appropriate locations where flow exits the model.

4.5. Results and Outcome of Model Simulation

Appendix A presents maps of peak depths for the 1% AEP design storm hydraulic model runs.

The adopted parameters in the hydraulic modelling were optimised to achieve a close match with values obtained from the Rational Method calculations.

Peak discharges at the downstream drainage easement modelled in TUFLOW for the 1% AEP event are presented in Table 5. As shown, the modelled peak discharges compared well with those presented in Table 3. Table 2

It should be noted that due to limitations of the survey, flow paths downstream of the site towards the West may not be fully represented in the existing scenario.

Table 5 Modelled 1% AEP Peak Discharges at Downstream Drainage Easement

AEP (%)	Peak Discharge (m ³ /s)	
	Interim Development Scenario	Ultimate Development Scenario
1	0.97	2.08
10	0.62	1.43
20	0.52	1.29

5. DRAINAGE IMPROVEMENT

The hydrology and hydraulic assessment for all development (Majara Street Stage 2, Majara Street Stage 3 and King Street Industrial Estate inclusive) catchments enables the local catchment characteristics to be recognised and appropriate stormwater management practices to be implemented.

It is envisaged that provision of on-site detention will be necessary for all developments (Majara Street Stage 2, Majara Street Stage 3 and King Street Industrial Estate inclusive) in the ultimate development scenario to ensure the flow capacity at the downstream drainage easement is not exceeded.

5.1. Detention Storage Assessment

For the purposes of assessing detention storage requirements, an XPRAFTS hydrological model of the Majara Street Stage 2 subdivision, Majara Street Stage 3 subdivision and King Street Industrial Estate was developed to estimate stormwater flow rates discharging from the sites. XPRAFTS is a software used to simulate runoff hydrographs at defined points throughout a watershed based on a set of catchment characteristics and specific rainfall events. XPRAFTS uses the Laurensen non-linear runoff routing procedure to develop a sub-catchment stormwater runoff hydrograph.

5.1.1. Hydrological Model Setup

Model setup for this study included catchments discharging into the downstream drainage easement based on the site extents excluding upstream catchments. All catchments have been modelled using parameters shown in Table 6 to Table 8. The XPRAFTS catchment layout is presented in Figure 3.



Figure 3 XPRAFTS Catchment Layout

Table 6 Catchment Parameters for Developed Conditions

Node	Total Area (ha)	Catchment Slope (%)	Manning's n	Impervious (%)
King Street Industrial Estate	2.97	0.25	0.025	100
Majara Street Stage 3	1.91	0.25	0.025	70
Majara Street Stage 2	2.68	0.25	0.025	70

Design rainfall parameters and temporal patterns were sourced from methods described in AR&R (1987, IEAust). Table 7 shows the parameters used to generate rainfall intensities for current study.

Table 7 – Rainfall Parameters

Parameter	Coefficient
2 Year ARI - 1 hour duration	23.32 mm/hr
2 Year ARI - 12 hour duration	4.35 mm/hr
2 Year ARI - 72 hour duration	1.17 mm/hr
50 Year ARI - 1 hour duration	43.13 mm/hr
50 Year ARI - 12 hour duration	7.88 mm/hr
50 Year ARI - 72 hour duration	2.22 mm/hr
Location Skew	0.19
Geographic Factor F2	4.28
Geographic Factor F50	15.61

Table 8 Rainfall Losses Parameters

AEP (%)	Initial Loss (mm)	Continuining Loss (mm/hr)
1	0	2.5
10	0	2.5
20	0	2.5

5.1.2. Model Validation

Simulations in the model were run for the 1, 10 and 20% AEP design storm events with durations ranging from 15 minutes to 2 hours. The critical duration for the 1, 10 and 20% AEP design storm events was found to be less than 60 minutes from the local catchments. The peak discharges estimated from the XPRAFTS model are compared to those estimated from Rational Method Calculations and TUFLOW hydraulic models for the developed conditions and presented in Table 9.

Table 9 – Modelled Developed Conditions Peak Discharges Comparison

AEP (%)	Calculated Peak Discharge (m ³ /s)					
	Interim Development Scenario (Majara Street Stage 2 only)			Ultimate Development Scenario (Majara Street Stage 2, Majara Street Stage 3 and King Street Industrial Estate)		
	Rational Method	TUFLOW	XPRAFTS	Rational Method	TUFLOW	XPRAFTS
1	1.00	0.97	0.92	2.85	2.08	2.80
10	0.47	0.62	0.58	1.44	1.43	1.74
20	0.37	0.52	0.50	1.13	1.29	1.50

A comparison indicates that XPRAFTS model peak flow rates in the 1, 10 and 20% AEP design storm events are close to those obtained with the rational method, thus the XPRAFTS model is deemed appropriate for the purpose of detention storage requirements assessment.

5.1.3. Detention Storage Configuration

The detention storage at Majara Street Stage 2 and Majara Street Stage 3 subdivision has been provided as follow:

- 115.7m³ of storage volume within the underground stormwater pipe network up to RL 695.5mAHD
- Overflow level (from pits into development area) of 696.7mAHD
- Overflow level (from development area into drainage easement) of 697.1mAHD
- 1750 m³ of storage volume within the development footprint up to RL 697.5mAHD
- Low flow outlet pipe of 1 x 450mm dia. RCP (100m length, 0.5% slope)

It is envisaged that on-site detention will be provided at King Street Industrial Estate.

5.1.4. Detention Storage Calculation Results

The peak flows estimated from the XPRAFTS model for Majara Street Stage 2 subdivision and Majara Street Stage 3 are provided in Table 10. Table 10 also presents the maximum stage of the proposed detention storage. The results from the XPRAFTS model indicate that the proposed detention storage for Majara Street Stage 2 subdivision and Majara Street Stage 3 subdivision can mitigate the stormwater flow rates from the developed to existing conditions for the 20%, 10%, 5%, 2% and 1% AEP design storm events.

Table 10 XPRAFTS Detention Basin Assessment Results for Majara Street Stages 2 and 3

AEP (%)	Existing		Post Developed	Mitigated		Post Developed Peak Flow Mitigated (Y/N)	Peak Stage (m)	Ponding Depth (m)
	Critical Storm Duration (min)	Peak Flows (m ³ /s)	Peak Flows (m ³ /s)	Critical Storm Duration	Peak Flows (m ³ /s)			
20	60	0.40	0.86	60	0.38	Y	697.1	0.4
10	60	0.46	1.00	60	0.42	Y	697.1	0.4
5	60	0.55	1.20	60	0.48	Y	697.2	0.5
2	60	0.66	1.39	60	0.56	Y	697.2	0.5
1	60	0.78	1.61	60	0.64	Y	697.2	0.5

5.2. Drainage Easement Flow Capacity Assessment

An existing V-drain with 760mm wide concrete base, and stabilised earth side slopes of 1:8 and 1:4 on either side currently runs along the drainage easement, which eventually connects into the existing concrete channel adjacent to Ellendon Street.

In the developed conditions, it is envisaged that peak flows from the following areas will drain into the downstream drainage easement:

- 1% AEP mitigated flows from the Majara Street Stage 2 subdivision
- 1% AEP mitigated flows from the Majara Street Stage 3 subdivision

- 20% AEP mitigated flows from the King Street Industrial Estate

The remaining 1% AEP flows from King Street Industrial Estate is assumed to drain towards King Street.

This channel is proposed to be upgraded to convey 1% AEP flows up to the ultimate development scenario; however is limited to a top width of 3m. Peak design flows as shown in Table 11 were used. The results indicate that in the ultimate development scenario, approximately 0.9m³/s of peak flows is anticipated in the 1% AEP at the downstream drainage easement.

Table 11 Peak Flows at Downstream Drainage Easement in Ultimate Development Scenario

Flows from	Peak Flows (m ³ /s)	AEP (%)
King Street	0.27*	20
Majara Street Stage 2	0.64^	1
Majara Street Stage 3		
Total	0.91	-

^From XPRAFTS

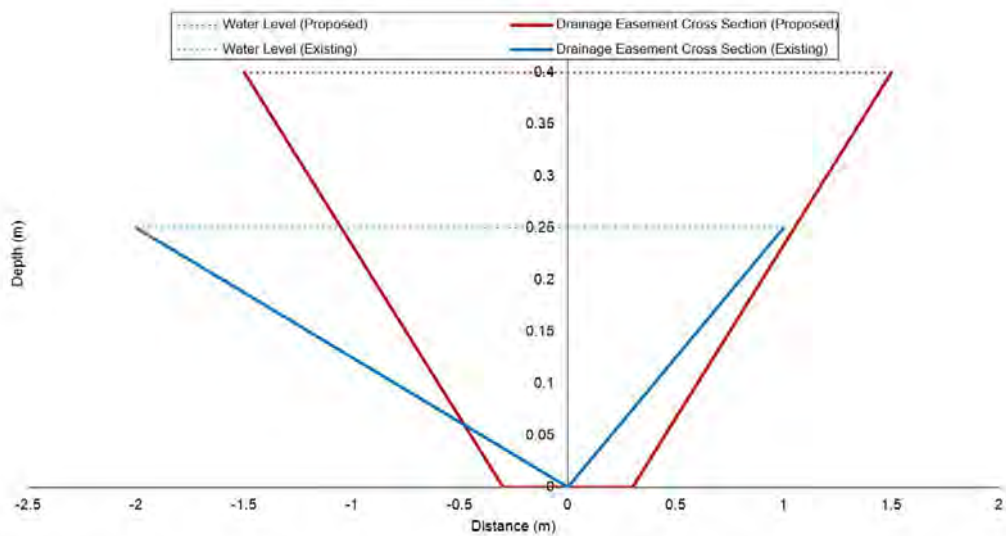
*From Rational Method

The Manning's Equation for steady uniform flow has been used to assess flow capacity at the downstream drainage easement channel in both existing and proposed configuration. The parameters of the channel for the downstream drainage easement are detailed in Table 12 below.

Table 12 Comparison of Existing and Proposed Channel at Drainage Easement

Parameter	Existing Configuration	Proposed Configuration
Type	V shaped drain	Trapezoidal drain
Additional Features	760mm wide concrete invert	600mm wide concrete invert
Manning's n	0.013 for concrete 0.035 for earth	0.013 for concrete 0.035 for stabilized earth
Slope (%)	2.0	2.0
Side Slopes	1 in 8 and 1 in 4	1 in 3
Base Width (m)	-	0.6
Top Width (m)	3	3
Depth (m)	0.25	0.4
Flow Capacity (m ³ /s)	0.52	1.38
Velocity (m/s)	1.4	1.9
Hazard d.V (m ² /s)	0.7	0.8

Figure 4 Comparison of Existing and Proposed Flow Capacity at Downstream Drainage Easement Channel



The results indicate that the proposed channel has a capacity of conveying the anticipated mitigated peak flow rate in 1%AEP (no freeboard).

The configuration of the channel is constrained by the 3m width of the existing easement. Due to the limited footprint, there is no scope to provide a freeboard within the existing easement. If required, measures could be included in the detailed drainage design for the future subdivision of the site to increase the detention capacity and provide additional freeboard to the easement.

5.2.1. Flood Hazard Categorisation

Table 12 outlines the safety risks categories recommended by Engineers Australia (2010).

