TUART BROOK LOCAL STRUCTURE PLAN - AMENDMENT

City of Bunbury

March 2024

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DOCUMENT CONTROL

Control Version	Date	Status	Distribution	Comment
A	25/01/2024	Draft	HD	For QA
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C	23/04/2024	Final	WAPC/LG	For Lodgement
D	04/07/2024	Final	WAPC/LG	Modifications as per City of Bunbury request.

Prepared for:	Development WA & Kingslane Pty Ltd	Date:	19 November 2024
Prepared by:	AR	Job No:	23613
Reviewed by:	KS	Ref:	D

DISCLAIMER

APPROVALS PAGE

This amended structure plan is prepared under the provisions of the City of Bunbury Local Planning Scheme No. 8.

IT IS CERTIFIED THAT THIS AMENDED STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

_____ [DATE]

Signed for and on behalf of the Western Australian Planning Commission:

_____

an officer of the Commission duly authorised by the Commission pursuant to section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

_____ Witness

_____ Date

_____ Date of Expiry

TABLE OF AMENDMENTS

Amend No:	Summary	Date approved by the WAPC
1	Modifications to Residential Cells and Public Open Space and internal road layout. Removal of the Local Centre and Replacement of Mixed Use Residential Cell Modification to Bussell Highway intersection Minor modification to Primary School site	
2	Modifications as required by the City of Bunbury regarding Structure Plan Manner and Form	
3		

EXECUTIVE SUMMARY

This amendment to the Tuart Brook Local Structure Plan (the Structure Plan) has been prepared to guide the subdivision and development of the area bounded by Washington Avenue to the north, Bussell Highway to the east, the Preston River to Ocean Regional Park to the south and Parade Road to the west. The site is located approximately 5.7 kilometers or 9 minutes (by road) south of the Bunbury Central Business District.

On approval, this amendment, is intended to extend the life of the Structure Plan for a further 10 years or longer as determined by the Western Australian Planning Commission (WAPC) in accordance with Schedule 2, cl.28(2) of the *Planning and Development (Local Planning Schemes) Regulations 2015*. The amendment to the Structure Plan has been written in a way that it both incorporates the existing elements of the approved Structure Plan whilst incorporating the current requirements and revisions as identified within the report.

Despite the existing Structure Plan being approved almost 10 years ago, due to the difficulty in the provision of some services, the site remains largely undeveloped except for some subdivision of lots west of Parade Road. As servicing constraints are largely resolved, particularly with regards to the availability to connect to reticulated sewage, the development of the Local Structure Plan area can commence in the near future and will contribute to the City of Bunbury's ability to provide for the residential needs to accommodate the City's projected growth demands.

The amendment to the Structure Plan is considered of a minor nature in accordance with section 7.1.1 of the *WA Planning Manual – Guidance for Structure Plans* as it does not impact on the purpose, objectives, or the overall design response of the plan. The report has been updated to make it contemporary, efficient, and accurately reflect the current planning and servicing requirements. The fundamentals of the existing Structure plan (2014) remain valid and no significant changes to the approved structure plan are proposed.

The key modifications made as part of this amendment to the Structure Plan include:

- Consideration of Bushfire Requirements in accordance with SPP 3.7.
- Updates to the Transport Impact Assessment as a result of the construction of the Bunbury Outer Ring Road and statutory requirements.
- Revised road layout to support individual land development opportunities.
- Revision of intersection onto Bussell Highway.

The 92.4399ha Structure Plan site incorporates 34.4091ha of land for residential development, 25.1415ha of Regional Open Space, 8.0642ha of Public Open Space, a Mixed-Use Residential site and a primary school site. Consultation with the City of Bunbury and the Department of Planning, Lands and Heritage has been undertaken in relation to this portion of the site to allow some flexibility when development occurs.

The contemporary design of the amended Structure Plan maximises the accessibility of green spaces while addressing Bushfire Management, Traffic and Noise Management policies and guidelines. The road layout largely promotes the development of regular shape lots of different sizes to accommodate a variety of community needs.

The amended Structure Plan embraces the principles of the WAPC's Liveable Neighbourhoods and seeks to:

- foster a strong sense of community and identity;
- provide an inter-connected network of streets to provide for safe and efficient walking, cycling and driving experiences;
- ensure active street/land use interfaces maximising surveillance opportunities;
- provide for safe and convenient access to the public transport network;

- provide a wide variety of lot sizes and housing types to cater for a range in housing choice and lifestyle opportunities;
- avoid key environmental areas and incorporate these features into the design of the area; and
- provide an integrated approach to the design of open space and urban water management;

A summary of the key statistics is provided in **Table 1.**

Item	Data	Structure Plan Ref (section no.)
Total area covered by the structure plan	92.4399 hectares	Section 1 – 1.1
Area of each land use proposed: • Residential R20/40 • Residential R30/60 • Residential Mixed Use	Hectares / Lot yield 28.8735 / 641 (based on R20) 4.5356 / 206 (based on R40) 0.6910 / 31	Section 1 – 4.2.1
Total estimated lot yield	878	Section 2 – 5.2
Estimated number of dwellings	878	Section 2 – 5.2
Estimated residential site density	12.9 dwellings per site/ hectare (excluding ROS)	Section 2 – 5.2
Estimated population	2195 (2.5 persons per dwelling)	Section 2 – 5.2
Number of high schools	0	n/a
Number of primary schools	1 (3.75ha)	Section 2 – 5.6
Estimated commercial floor space	0.9300ha net lettable area (max Office - 200m² per lot and max Shop – 300m² per lot)	Section 2 – 2.3.7
Estimated area and percentage of public open space given over to: • Regional open space • District open space • Neighbourhood parks • Local parks	 25.1715 hectares 27.2% 0 hectares 0 hectares 8.0642 hectares 5 parks	Section 1 – 4.1.3 Section 2 – 5.1
Estimated percentage of natural area	33.2357 hectares 35.95 %	Section 2 – 5.1 Table 4