Table 13 Flow Hazard Regimes for infants, children and adults

d.V (m ² /s)	Infants, small children (H.M < 25 m.kg) and frail persons	Children (H.M = 25 to 50 m.kg)	Adults (H.M > 50 m.kg)
0 to 0.4	Extreme Hazard	Low Hazard	Low Hazard
0.4 to 0.6	Extreme Hazard	Significant Hazard	Low Hazard
0.6 to 0.8	Extreme Hazard	Extreme Hazard	Moderate Hazard
0.8 to 1.2	Extreme Hazard	Extreme Hazard	Significant Hazard
>1.2	Extreme Hazard	Extreme Hazard	Extreme Hazard

Flow at full depth in the main channel within the drainage easement is considered as Moderate Hazard for adults. The drainage easement is contained within private property boundary therefore does not pose risk to the general public. Appropriate precaution should be taken by the landowner and visitors when accessing the channel during major storm events.

6. CONCLUSIONS AND RECOMMENDATIONS

Results of the current study showed that a compliant design at the downstream drainage easement can be achieved to capture flows from the proposed developments in both interim and ultimate development scenarios with on-site detention for all developments (Majara Street Stage 2, Majara Street Stage 3 and King Street Industrial Estate inclusive) in the ultimate development scenario.

Note that downstream of the site, no Lidar data has been provided; this is a limitation of the current model, as inconsistencies in topography are likely to affect present modelling results.

APPENDIX A DRAINAGE MAP




COORDINATE SYSTEM Datum: GDA94 Projection: MGA Zone 55		NORTH	DRAWING NO. FIG 1	REVISION -	STATUS DRAFT	CLIENT	 SMEC SMEC Australia Ltd Level 1, 154 Melbourne Street South Brisbane QLD 4101
PAGE SIZE A3	SCALE 1:2,000		CREATED BY K.TAN	DATE 17-3-2016			
PROJECT NO. 3002410	PROJECT TITLE MAJARA STREET STAGE 2	TITLE EXISTING SCENARIO 1% AEP FLOOD DEPTH					

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COORDINATE SYSTEM Datum: GDA94 Projection: MGA Zone 55		NORTH	DRAWING NO. FIG 2	REVISION -	STATUS DRAFT	CLIENT	 SMEC SMEC Australia Ltd Level 1, 154 Melbourne Street South Brisbane QLD 4101
PAGE SIZE A3	SCALE 1:2,000		CREATED BY K.TAN	DATE 17-3-2016			
PROJECT NO. 3002410	PROJECT TITLE MAJARA STREET STAGE 2	TITLE INTERIM SCENARIO 1% AEP FLOOD DEPTH					

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BUSHFIRE & EVACUATION SOLUTIONS
SYDNEY • ILLAWARRA • SHOALHAVEN



Bushfire Hazard Risk Assessment & Compliance Report

Planning Proposal – Residential Subdivision Development

Lot 3 Majara Street
BUNGENDORE NSW

3 August 2015



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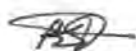
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Document Certification

This report has been developed based on agreed requirements as understood by Bushfire and Evacuation Solutions at the time of investigation. It applies only to a specific task on the nominated lands.

Any recommendations or findings of this report are based on an honest appraisal of the constraints that existed at the site at the time of investigation, subject to the scope, resources and information available and provided at the time. Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.



Principal Consultant

BUSHFIRE & EVACUATION SOLUTIONS

3 August 2015

Version Control

Version:	Date/ amendments	Authorised by
Version 1	3/08/2015	
Version 2	4/08/16	
Version 3	6/12/2016; Section 4.2 page 14	
Version 4	23/02/2017; Pages 5, 9, 10, 11, 12, 25	KT

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Disclaimer: Any recommendation or advice expressed in this document is made in good faith and in accordance with the relevant legislation for bushfire prone development in NSW. It should be borne in mind that the measures recommended in this report cannot guarantee that a building will survive a bushfire event on every occasion. This is due to the degree of vegetation management, the unpredictable behaviour of bushfires and extreme weather conditions. The author of this report accepts no responsibility for any loss or damage, whether direct or consequential, suffered by any person as the result of or arising from the reliance on the statements, information or recommendations of this document.

Definitions

Asset Protection Zone (APZ):

An area surrounding a development managed to reduce the bushfire hazard to an acceptable level.

AS 3959-2009 Construction of buildings in bushfire-prone areas:

The relevant Australian Standard for bushfire prone construction detailing the deemed to satisfy construction provisions for building development in NSW assessed as BAL-12.5 to BAL-40.

Bushfire Attack:

Attack by burning embers, radiant heat or flame generated by a bushfire, which might result in ignition and subsequent damage to, or destruction of a building.

Bushfire Prone Land:

An area that is subject to, or likely to be subject to bushfire attack. In general, a bushfire prone area is an area mapped for a local government area that identifies the vegetation types and associated buffer zones. Bushfire prone land maps are prepared by local councils and certified by the Commissioner of the NSW RFS.

Bushfire Attack Level (BAL):

A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact using increments of radiant heat expressed in kilowatts per metre squared (kW/m²), and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.

Bush Fire Protection Measures (BPMs):

A range of measures (controls) available to minimise the risk arising from a bushfire. BPMs include APZs, construction standards, suitable access arrangements, water and utility services, emergency management arrangements and landscaping.

Bush Fire Safety Authority

An approval of the Commissioner of the NSW RFS required for subdivision for residential or rural residential purpose or for a special fire protection purpose listed under section 100B (6) of the *Rural Fires Act*. This form of development is considered to be integrated development.

Fire Danger Index (FDI):

An index providing a determination of the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long and short term drought effects.

Planning for Bush Fire Protection 2006 (PBP):

Legislative planning guideline produced by the NSW Rural Fire Service detailing the specifications and requirements for bushfire prone development in NSW.

Executive Summary

This report provides an assessment of the bushfire risk and bushfire protection measures relevant to a planning proposal for rezoning of land from Light Industrial to Low Density residential at Lot 3 Majara Street Bungendore NSW.

This assessment provides confirmation that the site is located on bushfire prone land and is therefore subject to the specifications and requirements of the NSW Rural Fire Service document 'Planning for Bush Fire Protection' 2006 (PBP 2006).

The eastern section of the subject site is exposed to grassland vegetation considered by the assessment to be a potential bushfire hazard. The level of bushfire risk resulting from exposure to this grassland hazard area is assessed as LOW. The highest bushfire attack level (BAL) affecting the subject site has been assessed as BAL-12.5.

As this proposal just relates to the re-zoning of the site it is not considered as integrated development. A future application for residential subdivision would be required to be assessed against the aim, objectives and performance criteria of PBP 2006. In order to demonstrate that a future application for residential development on the site is capable of satisfying the specifications and requirements of PBP 2006, section 7 of this report makes recommendations for the following bushfire protection measures:

- APZ management within the subject site.
- Residential bushfire construction in accordance with the provisions of AS 3959-2009.
- Standards relating to the provision of water supplies and utilities required for fire-fighting operations.
- Standards relating to the construction of public roads and emergency access to the site.

Where these measures are incorporated, it is determined that a future residential proposal would be able to adequately satisfy the aim and objectives of PBP 2006.

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1.0 Introduction

Bushfire and Evacuation Solutions have been commissioned by SMEC Australia Pty Ltd to provide a bushfire hazard risk assessment and recommendations for compliance for the proposed rezoning of land (i.e. from IN2 Light Industrial to R2 Low Density Residential) for the purpose of future residential subdivision within Lot 3 Majara Street Bungendore NSW, (herein the '*subject development*'). This assessment considers the subject development site on the basis of;

- A site specific inspection undertaken on 19 July 2015,
- A desktop assessment using licensed or on-line spatial data resources available at the time of this report.

The methodology applied for this assessment is based on the guidelines provided within the NSW Rural Fire Service document 'Planning for Bushfire Protection, 2006' (PBP) and specifically Appendix 2 and Addendum: Appendix 3, 2010.

PBP states: '*The aim of PBP is to use the NSW development assessment system to provide for the protection of human life (including firefighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, on-site amenity and protection of the environment.*

More specifically, the *objectives* are to:

- (i) Afford occupants of any building adequate protection from exposure to a bush fire;
- (ii) Provide for a defensible space to be located around buildings;
- (iii) Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;
- (iv) Ensure that safe operational access and egress for emergency service personnel and residents is available;
- (v) Provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and
- (vi) Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire-fighting).'

This assessment includes an analysis of the potential (persisting) bushfire hazard extent and threat to the subject site and where relevant, recommends standards and bushfire mitigation measures which seek to address the aim and objectives of PBP 2006.

While the planning proposal is not required to be referred to the NSW RFS, it is reasonably anticipated that a future application for residential subdivision would be deemed Integrated

Development. The following assessment is therefore made in accordance with the information requirements of Clause 44 - Rural Fires regulation 2013, Application for a Bush Fire Safety Authority to demonstrate that the use of the site for residential purposes is acceptable in relation to the potential bushfire hazard.

1.1 Aim and Objectives of this Report

This report seeks to apply the aims and objectives of PBP 2006 in recommending measures which effectively mitigate the level of bushfire risk to any future proposed development within the subject site. The specific objectives include:

- Determination of the vegetation formations on and surrounding the subject site (considered to be a bushfire hazard) in accordance with the vegetation classification system contained in *Planning for Bushfire Protection 2006*;
- Determination of the effective slope under vegetation deemed to be a hazard.
- Determination of the Fire Danger Index [FDI] relevant to the site;
- To apply the objectives of PBP 2006 in recommending measures which address the following:
 - (i) The provision of minimum building setbacks (Asset Protection Zones - APZs) from vegetated (hazard) areas within and adjoining the site.
 - (ii) The provision of adequate water supplies for fire-fighting;
 - (iii) The provision of adequate access arrangements for emergency service vehicles;
 - (iv) The determination of construction standards for future building development within the site to minimize the vulnerability of buildings to ignition from radiant heat and ember attack;
 - (iv) The identification of land management responsibilities; and
 - (v) The provision of emergency evacuation management.

2.0 Statutory Framework

The legislation and statutory planning documents relevant to any proposed future residential subdivision development on bush fire prone land include:

(I). Environmental Planning and Assessment Act (EP & A Act) 1979.

- **Section 79C (1):** states the following - "In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:
 - The likely impacts of the development (e.g. natural hazards such as

Bush fire threat);

- The suitability of a site for development (e.g. bushfires).

- **Section 91(1)**: defines the subdivision of bushfire prone land for residential and rural residential subdivision that are located in a bush fire prone area as integrated development, requiring authorization under Section 100B of the Rural Fires Act 1997. This section is relevant for future residential development on the site in the event that the proposed rezoning is successful.

(II). ***Rural Fires Act 1997.***

- **Section 100B**: Section 100B provides for the issue of a Bushfire Safety Authority (by the Commissioner of the NSW Rural Fire Service), for development which is considered as subdivision of bushfire prone land for residential development. The subject Planning Proposal is not integrated development and does not require referral to the NSW Rural Fire Service.

(III). ***Rural Fires Regulation 2008.***

- **Section 44**: provides details of the matters that are required to be addressed for the issue of a *Bushfire Safety Authority* under Section 100B of the *Rural Fires Act*.

(IV). ***Threatened Species Conservation Act 1995 (TSC Act).***

- Aims to protect and encourage the recovery of threatened species, populations and communities as listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development or an activity (e.g. hazard reduction) is likely to significantly affect threatened species, populations and ecological communities.