Table 1 Summary Table

Appendix No.	Document Title	Nature of Document	Referral/Approval Agency	Approval Status and Modification
A	Environmental Assessments	Supporting	City of Bunbury/DBCA/DWER	Approved (2013)
B	Local Water Management Strategy	Supporting/Requires Approval	DWER	Approved (2013)
C	Bushfire Management Plan	Supporting/Requires Approval	City of Bunbury / DFES	
D	Servicing and Staging Report	Supporting	City of Bunbury	
E	Transport Impact Assessment	Supporting	City of Bunbury/MRWA	

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PART ONE: IMPLEMENTATION

1 STRUCTURE PLAN AREA AND OPERATION

1.1 Structure Plan Area

The boundaries of the structure plan area include the portion of the Local Government of the City of Bunbury (the City) designated as "Tuart Brook Local Structure Plan Area" as shown on **Figure 1 - Tuart Brook Local Structure Plan Area.**

Bussell Highway defines the eastern boundary of the structure plan area with Washington Avenue to the north, Preston River to Ocean Regional Park (Lillydale Road) to the south and Parade Road to the east.

The lots included in the structure plan and the approximate lot areas are included in **Table 3** below.

The amended Structure Plan (refer to **Figure 1, Table 1**) incorporates 25.1715ha of Regional Open Space (ROS), 8.1ha of Public Open Space (POS), a 3.75ha Primary School and a 6910m² mixed use residential site capable of providing for a range of retail and community related uses.

Once developed, the amended Structure Plan is estimated to be capable of supporting approximately 878 dwellings and an overall estimated population of 2195 people.

Lot	Road	Plan No.	Area (ha)	Proprietor
800	Parade Rd	P65631	1.7408	[redacted]
9001	Parade Rd	P65631	1.6181	
57	Lingard Loop	P420373	0.1557	
300	Lingard Loop	P286927	0.0388	
802	Washington Ave & Parade Rd	P65631	25.826	
501	Washington Ave	P46368	28.325	
100	Bussell Hwy	P57761	3.0175	
4	Bussell Hwy	D31183	2.0234	
3	Bussell Hwy	D31183	1.8251	
7	Bussell Hwy	D69285	0.2009	
8	Bussell Hwy	D75424	13.864	
4	Bussell Hwy	D30204	6.9882	
3	Bussell Hwy	D30204	6.8164	
		Total Area	**92.4399**	

Table 3 Lot details

1.2 Operation

This amendment to the Tuart Brook Local Structure Plan (LSP) comes into effect on the date on which it is approved by the Western Australian Planning Commission (WAPC). It is requested that this amendment extends the validity of the LSP for a further 10 years from that date, or another period determined by the WAPC in accordance with the Planning and Development (Local Planning Scheme) Regulations 2015 Schedule 2 – Deemed Provisions.

The (amended) Structure Plan is to be given due regard when making decisions on the development and subdivision of land within the Structure Plan area.

2 INTERPRETATION AND RELATIONSHIP WITH STATUTORY PLANNING FRAMEWORK

The Tuart Brook Local Structure Plan constitutes a Structure Plan pursuant to Clause 38 and Schedule 5 of the City of Bunbury Local Planning Scheme No.8 and the Planning and Development (Local Planning Schemes) Regulations 2015 Schedule 2 – Deemed Provisions for local planning schemes.

The Structure Plan map outlines future land use, zones and reserves applicable within the structure plan area.

Pursuant to the Planning and Development (Local Planning Schemes) Regulations 2015 Schedule 2 – Deemed Provisions for local planning schemes, a decision maker of an application for development approval or subdivision approval is to have due regard to the provisions of this Structure Plan, including the Structure Map, Implementation Report, Explanatory Report and Technical Appendices.

3 PURPOSE

The purpose of the Tuart Brook Local Structure Plan is to facilitate development of the site to guide future subdivision in a coordinated approach.

The Structure Plan provides guidance on the future urban structure of the site, the distribution of land uses and the necessary development requirements to be complied with.

4 STAGING

The development staging shall follow an orderly sequence and provide a manageable level of service of essential infrastructure for roads, drains and utility services. Cooperation between landowners will be necessary to facilitate development and stage development appropriately in some instances according to landowner timeframes, market demand and infrastructure implementation.

The initial stages of development are likely to occur on the western side of Parade Road. This is expected to extend into Lots 8, 501 and 802 to the east of Parade Road, though there are multiple options for the sequencing of subsequent stages east of Parade.

5 SUBDIVISION AND DEVELOPMENT REQUIREMENTS

5.1 Land Use Zones

The amended Tuart Brook Local Structure Plan Map outlines land use, zones and reserves applicable within the Structure Plan area (refer **Figure 1**). Land use permissibility within the Structure Plan area shall be in accordance with the corresponding zone or reserve under LPS 8, or as otherwise outlined in this Structure Plan.

The Structure Plan contains the following zones: Residential, Public Open Space and Mixed Use – Residential. These zones are consistent with Local Planning Scheme No.8.

5.2 Residential

5.2.1 Dwelling Target

In accordance with the requirements of Liveable Neighbourhoods, subdivisions are to achieve an average residential density of 22 dwellings per site hectare across the Structure Plan area.

5.2.2 Density

a. **Figure 1** defines the broad residential density ranges that apply to specific areas within the Structure Plan. Lot specific residential densities, within the defined residential ranges, are to be subsequently assigned in accordance with a Residential Density Code Plan approved by the WAPC.
b. A Residential Density Code Plan is to be submitted at the time of subdivision to the WAPC and shall be consistent with the Structure Plan, and the Residential Density Ranges identified in **Figure 1** and locational criteria contained in Clause 5.3.2.
c. The Residential Density Code Plan is to include a summary of the proposed dwelling lot yield of the subdivision.
d. A Residential Density Code Plan is not required if the WAPC considers that the subdivision is for one or more of the following:
    i. The amalgamation of lots;
    ii. Consolidation of land for 'super lot' purposes to facilitate land assembly for future development;
    iii. The purposes of facilitating the provision of access, services or infrastructure; or
    iv. Land which by virtue of its zoning or reservation under the Structure Plan cannot be developed for residential purposes.