(V). ***Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).***

- Applies to developments and associated activities that have the potential to significantly impact on matters of national environmental significance protected under the Act

(VI). ***Planning for Bush Fire Protection 2006 (NSW Rural Fire Service).***

- This document provides the legislative guideline (specifications and requirements) for bush fire prone development in NSW.

3.0 Description of the property

RF Reg. Clause 44 Application for bushfire safety authority (a): a description (including the address) of the property on which the development the subject of the application is to be carried out

3.1 Lot and deposited plan (DP) number of the subject property

Lot 3 in DP 1195030

3.2 Street address and locality map

Lot 3 Majara Street Bungendore NSW (refer locality map, Appendix 1).

3.3 Zoning of the subject land and any adjoining lands

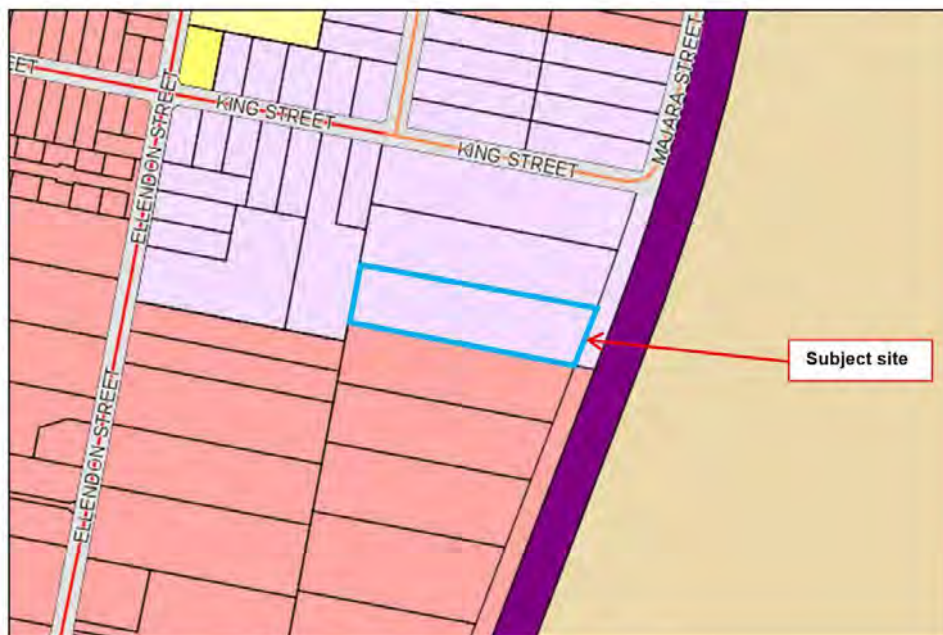


Figure 1: Extract – Palerang Council Mapping

The subject site is zoned IN2 (Light Industrial). Adjacent land to the east beyond the main Goulburn – Cooma railway line is zoned RU1 (Primary Production). Adjacent land to the north/ northwest is zoned IN2 with adjacent land to the south/ southwest being zoned R2. The subject application seeks to rezone the site from IN2 to R2.

3.4 Description of the proposal

The subject site occupies 1.42 hectares of land located adjacent to established urban development within the south eastern section of the township of Bungendore.

The site is currently cleared of any freestanding vegetation and contains only grassland vegetation. There is no existing building development within the subject site.

Land adjoining the southern boundary of the subject site is either approved or currently under construction as a residential subdivision. Land adjoining the northern boundary is currently the subject of a development application for a light industrial subdivision.

The proposal aims to rezone the subject lot as R2 Low Density Residential to enable future residential development consistent with the approved, adjacent residential subdivision to the south.

Staging Issues (temporary and reciprocal asset protection zone easements / agreements)

The Majara Street road reserve provides a suitable buffer which adequately satisfies the required (minimum) APZ/ separation distance from unmanaged grassland to the east (refer section 6.1.2).

For the purposes of bushfire safety compliance, future residential subdivision development within the site will not rely on any additional temporary or reciprocal asset protection zone (APZ) easements / agreements within the subject development site or on adjoining lands.

3.5 Aerial or ground photographs of the subject land including contours and existing and proposed cadastre

An ortho-photo and boundary overlay of the subject property is as shown in Figure 3 and Appendix 1.

Ground/ site photos (captured 19/07/2015) of the subject property, neighbouring lands and existing public access roadway are appended to this report (Appendix 3).

Contours considered by this report are derived from the Department of Lands SIX Viewer (10m Contour Interval) and the attached Lot Layout Plan (Appendix 2).

4.0 Details of Other Site Constraints

4.1 Identification of any significant environmental features

RF Reg. Clause 44 Application for bushfire safety authority (d): *identification of any significant environmental features on the property*

For the purposes of bushfire safety compliance, this assessment notes that the subject property is generally considered as cleared/ managed land.

The proponent has not advised of any constraint, restriction or burden over the subject property for the purposes of vegetation management and land development and associated asset protection zone (APZ) maintenance.

Based on a brief desktop assessment of the subject property, the following table outlines any significant environmental features potentially affected by the subject development.

Table 1.0	Present within Subject Property	Present within Study Area	Comment
Native Forest / Vegetation	No	No	The subject site and adjacent land within the study area is generally cleared of native forest vegetation.
Riparian Corridor	No	No	
SEPP 14 – Wetland	No	No	
SEPP 26 – Littoral Rainforest	No	No	
SEPP 44 – Koala Habitat	No	No	
Areas of Geological Interest	Undetermined	Undetermined	
Environmental Protection Zones	No	Unknown	
Steep Lands (>18°)	No	No	
Land Slip Area	No	No	

<i>Table 1.0</i>	<i>Present within Subject Property</i>	<i>Present within Study Area</i>	<i>Comment</i>
Flood Prone Area	No	No	
National Park / State Forest	No	No	

4.2 Details of threatened species, populations, endangered ecological communities and critical habitat known to the applicant

RF Reg. Clause 44 Application for bushfire safety authority (e): *the details of any threatened species, population or ecological community identified under the Threatened Species Conservation Act 1995 that is known to the applicant to exist on the property*

No known threatened species, populations or ecological communities identified under the NSW Threatened Species Conservation Act 1995 have been noted, recorded or advised of as part of this assessment.

Furthermore, there are no identified threatened species, habitats or ecological communities present on the Site.

4.3 Details of Aboriginal heritage known to the applicant

RF Reg. Clause 44 Application for bushfire safety authority (f): *the details and location of any Aboriginal relic (being a relic within the meaning of the National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property*

There are no known Aboriginal relics (being a relic within the meaning of the NSW National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) have been noted, recorded or advised of as part of this assessment.

5.0 Bushfire Hazard Risk Assessment

RF Reg. Clause 44 Application for bushfire safety authority (b): a classification of the vegetation on and surrounding the property (out to a distance of 140 metres from the boundaries of the property) in accordance with the system for classification of vegetation contained in Planning for Bushfire Protection

5.1 Structural description consistent with the identification key in Keith D (2004)

The subject property is currently mapped as bushfire prone land (Vegetation 'Category 2') as currently shown by the Palerang Council Bush Fire Prone Land Map (refer Figure 2 below).

In this regard, the NSW legislative requirements for building and land subdivision development on bushfire prone lands are applicable.

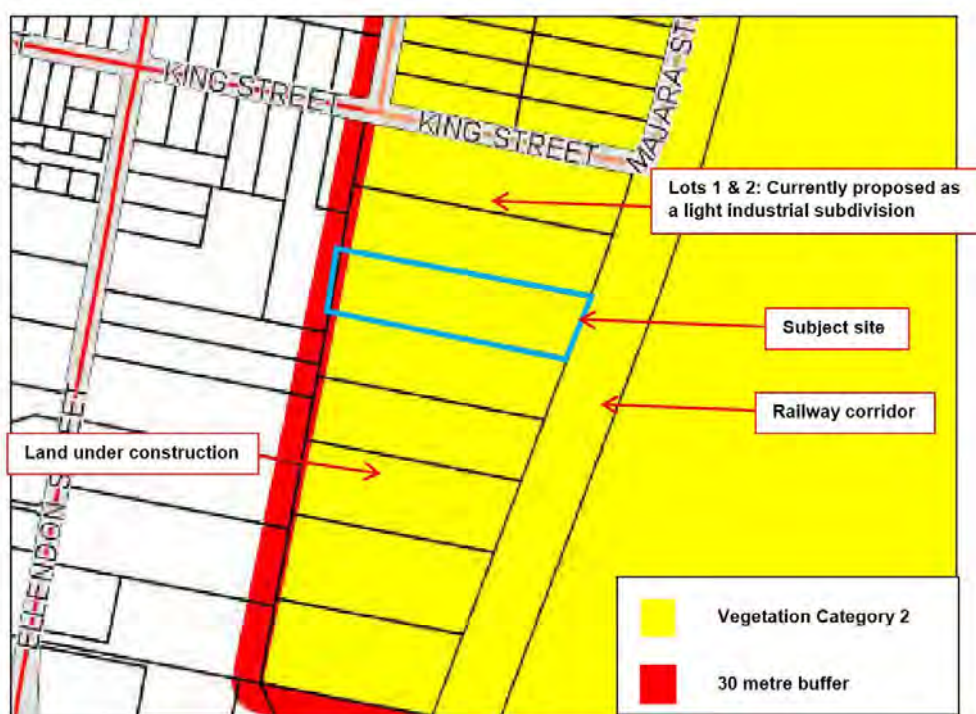


Figure 2: Extract Palerang Council Bushfire Prone Land Map

The area of vegetation considered as a potential hazard and subsequent threat to the site is that associated with unmanaged grassland, primarily to the east of the site (i.e. within the adjacent railway corridor and rural lands to the east).

PBP 2006 (A2.3) recognises that a significant threat can exist for development in grassland areas. In addition, the building construction provisions of AS 3959-2009 apply to residential development located within 50 metres of unmanaged grassland vegetation.

Note: The grassland hazard to the east includes a narrow corridor of sparse, low shrubs (i.e. predominantly <2m in height) which mark the western boundary to Lot 24 DP 709547. Based on the narrow extent of this corridor (i.e. <15 metres in width), this shrubland area is considered to be insignificant in terms of its potential to increase the level of risk beyond that assessed for "grassland" vegetation.

The location, nature and extent of vegetation (hazard) within the study area is illustrated in Figure 3 (below) and in Appendix 3 (site photographs).

In regards to areas accepted as a non-hazard, PBP 2006 states the following;

'For the purposes of assessment, the following are not considered a hazard or as a predominant vegetation class/ formation and can be included within an asset protection zone;

- non-vegetated areas including roads, footpaths, cycle ways, waterways, buildings, rocky outcrops and the like; and*
- Reduced vegetation including maintained lawns, golf course fairways, playgrounds or sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries.*

Based on this description, the following areas located within the study area are considered as managed land in terms of this assessment:

- Land located between the subject site and adjacent railway corridor including the Majara Street road reserve and pedestrian walkway;
- Land to the south of the site currently under construction as a residential subdivision.
- Developed residential and light industrial land to the west of the site.
- Lots 1 and 2 to the north (i.e. currently the subject of a separate DA for development as a light industrial subdivision).

5.2 Past disturbance factors and any future intended land uses that could alter the vegetation classification in the future

Based on the existing and proposed land use surrounding the site it is anticipated that the extent of bushfire vegetation that may persist or accumulate adjacent to the subject site is unlikely to significantly increase beyond its current extent.

5.3 Assessment of the effective slope to a distance of 100m

RF Reg. Clause 44 Application for bushfire safety authority (c): *an assessment of the slope of the land on and surrounding the property (out to a distance of 100 metres from the boundaries of the property)*

The effective slope underlying the grassland/ hazard area has been assessed as:

- Upslope/ flat 0 degrees:



Figure 3: Grassland hazard area to the east of the site

5.4 Distance/Separation between building line and bushfire hazard

The separation distance between the eastern boundary of the subject development site and adjacent grassland hazard area is assessed as:

- 20 metres

5.5 Fire Danger Index (FDI) for Local Government Area (LGA)

☒ 100 ☐ 80 ☐ 50

Southern Ranges (Table A2.3 PBP 2006)

5.6 Determination of Bushfire Risk

RF Reg. Clause 44 Application for bushfire safety authority (g): a bush fire assessment for the proposed development (including the methodology used in the assessment) that addresses the following matters [sub clauses i – viii]

The methodology applied for the following bushfire hazard risk assessment is based on the provisions contained within PBP 2006 (Appendix 2) and the assessment methodology outlined in PBP Addendum: Appendix 3 2010.

Table 2.0: BAL Risk Rating

Nearest property boundary	Vegetation Formation	Slope (under hazard)	Separation from hazard	BAL Risk Rating AS3959
Eastern Boundary – subject development site	Grassland	Upslope/ flat 0°	20 metres	LOW

Note: Based on the relevant bushfire parameters (as outlined above), the risk of exposure to bushfire attack for the subject site is assessed as **LOW**.

6.0 Bushfire Protection Measures

PBP 2006 prescribes the application of a combination of bushfire protection measures which seek to reduce the bushfire risk to an acceptable level. These measures are summarised below.

6.1 Asset protection zones (APZs) including any management arrangements or easements including those contained on adjoining lands)

RF Reg. Clause 44 Application for bushfire safety authority (g) (i): *the extent to which the development is to provide for setbacks, including asset protection zones*

6.1.1 Components of an APZ

An asset protection zone (APZ) is a buffer zone located between a bushfire hazard and buildings that is designed to mitigate the risk to life and property. This area is managed to minimise fuel loads and reduce potential radiant heat levels, flame, ember and smoke attack at the building elevation. An APZ may include the following:

- Lawns and managed, discontinuous gardens;
- Roads, driveways and car parks;
- Swimming pools, tennis courts;
- Ovals, parkland and open space;

PBP 2006 acceptable solutions for APZ compliance require that:

- An APZ is provided in accordance with the relevant tables / figures [within PBP 2006],
- The APZ is wholly within the boundaries of the development site (exceptional circumstances* otherwise permitting),
- The APZ is in accordance with the requirements of the document 'Standards for Asset Protection Zones' (RFS 2005); &
- The APZ is located on lands with a slope less than 18 degrees.

PBP 2006 (Section 3.3) states the following in regards to an APZ on adjoining lands as an acceptable exceptional circumstance:

'Where it can be demonstrated that there is a strong likelihood of the adjoining land being developed for future residential or other compatible purposes'.

As advised by SMEC Australia, the development of land within Lots 1 and 2 to the north (i.e. proposed light industrial subdivision development) will occur concurrently with the subject development. It is

therefore reasonably assumed that all land to the north within the study area (out to 140 metres) will be managed to APZ standards prior to construction within the subject site.

Land to the south is currently approved for residential subdivision development and subject to construction.

6.1.2 Minimum required APZ

PBP 2006 does not specify minimum APZ/ building setbacks for residential subdivisions in relation to grassland hazard areas. However, the objectives of PBP include the following:

‘Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition’.

The potential for direct flame contact increases where the bushfire risk is assessed as extreme (i.e. >BAL - 29). As such, the APZ provided in relation to grassland hazard areas should ensure that the maximum BAL rating does not exceed BAL-29.

The minimum separation distance required in order to achieve this outcome (i.e. based on the parameters relevant to the subject site and on the values given in AS3959-2009, Table 2.4.2.) is given in Table 3.0 below.

Table 3.0: Minimum Required APZ

Vegetation Formation	Slope (under hazard)	Radiant heat exposure	Minimum required APZ/ separation distance
Grassland	Upslope/ flat 0°	29kW/m	9 metres

Considering the location of the subject site (i.e. 20 metres from the adjacent hazard area) it is evident that **the proposal can reasonably and easily facilitate the minimum APZ/setbacks** required in order to eliminate the potential of direct flame contact at the building.

Appendix 3 of this report illustrates a typical APZ profile. APZ recommendations are as listed section 7.1 (Bush fire Safety & Compliance Recommendations).

6.2 Bushfire Construction Standards

RF Reg. Clause 44 Application for bushfire safety authority (g) (vii): *the construction standards to be used for building elements in the development.*

The BCA contains both performance requirements and deemed-to-satisfy (DTS) provisions relating to the construction of buildings in bushfire prone areas. The construction requirements of AS 3959-2009 are accepted by PBP 2006 as the DTS construction standard for buildings in designated bushfire prone areas.

The bushfire attack levels (BAL) and AS 3959-2009 construction requirements relevant to future proposed residential building development within the subject site are detailed below.

Table 4.0: AS 3959-2009 BAL Construction Requirements

Vegetation Formation	Slope (under hazard)	Separation from hazard	AS3959 BAL Construction Level
Grassland	Upslope/ flat 0°	>20 – 50 metres	BAL – 12.5
Grassland	Upslope/ flat 0°	>50 metres	BAL - LOW

Note:

The relevant bushfire guidelines require that dwellings erected up to 50 metres from areas of unmanaged grassland (hazard) shall have a minimum level of construction that satisfies BAL – 12.5, pursuant to AS 3959 – 2009 ‘Construction of Buildings in Bushfire Prone Areas’.

6.3 Siting & adequacy of water (in relation to reticulation rates or where dedicated water storage will be required)

RF Reg. Clause 44 Application for bushfire safety authority (g) (ii): *the siting and adequacy of water supplies for fire-fighting.*

The subject development site will be connected to the reticulated (town) water supply which currently services existing development in the area.

Apart from the above, the proponent has not provided any specific advice (at the time of this assessment) regarding proposed reticulated water infrastructure and main size, supply pressure or guarantee of delivery. PBP acceptable solutions for a reticulated water supply area (relevant to the subject development) states that:

- *Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.*
- *Fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant*

water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles.

- Hydrants are not located within any road carriageway.
- All above ground water and gas service pipes external to the building are metal, including and up to any taps.
- The provisions of parking on public roads are met.

Based on AS 2419 and NSW RFS requirements, hydrant connection points;

- fed by mains supply only, should be located so as to be **no greater than 70 metres** from the furthest most point of buildings or areas that may require protection or water supply during a fire event.

Recommendations for water supply are outlined in Section 7.3 of this report.

6.4 Capacity of public roads (especially perimeter roads and traffic management treatments)

RF Reg. Clause 44 Application for bushfire safety authority (g) (iii): *the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency.*

PBP 2006 Acceptable Solutions (4.1.3 Access (1) – Public Roads) for public access roads include the following:

- *Public roads are two-wheel drive, all-weather roads.*
- *Urban perimeter roads are two-way, that is at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium rigid vehicle).*

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Source: AS 2890.2 – 2002.

- *The perimeter road is linked to the internal road system at an interval of no greater than 500 meters in urban areas.*
- *Traffic management devices are constructed to facilitate access by emergency services vehicles.*
- *Public roads have a cross fall not exceeding 3 degrees.*

- *All roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 meters in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard.*
- *Curves of roads (other than perimeter roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress.*
- *The minimum distance between inner and outer curves is six meters.*
- *Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient.*
- *There is a minimum vertical clearance to a height of four metres above the road at all times.*
- *The capacity of road surfaces and bridges is sufficient to carry fully loaded fire-fighting vehicles (approximately 15 tonnes). Bridges clearly indicate load rating.*
- *Public roads greater than 6.5 metres wide are to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression.*
- *Public roads between 6.5 and 8 metres wide are 'No Parking' on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.*
- *Public roads up to 6.5 metres wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.*
- *One way only access roads are no less than 3.5 metres wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.*
- *Parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are located within the parking bays.*
- *Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.*

Recommendations for any new public roads proposed for future development of the site are included in section 7.5 (Bush fire Safety & Compliance Recommendations).

6.5 Public roads link to fire trails and have two-way access

RF Reg. Clause 44 Application for bushfire safety authority (g) (iv): *whether or not public roads in the vicinity that link with the fire trail network have two-way access.*

There are no fire trails required or recommended by this report.

6.6 Adequacy of access and egress for emergency response

RF Reg. Clause 44 Application for bushfire safety authority (g) (v): *the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response.*

PBP 2006 acceptable solutions for property access roads (relevant to the subject development site) states that:

'No specific access requirements apply in a urban area where a 70 metres unobstructed path can be demonstrated between the most distant part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply).'

PBP 2006 (section 4.1.3 Access (2)) also states: *'A distinction is drawn between rural private access roads and those in urban areas....Urban areas have an existing infrastructure and requirements are generally less of a problem. In addition it is acknowledged that fire appliances will generally operate from the public road system'.*

It is anticipated that future development and planning for the site will reasonably comply with the above provisions.

6.7 Adequacy of maintenance plans and emergency procedures

RF Reg. Clause 44 Application for bushfire safety authority (g) (vi): *the adequacy of bush fire maintenance plans and fire emergency procedures for the development site.*

No additional advice or information regarding bushfire maintenance plans & fire emergency procedures has been provided by the proponent.

Should a bushfire emergency impact upon this area, the implementation of the existing Lake George Bush Fire Risk Management Plan should be adequate for bushfire suppression, hazard management and maintenance.

6.8 Adequacy of sprinkler systems & other fire protection systems

RF Reg. Clause 44 Application for bushfire safety authority (g) (viii): *the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development.*

There are no sprinkler systems required or recommended by this report.

7.0 Bushfire Safety & Compliance Recommendations

The following recommendations are based upon the incorporation of relevant provisions (acceptable solutions and/ or performance criteria) of PBP 2006 for a residential subdivision development on bushfire prone land in the event that the site is successfully re-zoned.

7.1 Defendable Space / Asset Protection Zone (APZ) Recommendations

Recommendation 1.

Future residential development of the subject land will require that at the commencement of building works (and in perpetuity) the entire development site be managed/ maintained as an Asset Protection Zone (APZ - Inner Protection Area - IPA).

The IPA should be managed in accordance with PBP 2006 (A2.2) (vi) which states:

'The IPA is critical to providing a defendable space and managing heat intensities at the building surface. The IPA should provide a tree canopy cover of less than 15% and should be located greater than 2 m from any part of the roofline of a dwelling. Garden beds of flammable shrubs are not to be located under trees and should be no closer than 10 m from an exposed window or door. Trees should have lower limbs removed up to a height of 2 m above the ground'.

The above recommendation should ensure that no easily combustible material, structures, available forest fuel/bushfire vegetation or other items be installed, stored or allowed to re-accumulate and become contiguous within the area. The IPA extent should not support or carry a running bushfire or grassfire towards the subject development site and associated infrastructure.

Landscaped areas within the APZ are to be maintained in accordance with the following documents:

- A. PBP 2006: *Appendix 5: Bush Fire Provisions – Landscaping and Property Maintenance.*
- B. *Standards for Asset Protection Zones* (NSW Rural Fire Service).