5.2.3 Locational Criteria

The allocation of residential densities shall be in accordance with the following locational criteria:

a. The R20 density code shall apply as the base code to all "Residential" zoned lots, with the exception of those lots coded R40 or R60 as set out in (2) below.
b. The R40 density code may apply to all "Residential" zoned lots where one or more of the following applies:
    i. The lot is located on a street corner or at the end of a street block; or
    ii. Considered to be in an area of high amenity including within 400m of a mixed-use area, around public open space, primary school and adjacent to major public transport routes.
c. A Residential Density Code Plan is lodged in support of a Subdivision Application identifying the allocated density code consistent with the approved Local Structure Plan.

5.3 Mixed Use – Residential

The Structure Plan (refer **Figure 1**) identifies an area at the proposed intersection of Parade Road and east-west Neighbourhood Connector B Road for "Mixed Use – Residential". This was previously identified in the approved Structure Plan as a Local Centre however, the "Mixed Use – Residential" zone is consistent with LPS 8 and provides a broader range of potential development opportunities for the site.

In accordance with LPS 8 "Mixed Use – Residential" is intended to facilitate development of residential and non-residential land uses in strategic locations that complements the hierarchy of designated activity centers, with a predominantly residential character and amenity that meets both the medium and higher density housing and employment needs of the City.

5.4 Road reserves

Road reserves are to be designed generally in accordance with the Structure Plan Map included as **Figure 1**. The road reserve widths of the proposed internal road network are between 18m - 20m for the neighbourhood connectors and 15m for the minor access streets, which are generally consistent with the Liveable Neighbourhoods (WAPC 2009) requirements.

The applicant/owner shall make provision for footpaths through the structure plan area as identified on **Figure 1**. The final location and width of footpaths are to be determined at subdivision stage and shall be in accordance with the requirements of Liveable Neighbourhoods.

5.4.1 Interface with adjoining areas

The amended Local Structure Plan provides for orderly connection of local roads from Tuart Brook to adjoining areas and to the wider road network, via the connections shown on the amended Structure Plan Map at **Figure 1.**

Consistent with the approved Structure Plan, a 20m wide Noise Buffer runs parallel to Bussell Highway separating the Structure Plan boundary from the Bussell Highway road reserve.

No direct vehicular access on to Bussell Highway will be permitted except via the intersection shown on the amended Local Structure Plan Map at **Figure 1**. Minor updates to the location and alignment of the neighbourhood connector roads onto Washington Avenue and Parade Road as identified on the Structure Plan, which have been considered as part of the Traffic Impact Assessment. Detailed design of these intersections will occur as part of the subdivisional works.

The boundary interface between the Structure Plan area and adjoining land holdings will be addressed through the subdivision process and will incorporate a combination of fencing and/or internal road separation as detailed in the technical appendices, particularly with regards to noise attenuation.

5.5 Public Open Space

The Structure Plan area will require 10% POS in accordance with the WAPC's Liveable Neighbourhoods. POS is to be provided generally in accordance with **Tables 4 and 6, and Figure 11** with an updated POS schedule to be provided at the time of subdivision for determination by the WAPC, upon the advice of the City.

The POS proposed as part of the Structure Plan include areas for noise attenuation associated with the Bussel Highway, drainage, passive and active recreation as well as the protection of existing vegetation. The POS adjoining the Primary School Site will serve as a multi-purpose recreation space, servicing the primary school and community.

At the time of subdivision, the POS areas shown on the amended Structure Plan (refer **Figure 1**) are to be ceded free of cost to the Crown and vested to the City. A schedule of POS to be provided as shown below in **Table 4**.

5.6 Other reserves:

The ROS boundary has been carried through from the approved Tuart Brook Local Structure Plan, as identified in the GBRS and the LPS 8, incorporating the boundaries of the Resource Enhancement Wetlands and is identified as being particularly important in providing a wildlife and conversation corridor.

The ceding of ROS may be carried out at the time of subdivision in accordance with the requirements of the Kalgulup Regional Park Management Plan and relevant servicing authorities.

The Structure Plan area also includes a Primary School Site reserve to service the immediate and broader area as required by the Department of Education.

Public open space schedule		
Calculation of Required POS Provision		
Total site area (ha)		**92.4399**
Deductions		
Environmental	0.0000	
Conservation Category Wetland	0.0000	
Bush Forever	0.0000	
Regional Open Space Reserves	25.1715	
Restricted Access Conservation Areas	0.0000	
Surface area of natural water bodies	0.0000	
Infrastructure		
Rail Reservation	0.0000	
Regional Road Reservations, widenings - Primary/Other	0.0000	
Public utilities (include pump station sites, transmission corridors)	0.0000	
Drainage (steep sided drains and basins)	0.0000	
Non Residential Land Uses		
Primary School	3.7487	
High School	0.0000	
Activity centres, commercial, retail (excluding residential component)	0.0000	
Community Purposes Sites	0.0000	
Public Purpose Reserves (noise buffer)	1.5048	
Other		
Surplus Restricted Public Open Space Not Credited	0.0000	
Total Deductions		
Total Deductions		**30.4250**
Gross Subdivisible Area (total site area minus deductions)		**62.0149**
Required Public Open Space (10%)		**6.2015**
Breakdown of POS Provided		
Restricted Public Open Space		
Conservation Category Wetland Buffer (up to 50m)	0.0000	
Resource Enhancement, multiple use wetland or similar and associated buffers (up to 30m)	0.0000	
Reserved land encumbered by easements ie powerlines, sewer gas - deemed suitable for POS	0.0000	
Total Restricted POS	0.0000	
Maximum 20% credit	0.0000	
Total Restricted POS Credited to a maximum of 20%		**0.0000**
Surplus Restricted POS Not Credited i.e. over the maximum 20%	0.0000	
Unrestricted Public Open Space: by function (refer Note 4)		
Sport	0.0000	
Recreation	0.0000	
Nature	8.0642	
Total Unrestricted POS	8.0642	
Total Unrestricted POS		**8.0642**
Total		**8.0642**
POS Provision as Percentage of Gross Subdivisible Area		**13.00%**

Table 4 Public Open Space Schedule

5.7 Development layout

Subdivision, development, and land use within the structure plan area is to be generally in accordance with the approved Local Structure Plan.