Based on the specifications of these documents, landscaping within the APZ should ensure the following:

- i. Garden beds containing shrubs and other plants should not directly abut the dwelling. Where this does occur gardens should contain bush-fire resistant species and non-flammable ground covers (e.g. pebbles). Flammable mulches or wood/ bark

chips should not be used.

- ii. Trees and shrubs planted within the APZ should be low-flammability species (i.e. native and/or introduced species).
- iii. Planting of trees/ shrubs within the APZ is acceptable provided that they are well spread out and do not form a continuous canopy.
- iv. Trees should not directly overhang a building. Canopies should not be within 2 metres of the building and should not link directly with the bushfire hazard.
- v. Garden beds containing flammable species should not be located under any tree.
- vi. Trees should have lower branches removed up to a height of 2 metres above the ground.

Appendix 4 of this report illustrates a typical profile for an APZ.

7.2 Construction Standard Recommendations

Recommendation 2.

Any residential buildings proposed for construction within the subject site (that are located within 50 metres of the adjacent 'grassland' hazard area) are to be designed and constructed in accordance with the provisions of AS 3959-2009 '*Construction of buildings in bushfire prone areas*' as detailed within Table 4.0 of this report.

7.3 Water Supply Recommendations

Recommendation 3.

The reticulated water supply (hydrant spacing, sizing and pressures) will be required to comply with the provisions of AS 2419 – 2005, the acceptable solutions of PBP 2006 and requirements of the NSW RFS as outlined in section 6.3 of this report.

7.4 Gas and Electricity Supply Recommendations

Recommendation 4.

Within the subject development site, gas and/ or electrical supply connections servicing future proposed building development must be designed & located in accordance with PBP 2006, including:

- Any new or re-positioned electrical transmission lines are located underground.

- Reticulated or bottled gas is Installed and maintained in accordance with AS1596 and the requirements of the relevant authorities
- All exposed/external gas service piping is to be metal
- All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation
- Release valves are directed away from the building and at least 2 metres away from any combustible material so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal.
- Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.

7.5 Vehicle Access/Egress Recommendations

Recommendation 5.

All proposed access roads are required to be designed and constructed in accordance with the acceptable solutions of PBP 2006 (4.1.3 Access (1) – Public Roads) as outlined in section 6.4 of this report.

8.0 Conclusion

This report has been commissioned to provide a bushfire hazard risk assessment for the proposed rezoning of 3 Majara Street Bungendore.

This assessment has considered the subject site with due regard to the legislation and policies relevant to a planning proposal for re-zoning of bushfire prone land. In accordance with these requirements the recommended bushfire protection measures for future development of the site would include the provision of asset protection zones, access arrangements, bushfire construction, water and utilities and emergency management arrangements.

Where the required bushfire protection measures are provided for it is a considered opinion that the bushfire risk exposure to future residential development within the site is relatively low.

Based on this assessment it is determined that the proposed rezoning proposal can comply with the relevant bushfire planning legislation, subject to compliance with the provisions (acceptable solutions and/or performance criteria) of PBP 2006 as outlined in this report.

It should be noted that future development within the subject site (post rezoning) would be subject to further assessment under the bushfire planning legislation of either *section 79BA of the EP & A Act 1979* or *section 100B of the Rural Fires Act 1997*.



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References

Australian Standard 3959-2009, Construction of buildings in bushfire prone areas – Standards Australia.

Building Code of Australia (2010) – Australian Building Codes Board, Canprint.

Environmental Planning and Assessment Act (1979) – NSW Government Printer.

- Section 79BA Consultation and Development Consent Certain Bushfire Prone Land
- Section 146 Bushfire Prone Land

Rural Fires Act (1997) – NSW Government Printer

Landscape and building design for bushfire areas (2003) – Ramsay G C & Rudolf L, CSIRO Publishing, Collingwood Victoria.

Ocean shores to desert dunes: the native vegetation of NSW and the ACT (2004) – Keith D, NSW Dept of Environment and Conservation, Hurstville NSW.

Planning for Bushfire Protection. A guide for councils, planners, fire authorities and developers (2006) – NSW Rural Fire Service.

Addendum: Appendix 3 - Planning for Bushfire Protection. A guide for councils, planners, fire authorities and developers (2010) – NSW Rural Fire Service.

Standards for Asset Protection Zones – NSW Rural Fire Service

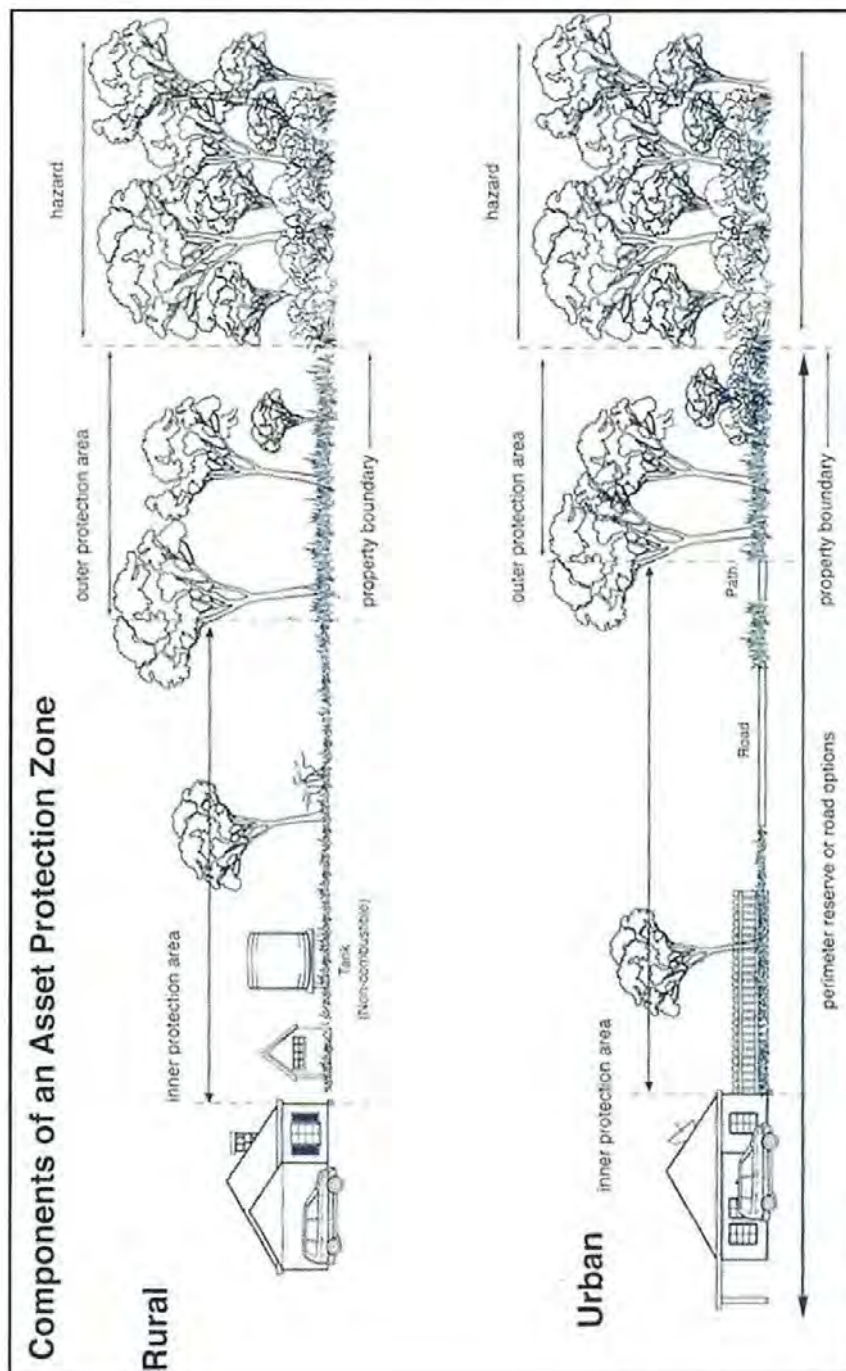
Appendix 1: Map 1 – Overview and Access



Appendix 2: Site Photos (19/07/2015)



Appendix 3: PBP APZ Profile



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MAJARA STREET

Current Land Use



Legend

- Site Boundary
- IN2 Light Industrial
- R1 - General Residential
- R2 - Low Density Residential
- RE1 - Public Recreation
- RU1 - Primary Production
- SP1 - Special Activities
- SP2 - Infrastructure

Proposed Land Use



Legend

- Site Boundary
- IN2 Light Industrial
- R1 - General Residential
- R2 - Low Density Residential
- RE1 - Public Recreation
- RU1 - Primary Production
- SP1 - Special Activities
- SP2 - Infrastructure

Note: These maps have been adapted from the Palerang Local Environmental Plan 2014, Land Zoning Map - Sheet LZN_004A.



Current and Proposed Land Use

Majara Street, Bungendore

PROJ. DRG NO Q215-0302-40 D001 REV 01 DRWN MD CHKD GS DATE 14.12.2016

Tract

MAJARA STREET

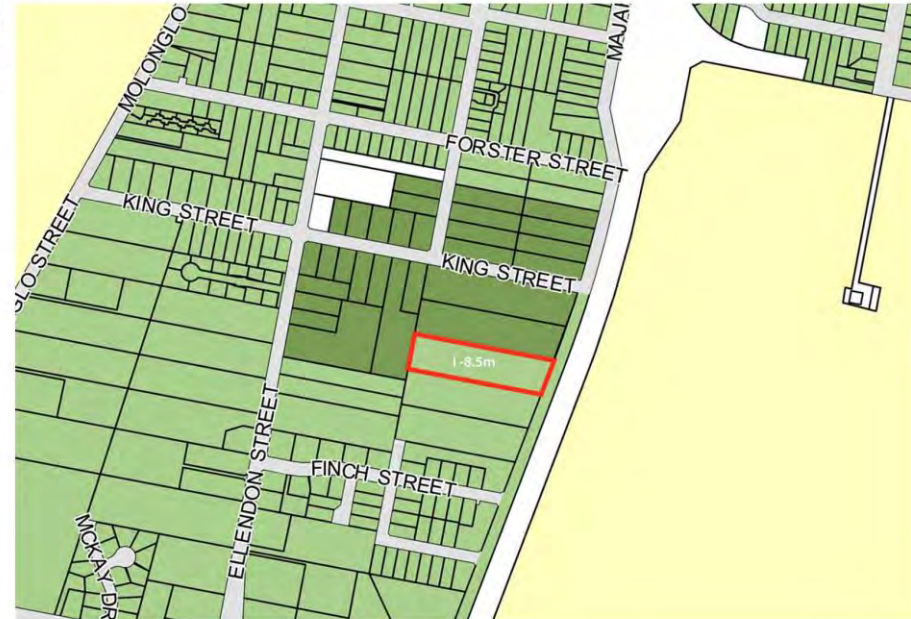
Current Building Heights



Legend

- Site Boundary
- I - 8.5m
- J - 9m
- K - 10m

Proposed Building Heights



Legend

- Site Boundary
- I - 8.5m
- J - 9m
- K - 10m

Note: These maps have been adapted from the Palerang Local Environmental Plan 2014, Height of Building Map - Sheet HOB_004A



Current and Proposed Building Heights

Majara Street, Bungendore

PROJ. DRG NO Q215-0302-40 D001 REV 01 DRWN MD CHKD GS DATE 14.12.2016

Tract

MAJARA STREET

Current Lot Sizes



Legend

- Site Boundary
- AC - 80 ha
- 5 - 850 sqm
- U - 1000 Sqm

Proposed Lot Sizes



Legend

- Site Boundary
- AC - 80 ha
- 5 - 850 sqm
- U - 1000 Sqm

Note: These maps have been adapted from the Palerang Local Environmental Plan 2014, Lot Size Map - Sheet LSZ_004A



Current and Proposed Lot Sizes
Majara Street, Bungendore

PROJ_DRG NO Q215-0302-40 D001 REV 01 DRWN MD CHKD GS DATE 14.12.2016 Tract

Majara Street Bungendore rezoning

Economic Study

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Date	14 December 2016
Document name	16_6487 Bungendore economic study
Version	2

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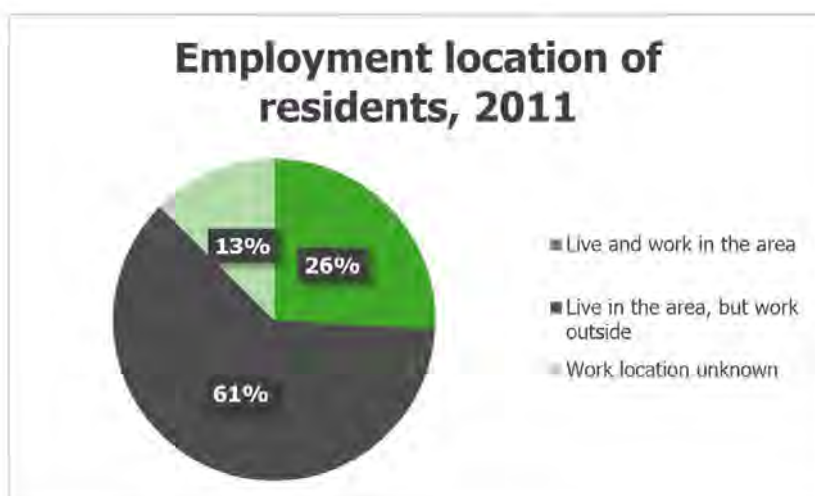
1 Economic Study

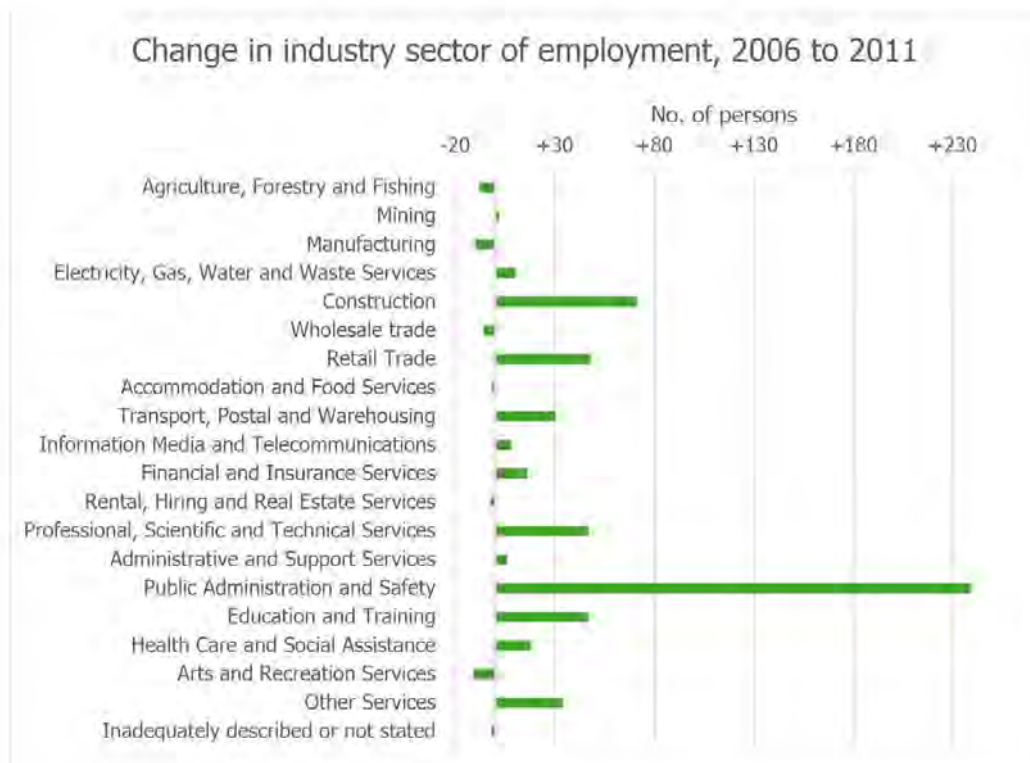
1.1 Demographics

Bungendore is a vibrant small country town of 2,754 (2011 Census) located within the recently created Queanbeyan-Palerang Regional Council. For the purposes of this report, Queanbeyan-Palerang Regional Council is referred to as Palerang LGA for consistency with LGA boundaries at the time of the 2011 Census.

Bungendore is in close proximity (40km) of the major metropolitan centre of Canberra (pop 355,596 at 2011 Census) and 25km of the major regional centre Queanbeyan (pop 37,991 at 2011 Census). Between the 2006-2011 census the population growth in Bungendore was a little over 40%, or just over 7% year on year.

The population of Bungendore and adjacent rural residential areas along the ACT border (comprising 61% of the total population of Palerang¹) rely heavily on the ACT and to a lesser extent Queanbeyan for access to higher order goods and services including speciality retail, tertiary education, hospitals and specialist medical providers and for employment. In 2011, 4,682 (61.4%) of Palerang Council area's working residents travelled outside of the area to work.





The change in industry sector employment indicates a large growth in Public Administration and Safety which, when combined with Employment Location of Residents, suggest a large number of residents live in Bungendore and work in the ACT primarily within the public service. Over the 2006-2011 period, there has been a decline in the traditional industrial activities, manufacturing, and wholesale trades.

The largest changes in the jobs held by the resident population between 2006 and 2011 in Bungendore were for those employed in:

- » Public Administration and Safety (+239 persons); and
- » Construction (+71 persons)

A review of the ABS Census data indicates the three most popular employment sectors are:

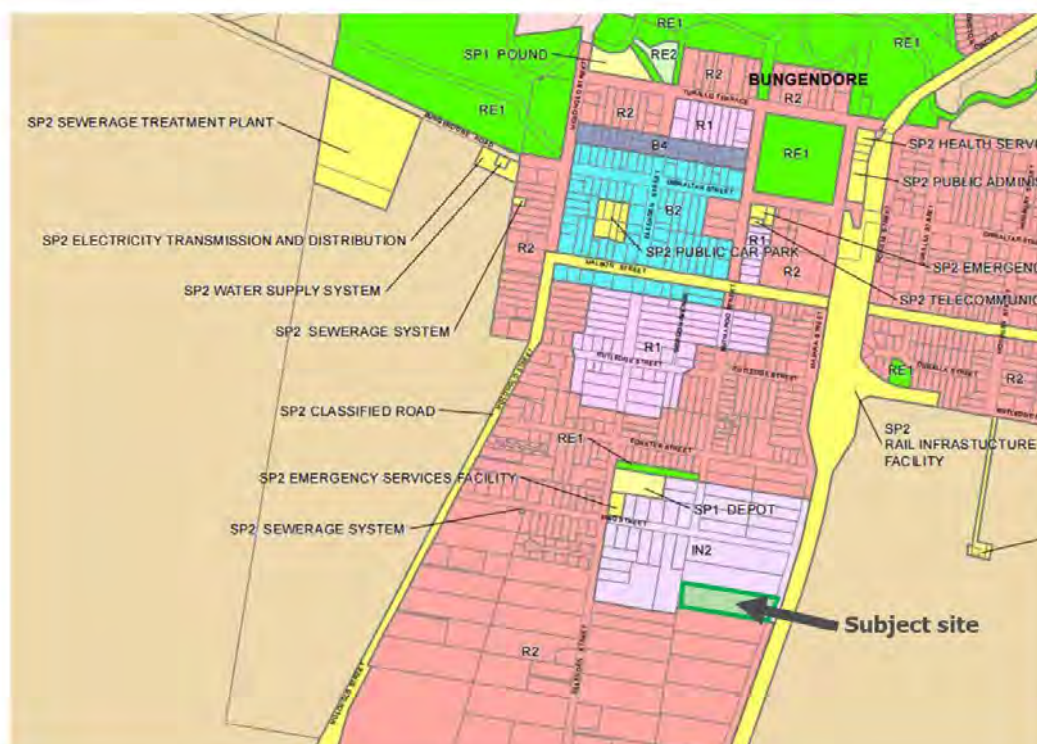
- » Public Administration and Safety (444 people or 29.0%)
- » Retail Trade (150 people or 9.8%)
- » Construction (148 people or 9.7%)

In combination, these three industries employed 742 people in total or 48.4% of the total employed resident population

1.2 Demand for industrial land

The 2009 Bungendore Land Use Strategy and Structure Plan that was prepared by P&A Walsh Consulting indicated that Bungendore's history as a rural settlement meant that 'blue collar' industries have never had a great presence in the town with existing industry generally constrained to local services.

Historically, the take up of industrial land in the town has been intermittent. Under the former *Yarrowlumla LEP 2002* and associated DCP, the Site was zoned 2(v) Village. The zoning was flexible to permit both residential, light industrial and a variety of other uses, however, the DCP favoured the use of the Site for industrial purposes. In 2014, the industrial use of the land indicated under the DCP provisions was transferred into the current *Palerang LEP 2014* by applying IN2 Light Industrial zone to the site. This change in zoning consequently prohibited the residential use of the site.



The Sydney – Canberra Corridor Regional Strategy 2008 indicated that future potential demand for industrial lands for the purposes of logistics, warehousing and transport, and manufacturing was more likely to occur close to the major regional centre of Queanbeyan due to its location adjacent to major regional transport infrastructure.

In the context of the newly formed Queanbeyan-Palerang Regional Council, the region now boasts an adequate supply of industrial land that is easily accessible from Bungendore. Industrial land that is in close proximity to Bungendore includes Queanbeyan and areas of the ACT, comprising of, the subdivision of Beard on the ACT/Queanbeyan border, Hume, Fyshwick, and the proposed future industrial estate of Eastern Broadacre near the suburb of Symonston.

Future demand for light industrial land in the Bungendore village is contingent on increased resident population through a series of subdivision approvals. However, this increase is also restricted by the securing of an adequate water supply for the town.

1.3 Land Valuation

In November 2015, a land valuation report was released on behalf of the Valuer General for the specific purpose of rating and taxing purposes. The report found that Canberra and Queanbeyan based employees were major buyers of residential and small rural properties within commuting distance of Canberra injecting significant income into the Palerang Council area. As a result, property prices tend to be more resilient to economic downturns than in the other rural-based LGA's.

Demand for Bungendore residential sites remained static throughout the review period (2014-2015). There was an average volume of vacant land sales in the village, with most sales occurring in the Bungendore Meadows Estate (off Trucking Yard Lane to the south), and Elmslea Estate to the northern fringe of the village. There was no change to 2014 values for Bungendore residential properties, whilst over the period 2012-2015, values decreased very slightly by 1.14%. Some of the larger blocks in Bungendore Village have been subdivided recently, while others are subject to development application consideration. Larger R2 zoned blocks recorded a 1.42% increase to 2014 values, whilst over the period 2012-2015 these blocks recorded a 0.96% overall increase.