The final layout of the proposed Mixed-Use area and Primary School site will be subject to future Local Development Plans and/or Development Approvals with the Local Government or relevant planning approvals framework.

5.7.1 Local Development Plans

The preparation of a Local Development Plan (LDP) in accordance with ?? of LPS 8 may be required by the WAPC on the advice of the City of Bunbury, as a condition of subdivision approval where deemed necessary for land comprising, but not limited to:

a. Lots abutting areas of Public Open Space;
b. Lots zoned "Mixed Use – Residential"; and
c. At the discretion of the developer where there are additional development considerations or site constraints that need to be addressed through an LDP to enable coordinated development of the site.

5.8 Other requirements

5.8.1 Bushfire protection

Land within the Structure Plan area is mapped as being bushfire prone under the Department of Fire and Emergency Services Bushfire Prone Mapping.

This amended Local Structure Plan is supported by a Bushfire Management Plan, prepared in accordance with *State Planning Policy 3.7 – Planning in Bushfire Prone Areas (SPP3.7)*. Any development on land within the Structure Plan area shall be constructed in accordance with the recommendations made by the Bushfire Management Plan and shall comply with the requirements of *Australian Standard 3959 – Construction of Buildings in Bushfire Prone Areas*.

Bushfire management requirements will ultimately be considered as part of future applications to subdivide or develop land within the Structure Plan area. A site-specific Bushfire Management Plan, where applicable, may be required at that time. As a minimum, a Bushfire Attack Level Contour Plan, prepared in accordance with an approved Bushfire Management Plan, will be required to be submitted at the time of lodgment of an application for subdivision and/or development approval.

5.8.2 Infrastructure arrangements

All proposed lots are to be connected to reticulated water, sewer, power as well as being connected to a comprehensive drainage system in accordance with the Local Government and Service Agency requirements.

All proposed lots are to be serviced by internal subdivision roads, with no direct access being proposed to Washington Avenue, Parade Road or Bussell Highway as identified on the Structure Plan map at **Figure 1**.

The Transport Impact Assessment included as **Appendix E** details the capability of existing and proposed roads.

Detailed design and implementation of subdivisional roads, intersections and the deliverance of services will occur as part of the subdivisional works.

5.8.3 Development and Infrastructure Agreement

Development contributions for infrastructure will be considered and managed in accordance with State Planning Policy 3.6 'Infrastructure Contributions (SPP 3.6) and are generally calculated a plied via the following mechanisms:

- Subdivision and development process.

- Development Contribution Plans.
- Developer Agreements.

The development contributions may include common infrastructure works such as roads, drainage and sewer as well as the equitable apportionment of POS.

Contributions may be a condition of subdivision approval and will become due and/or payable as part of the subdivision clearance process.

5.8.4 Protection or management of environmental or landscape features

It is intended that any freehold land identified as ROS may be entitled to available compensation under the GBRS or ceded to the State of WA as a planning condition of subdivision.

The 3 areas of POS adjoining the ROS reservation contain remnant vegetation that is also proposed to be ceded as part of the future development. A Landscape Management Plan may be required to be prepared by the developers to the satisfaction of the Local Government as a condition of subdivision.

5.8.5 Water resource management

An Urban Water Management Plan, consistent with the approved Local Water Management Strategy is to be prepared and implemented for each stage of the subdivision.

5.8.6 Heritage

The Structure Plan Area comprises sites of Aboriginal Cultural Heritage significance, as mapped on the Department of Planning, Lands and Heritage Aboriginal Cultural Heritage Inquiry System. Appropriate review of the sites and implementation of any relevant mechanisms for minimizing impact shall be considered prior to the commencement of ground disturbing works in accordance with the Aboriginal Heritage Act 1972.

5.9 Additional Details

5.9.1 Studies to be required under condition of subdivision/development approval

Once approved, the amended Tuart Brook Local Structure Plan forms the statutory framework to guide subdivision and development within the structure plan area.

Various detailed investigations may need to be undertaken in order to support the eventual subdivision of the site. The details of additional information required to be submitted and the stage which it is to be submitted, are summarized below:

Additional Information/Purpose	**Approval Stage**	**Responsible Agency (Consultation Required)**
Urban Water Management Plan	Subdivision Application	City of Bunbury (in conjunction with DWER)
Local Development Plan	Subdivision or Development Application	City of Bunbury
Density Plans	Subdivision Application	WAPC

Table 5 Additional Investigations

The responsibility for formulation of these plans will rest with the landowner/developers at the appropriate time of development.

As the development progresses it may be necessary to vary aspects of the Structure Plan and as such the plan is intended to be adaptable subject to suitable justification. Modifications to the adopted Structure Plan area to be undertaken in accordance with Schedule 2, Clause 29 of the Planning and Development (Local Planning Schemes) Regulations (2015).