In the twelve months prior to 2015, there were only four sales of commercial property in the Palerang LGA, all in Bungendore. This resulted in a slight increase in the values.

The Valuer General found that Bungendore has an insignificant industrial market with only 34 properties based in the Village. There were no sales over the review period 2014/2015, resulting in no change to the value levels, similar with industrial sales in nearby Queanbeyan. Over the period 2012-2015 there was a slight increase in values of 4.2%.

Properties Valued and Total Land Value					
Zone	Code	No of entries	2015 Total Land Value	2014 Total Land Value	% Change
Residential	R1, R2, R5, RU5	2,245	453,115,860	448,673,700	0.99
Rural	RU1	3,064	1,078,613,683	1,083,498,593	-0.45
Commercial	B2, B4	167	45,678,600	42,740,200	4.43
Industrial	IN2	34	12,846,500	12,846,500	0.00

Similarly, Queanbeyan has experienced a slight decline in the overall valuation of industrial land with the market remaining quite subdued over the last seven years. Over the border in the ACT, there is currently a surplus of industrial land and prices in Canberra have decreased over the past 3 years.

A stagnation in number of sales and value for industrial land demonstrates that there is, regionally, little demand for industrial zoned land. In the event that demand for industrial land in Bungendore increased, there is surplus supply in nearby Queanbeyan and the ACT to satisfy.



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Lots 3-4 DP1195030 Majara Street Bungendore

Traffic Impact Assessment

Prepared for: Bungendore Land Pty Ltd

Reference No: 3002410

15/12/2016

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Report for

Traffic Impact Assessment | Lots 3-4 DP1195030 Majara Street Bungendore | Bungendore Land Pty Ltd | 3002410
SMEC Australia

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1. Introduction

SMEC has prepared this Traffic Impact Assessment (TIA) in response to a request by Bungendore Land Pty Ltd, to address the requirements of Queanbeyan-Palerang Regional Council in support of a planning proposal for rezoning of Lot 3 DP 1195030 Majara St, Bungendore, from IN2 Light Industrial to R2 Low Density Residential. The report has been updated to respond to comments received from Council on 6 December 2016.

This report details the anticipated traffic generation of a future residential development across Lot 3 and Part of Lot 4, if the proposed rezoning of Lot 3 is successful.

This report provides an analysis of affected surrounding road network to determine the impact of a future residential development in Majara Street, immediately south of King Street.

2. Existing Conditions

2.1. Site Description

The site subject of rezoning is Lot 3, however the traffic impact assessment has considered the impact of residential development across Lots 3 and 4 if the rezoning of Lot 3 is successful.

The proposed development of Lot 3 and 4 for additional residential lots is identified in Figure 1.

Lot 3 is assumed to be bounded by a future industrial site (fronting King Street) to the north, Majara Street to the east, a future residential development site (Majara St Stage 2 subject to DA approval) to the south, and existing industrial site to the west. The Majara Street extension adjacent to the site which also runs alongside the Goulburn-Bombala Rail Line is currently an unsealed street.

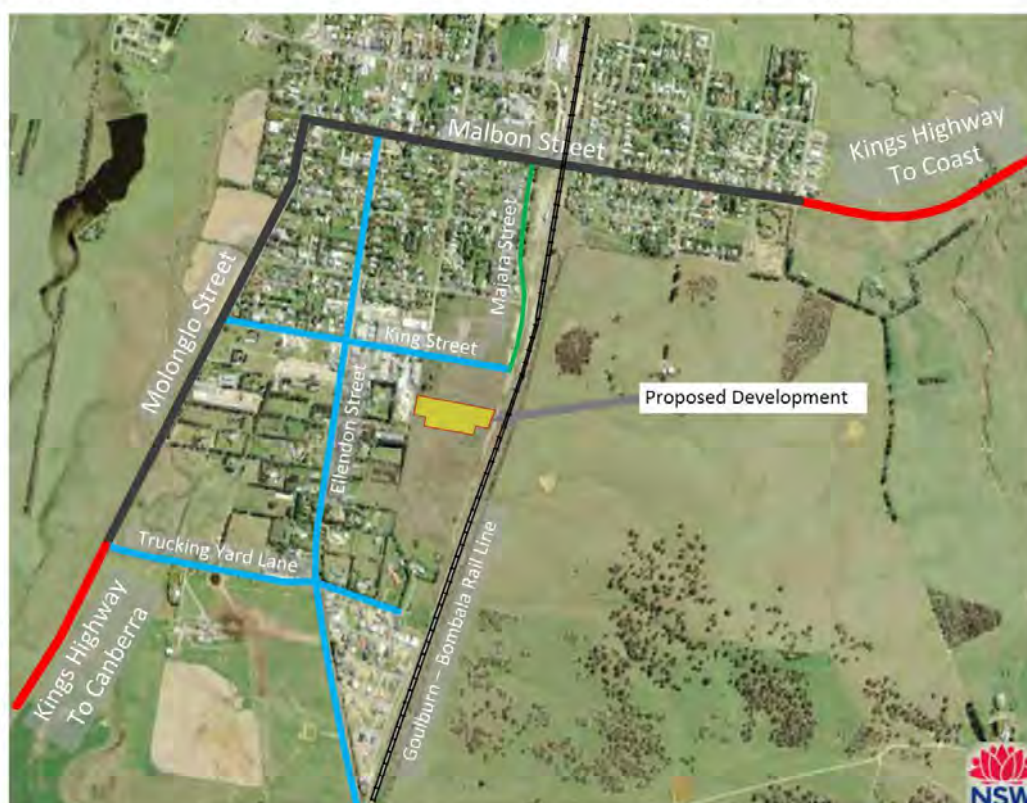


Figure 1: Lots 3-4 Development Site, Bungendore, Aerial Image Source: <http://maps.six.nsw.gov.au/>

The proposed development site is currently zoned IN2 – Light Industrial (Lot 3) and R2 – Low Density Residential (Lot 4) based on the information obtained from the Palerang Council website (<http://maps.palerang.nsw.gov.au/intramaps82public/>) as shown in Figure 2.

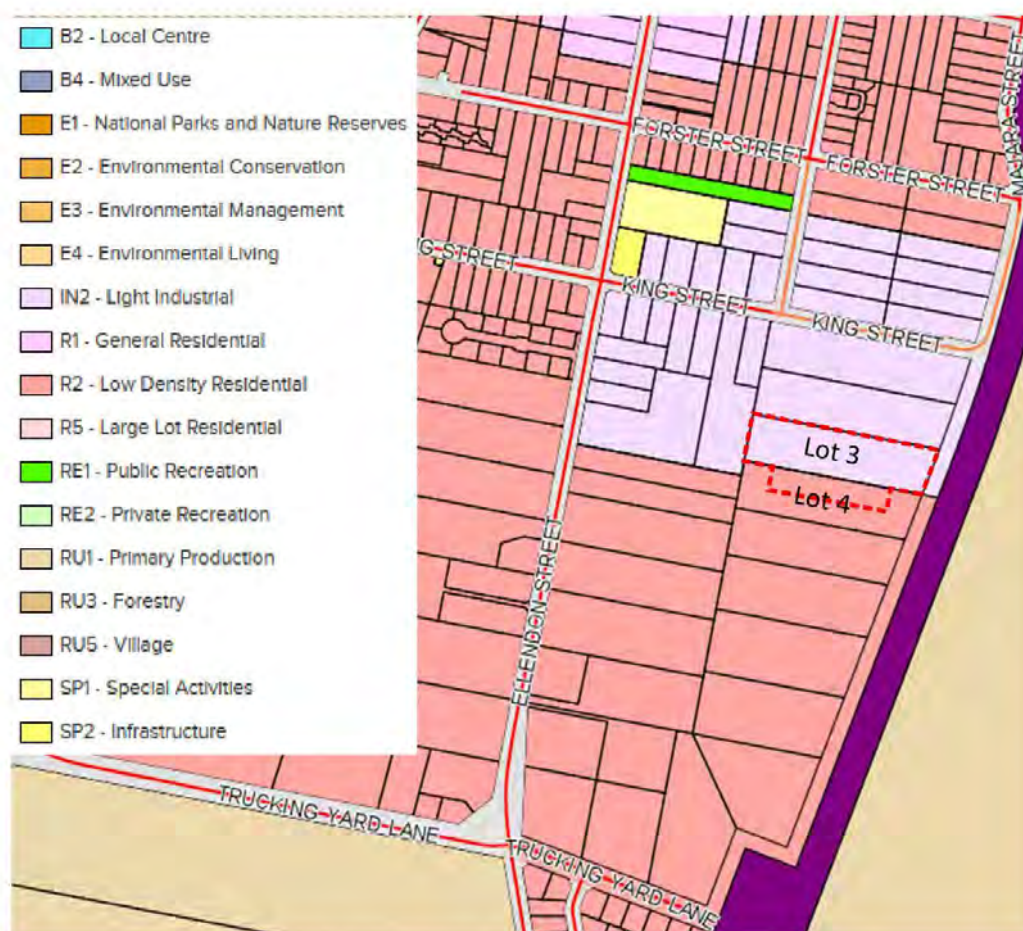


Figure 2: Lots 1-2 Development Site Land Use, Bungendore (source: <http://maps.palerang.nsw.gov.au/intramaps82public/>)

2.2. Existing Traffic Conditions

The speed limit along King Street is 50 km/h and it intersects Majara Street at the eastern end. Butmaroo Street intersects King Street midway along the precinct as a T intersection. There is currently a small amount of traffic passing the proposed development site from a residential development to the south.

2.3. Traffic Flows

Traffic volumes for eight sites around Bungendore was obtained from Queanbeyan-Palerang Regional Council on 14 December 2016. These site are listed in *Table 1* and illustrated in Figure 3.

Table 1: Ellendon Street Average Daily Traffic

Site	Site Description	ADT
N/A	Butmaroo Street, outside 59 Butmaroo Street (March-May 2016)	345
318	Ellendon Street between Rutledge St. and Forster St. (Dec 2011-Jan 2012)	1,077
321	Ellendon Street near 121 Ellendon Street (January-March 2012)	804
N/A	Ellendon Street outside 64 Ellendon Street (March-May 2016)	1,480
N/A	Majara Street outside 53 Majara Street (March-May 2016)	337
281	Molonglo Street south of Gibraltar Street (April 2014)	986
503	Molonglo Street south of Malbon Street (April 2014)	4,923
N/A	Trucking Yard Lane east of Kings Highway (March-May 2016)	753

Source: Queanbeyan-Palerang Regional Council, supplied 14 December 2016



Figure 3: Average Daily Traffic of Selected Roads in Bungendore, NSW

The Ellendon Street traffic data indicates that the majority of the vehicle traffic demand is located north of the proposed new development closer to the Malbon Street (Kings Highway) intersection. Although some of the Ellendon Street traffic data was collected in 2012, it is the most recent available and it is assumed that there has been no significant increase in traffic since then.