Figure 1 Structure Plan Map (page left black intentionally)

TUART BROOK LOCAL STRUCTURE PLAN

Plan No.	23613-02	
Date	08/07/24	
Drawn	NP	
Checked	KS	
Revision	D	
Scale	1:5000@A3	0 50m 100m 150m

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NOTE: This plan has been prepared for planning purposes. Areas, Contours and Dimensions shown are subject to survey

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PART TWO: EXPLANATORY SECTION

1 INTRODUCTION AND PURPOSE

The purpose of the amended Local Structure Plan is to provide for the orderly and proper planning of the Tuart Brook urban area in accordance with the State Planning Framework and the City of Bunbury Local Planning Policy Framework.

The intent of this amended Local Structure Plan is to guide the subdivision, development and infrastructure servicing of the Tuart Brook Local Structure Plan Area as a residential neighbourhood that is integrated with the surrounding College Grove, Dalyellup and Usher local areas.

The Structure Plan discusses the key outcomes and planning implications of the background and technical reports and describes the broad vision and more detailed planning framework being proposed. Part 2 is based on a detailed site-specific analysis of opportunities and constraints and the following Technical Reports and strategies:

- Environmental Assessments
- Local Water Management Strategy
- Bushfire Management Plan
- Servicing and Staging Report
- Transport Impact Assessment

1.1 Tuart Brook Local Structure Plan (approved)

The current Tuart Brook Local Structure Plan (the Structure Plan) was approved in 2014 and proposed the development of approximately 648 lots (refer **Figure 2** below).

The Tuart Brook Structure Plan has been updated to make it contemporary, efficient and accurately reflect current planning and servicing requirements. The fundamentals of the Structure Plan 2014 remain valid and no significant changes to the approved structure plan are proposed.

The approved Local Structure Plan was supported by the following consultant reports, the majority of which are still considered appropriate and relevant to the development and have therefore been carried forward as part of this revised version of the Local Structure Plan.

Upon advice from Officers at the City of Bunbury (the City) and Department of Planning Lands and Heritage (DPLH) it was determined that the best approach to progressing a revision of the Structure Plan would be to prepare an amendment to the Local Structure Plan, which includes the minor updates and additional supportive documentation as identified in **Table 2** of this report in conjunction with the documentation approved as part of the approved Tuart Brook Local Structure Plan.

This process will ensure that there is a single, cohesive and up-to-date Tuart Brook Local Structure Plan to be used as part of the ongoing development of this area.

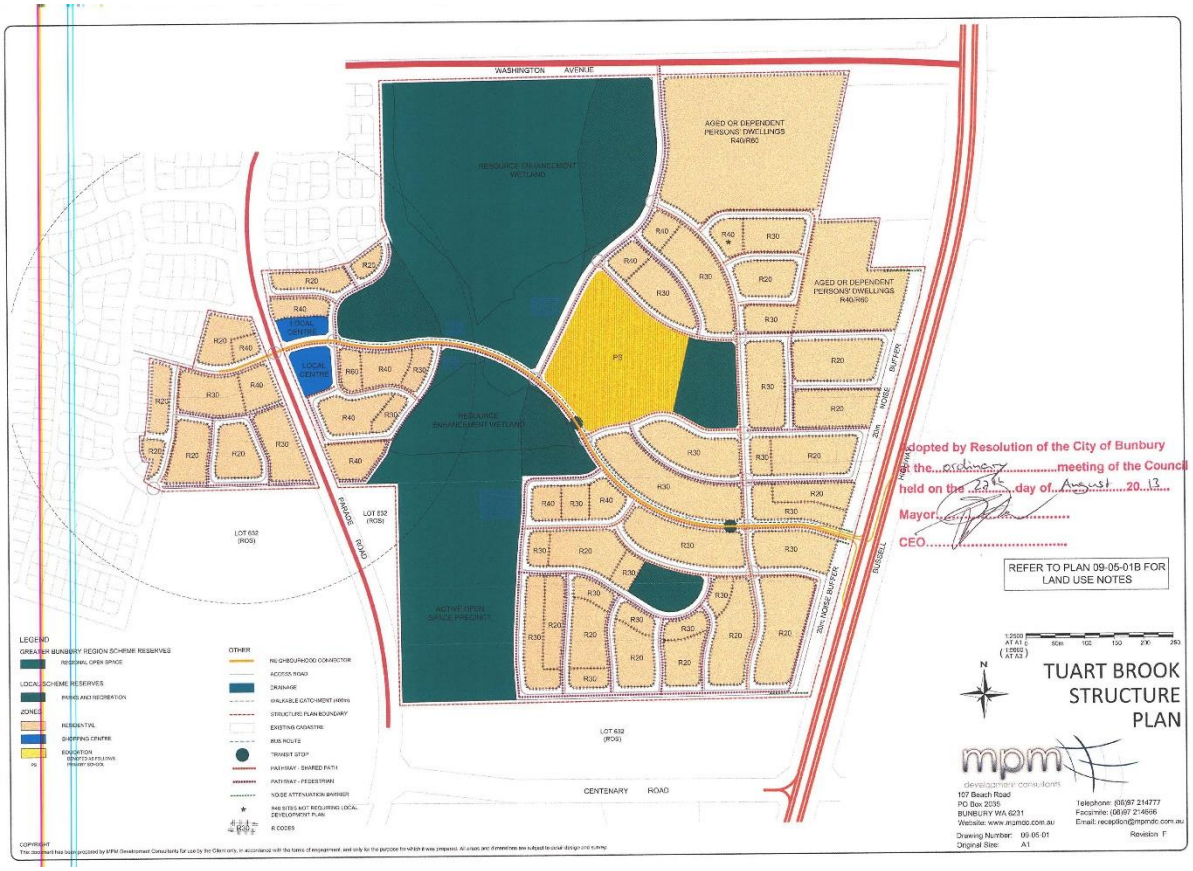

Figure 2 Tuart Brook Local Structure Plan (approved)

2 SITE AND CONTEXT ANALYSIS

2.1 Physical Context

2.1.1 Location

The structure plan area is located approximately 5.7 kilometres south of the Bunbury Central Business District within the Locality of Usher. The structure plan area is generally bounded by Bussell Highway to the east, Parade Road to the west, Washington Avenue to the north and the Preston River to Ocean Regional Park situated immediately to the south.

2.1.2 Area & Land Use

The structure plan area incorporates 11 lots as detailed in **Table 3** in conjunction with **Figure 3**. The structure plan area comprises a total of 92.4399 hectares and has historically supported rural land use activities (primarily grazing and agistment). Some low intensity grazing and agistment still occurs on portions of the subject land.

Much of the subject land, due to its previous rural use, is generally cleared with some intermittent trees and areas of remnant vegetation.

Six dwellings together with outbuildings and sheds are variously positioned on those lots fronting Bussell Highway. The balance of the land remains vacant.

A large area of Regional Open Space (ROS) traverses the structure plan area in a north-south direction. Contained generally within the northern two-thirds of the ROS are two Resource

Enhancement Wetlands (REW's). South of these the ROS is predominantly cleared grazing land (refer **Figure 3** – Aerial Site Plan).

2.1.3 Ownership and Title Details

The Structure Plan comprises 13 separate titles, with 10 different landowners, with the legal description of this land set out in **Table 3** of Part One of this report.

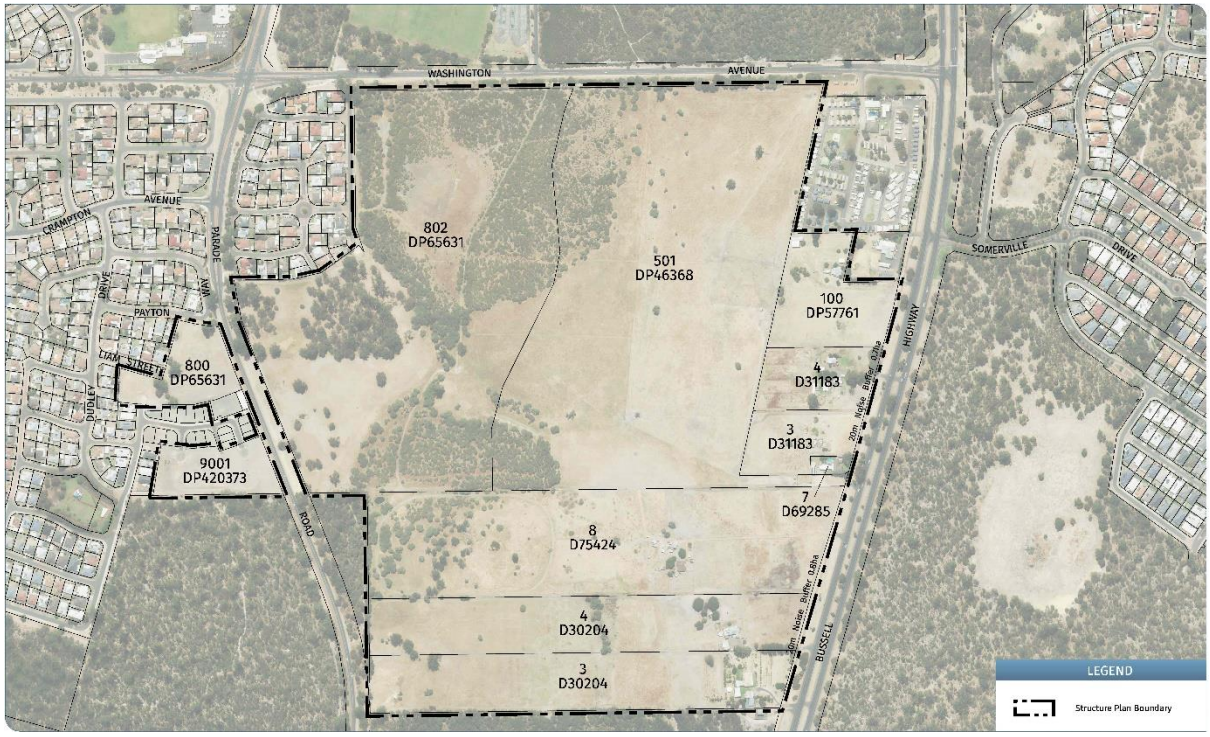

Figure 3 Aerial Site Plan

2.2 Surrounding Land Use and Community Context

The structure plan area is located within the locality of Usher and is approximately 6.5km (by road) south of the Bunbury City centre.

The surrounding land uses consist of the residential estates of Usher, College Grove and Dalyellup and a portion of the Kalgulup Regional Park, which includes a large portion of Lot 802 and the eastern portion of Lot 501 and wraps around the southern portion of the structure plan area extending further east and west. The area is also supported by a range of community facilities are within close proximity to the site including:

- Bunbury Regional Hospital;
- St John of God Hospital;
- South Bunbury Market Place Shopping Complex;
- Parks Centre Shopping Complex;
- South West Sport Centre incorporating Hay Park;
- Edith Cowan University;
- South West College of TAFE;
- A number of local primary schools; and,
- The Dalyellup District Centre commercial precinct.

The Structure Plan site is situated on Bussell Highway, providing excellent connectivity to the City Centre and outer regional areas.

The major roads surrounding the site include Bussell Highway, being a Primary Distributor, Washington Avenue and Parade Road both of which are District Distributor Integrator B roads, and Lillydale Road which is a Neighbourhood Connector.

Within the structure plan area there are no existing internal roads, pedestrian or cycle networks. There is a footpath on the east side of Northwood Gardens however there are no connecting pathways along Washington Avenue adjacent to Northwood Gardens.

There are no existing public transport facilities within the structure plan area, although the transport provider, TransBunbury currently operates in the vicinity of the site.