3. Proposed Development

3.1. Description

According to the Council's land zoning plan (shown previously in **Error! Reference source not found.**), the proposed development is located partially in a Light Industrial zone (IN2) and partially in a low density residential zone (R2). As part of this development, it is proposed to convert Lot 3 from IN2 to R2. Figure 4 shows the layout of the proposed development, which is assumed to have 12 blocks. Block 57 is assumed to allow dual occupancy so there will be 13 new residential dwellings.



Figure 4: Majara St, Bungendore, Lots 3-4 Proposed Subdivision Layout

3.2. Access

The new development is assumed to be connected to the surrounding network via Road 4, which passes through the proposed development and connects to Majara Street as shown in Figure 5. It is expected that traffic will use Ellendon Street, Majara Street and Trucking Yard Lane to enter and leave the development.



Figure 5: Lots 3-4 Majara Street Residential Development Accessibility, Bungendore

4. Impact of the Proposed Development

The proposed development is expected to generate trips that could potentially have a negative impact on the performance of the surrounding road network. The following sections discuss the processes involved to assess these potential impacts.

4.1. Traffic Generation

The additional daily and commuter peak traffic was calculated using published trip generation data from Roads and Maritime Services (RMS) and the Institution of Transportation Engineers (ITE).

The trip generation rates for residential land uses use a combination of RMS and ITE data. The RMS *Guide to Traffic Generating Developments* estimates a total of 2.0 trips in the commuter peak periods (AM and PM combined) for detached houses and 1.3 trips for townhouses. The ITE *Trip Generation* manual indicates that detached houses generate 33% more trips in the PM peak than in the AM peak, hence the AM and PM breakdown of trip generation rates in Table 2.

The directional trip distribution in each peak period for each land use type is also shown in Table 2. These are provided by the ITE manual.

Table 2: RMS Trips Generation Rates and ITE In/Out ratios

Land Use	Trip Rate			AM		PM	
	AM	PM	Daily	In	Out	In	Out
Residential Lots [per dwelling]	0.86	1.14	10.0	26%	74%	64%	36%

Based on these assumptions, the trips generated by the proposed residential development were estimated. The estimated trips generated are summarised in Table 3 and illustrated in Figure 6. The proposed development is expected to generate 130 daily vehicle trips.

Table 3: Estimated New Trip Generation

Land Uses	Dwellings	AM		PM		Daily
		In	Out	In	Out	
Proposed New Residential Lots	13	3	8	9	5	130
Total			11		14	

However, even with the increased demand, the total expected traffic volume is still below the capacity of King Street, which is 600 veh/h per lane¹.

The additional traffic demand is likely to have impacts on the three intersections indicated in Figure 6, which are:

- 1) Finch Street – Ellendon Street
- 2) Trucking Yard Lane – Molonglo Street (Kings Highway)
- 3) Majara Street – Malbon Street (Kings Highway)

¹ RMS Guide to Traffic Generating Developments, Table 4.3, p. 4-5

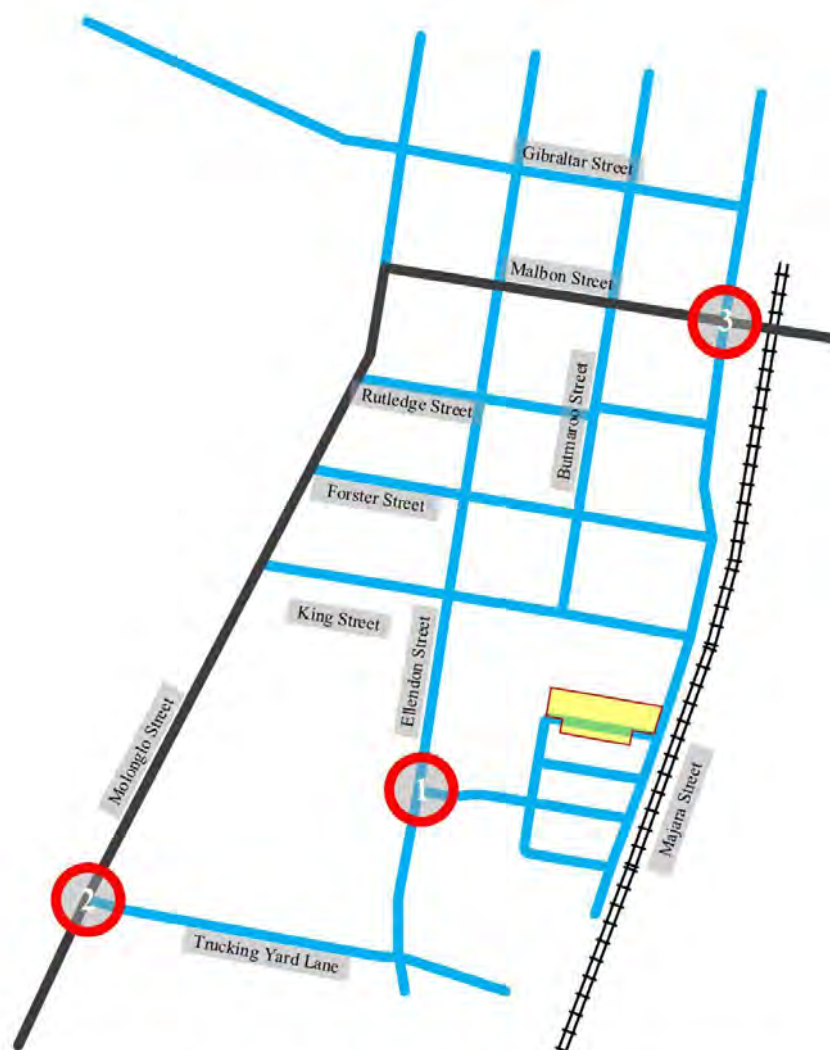


Figure 6: Impacted Intersection in Bungendore from the New Development

4.2. Traffic Distribution

Considering the location of the proposed development site, which is around the southern area of Bungendore, it is assumed that the additional generated traffic will be distributed as illustrated in Figure 7.

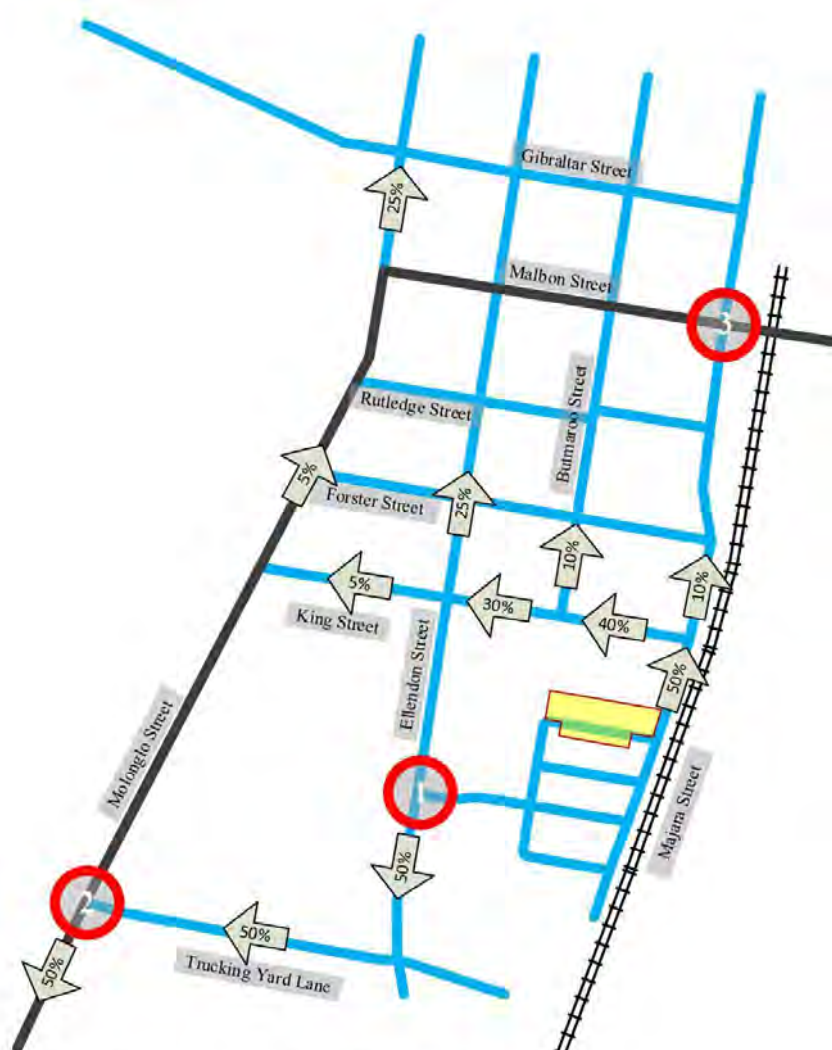


Figure 7: New Development Trip Distribution in Bungendore

The intersection demand volumes were estimated based on the following assumptions:

- 50% of the traffic will leave Bungendore and travel west towards Queanbeyan and Canberra
- 50% of the traffic will travel to destinations inside Bungendore and further to the north or east
- All traffic travelling to the west will use Ellendon Street and Trucking Yard Lane to access the Kings Highway
- The traffic travelling north and east will be distributed as follows:
 - 10% will use Kings Highway
 - 20% will use Majara Street
 - 20% will use Butmaroo Street
 - 50% will use Ellendon Street

ABS JTW data suggests that approximately 90% of people who live in Bungendore travel to Queanbeyan or Canberra for work. However, work trips typically only make up 15% of daily trips².

² 2011/12 Household Travel Survey Summary Report, 2013 Release, Transport for NSW

Other reasons for travelling to Canberra and Queanbeyan include education and shopping, which make up 9% and 16% of daily trips respectively. Based on these trip proportions, it appears reasonable to assume that 50% of daily trips are travelling to and from the western side of Bungendore.

4.3. Impact of Generated Traffic

The impact of the additional traffic demand on the surrounding road network was assessed by comparing current (before development) and future (after development) volumes against the capacities of the affected streets, as shown in *Table 4*. The peak hour count volumes are estimated as 10% of the ADTs for consistency in the comparisons. It is noted that the development is only expected to generate 11-14 peak hour trips, which represents 1.8-2.3% of the hourly capacity of a traffic lane. This very small increase in traffic is not expected to cause any traffic issues, whichever road the traffic travels along.

Table 4: Comparison of Traffic Demand – Current and Estimated

Location	Current		After Development		% ADT Increase
	ADT	Peak Hour	ADT	Peak Hour	
59 Butmaroo Street	345	35	358	36	4%
Ellendon Street (Rutledge – Forster)	1,077	108	1,110	111	3%
121 Ellendon Street	804	80	869	87	8%
64 Ellendon Street	1,480	148	1,513	151	2%
53 Majara Street	337	34	350	35	4%
Molonglo Street (south of Gibraltar)	986	99	1,019	102	3%
Molonglo Street (south of Malbon)	4,923	492	4,988	499	1%
Trucking Yard Lane (east of Kings Highway)	753	75	818	82	9%

Among the streets with available count data, Ellendon Street and Trucking Yard Lane are expected to have the highest proportional increase in daily traffic at 8% and 9% respectively. The resulting demand volume during peak periods (87 and 82 veh/h, respectively) is considerably below the capacity specified by the RMS Guide, which is 600 veh/h per lane.

All other roads around the proposed development area are expected to operate well below their capacity if the proposed development goes ahead.

5. Conclusion

The assessment showed that the traffic impact of the proposed residential development on the surrounding network is not significant and the road network has enough spare capacity to accommodate the additional traffic generated by the proposed development.



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