Figure 4 provides a context and site analysis identifying the key opportunities and constraints related to the structure plan area. The figure identifies the existing neighbourhood form in surrounding areas, and surrounding road and community infrastructure. The structure plan area is generally devoid of significant topographic features. View corridors are focussed onto the central ROS areas.

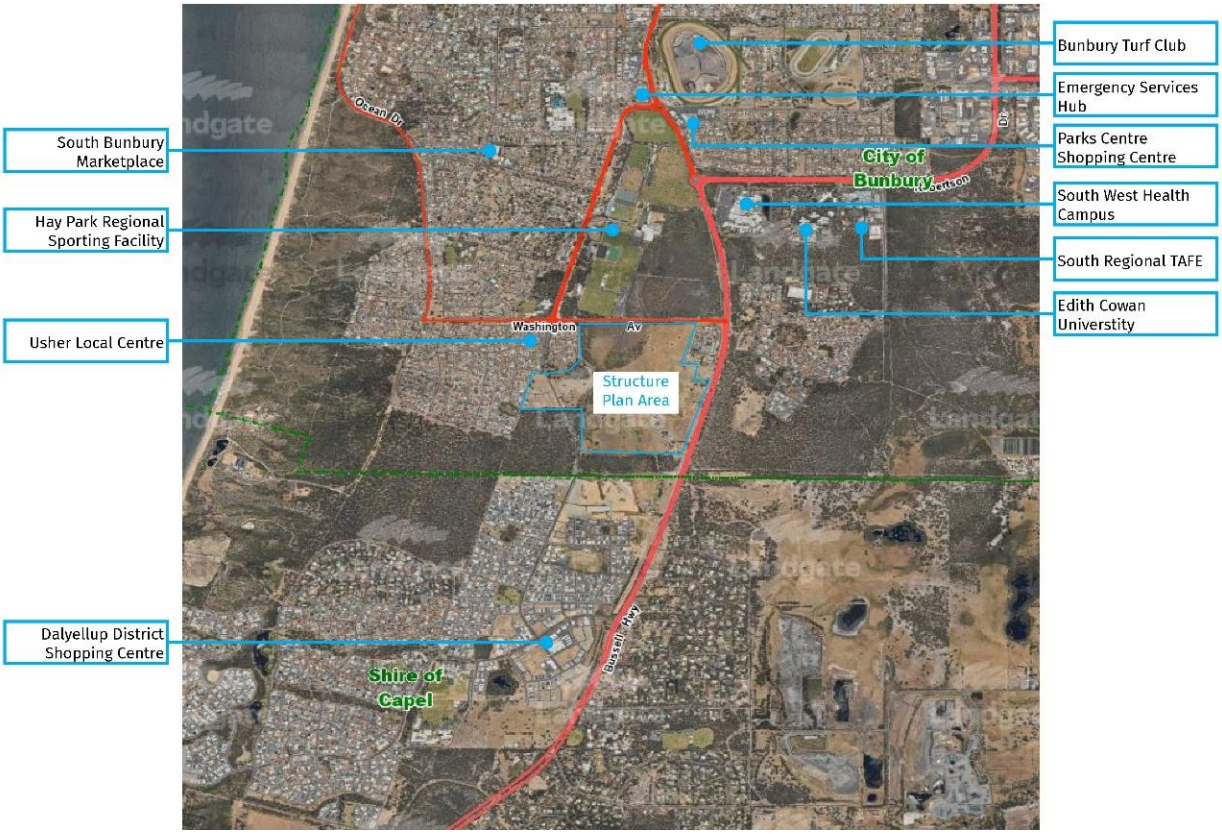

Figure 4 Context and Site Analysis

2.3 Planning Context

2.3.1 Greater Bunbury Region Scheme (GBRS)

Under the terms of the Greater Bunbury Region Scheme (GBRS) the subject land is predominantly zoned 'Urban', with the exception of a north-south corridor reserved as ROS as identified in **Figure 5** below.

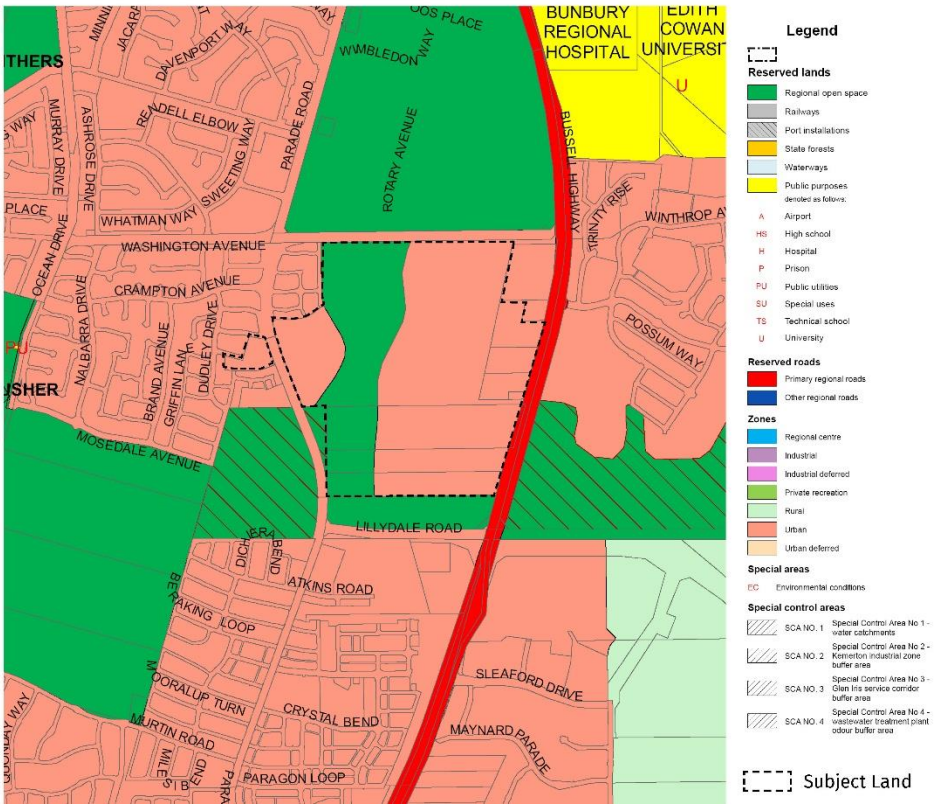

Figure 5 Greater Bunbury Region Scheme

2.3.2 Greater Bunbury Strategy 2013 & the Greater Bunbury Structure Plan 2013

The Greater Bunbury Strategy 2013 and Greater Bunbury Structure Plan 2013 (refer **Figure 6**) have been prepared by the DPLH, (known as the Department of Planning at the time) to guide urban and regional planning in the Greater Bunbury sub-region.

The Greater Bunbury Strategy incorporates the Greater Bunbury Structure Plan which is based on ensuring a 15-year supply of undeveloped land. The main purpose of the Structure Plan is to identify land ahead of the rezoning process and to stage the rezoning of that land in response to future growth trends.

The Strategy advocates that land that is already zoned, such as the Tuart Brook Local Structure Plan area, should be encouraged and prioritised for development given the considerable supply of land that has already been deemed suitable, or potentially suitable, for new urban development and that has already been zoned accordingly under the Greater Bunbury Region Scheme.

The Tuart Brook Local Structure Plan area should be encouraged and prioritised for development given the considerable supply of land that has already been deemed suitable, or potentially suitable, for new urban development and that has already been zoned accordingly under the Greater Bunbury Region Scheme.

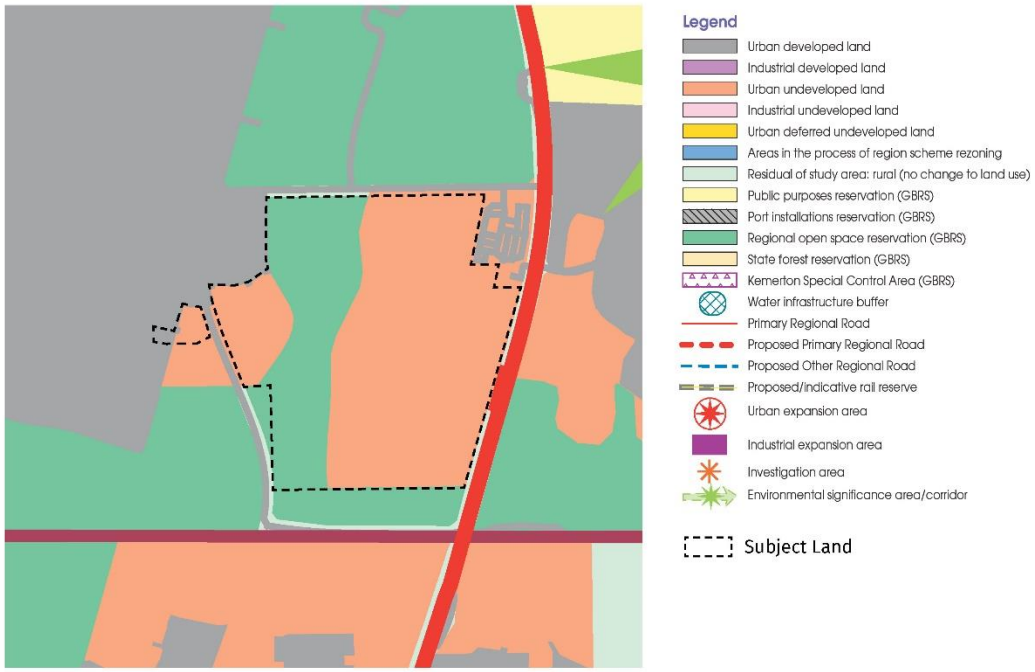

Figure 6 Greater Bunbury Structure Plan

2.3.3 State Planning Policy 3.7 – Planning in Bushfire Prone Areas

State Planning Policy 3.7 (SPP 3.7) seeks to guide the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure. SPP 3.7 applies to strategic planning proposals, including Structure Plans, over land designated as bushfire prone by the Department of Fire and Emergency Services (DFES). Given the Structure Plan area is partially designated as Bushfire Prone, SPP 3.7 is applicable to the LSP area. The requirements of SPP 3.7 are addressed by a Bushfire Management Plan prepared by JBS&G (**Appendix C**). Further details are provided in Section 3.3.6 of this report.

2.3.4 Liveable Neighbourhoods

Liveable Neighbourhoods (2009) operates as a neighbourhood design code, intended to facilitate the development of sustainable communities. The policy has many aspects but fundamentally the principle idea is to promote walkable mixed-use neighbourhoods.

Lot layout and road network have been designed in accordance with the recommendations of Liveable Neighbourhoods with the residential cells designed to ensure appropriately shaped and sized lots, serviced by a combination of Neighbourhood Connectors and Access Streets with the ability for a mixture of lot sizes which will be further determined as part of the subdivision process.

A minimum contribution of 10% of the gross subdividable area must be given up free of cost by the subdivider for public open space (POS) and may comprise; a minimum of 8% active and passive recreational purposes where the remaining 2% (of the overall minimum 10%, or one-fifth) comprises restricted use POS as outlined in Liveable Neighbourhoods. The allocation of POS within the Tuart Brook Structure Plan is identified in **Table 4** of this report.

Mixed Use development, such as that proposed within the amended Tuart Brook Local Structure Plan, should be strategically located to maximise the benefit from passing traffic and should be within easy walking distance of local residents.

The amended Tuart Brook Local Structure Plan has been updated to comply with the objectives and intentions of Liveable Neighbourhoods.

2.3.5 City of Bunbury Local Planning Strategy

The City of Bunbury Local Planning Strategy (Local Planning Strategy) adopted by Council in March 2018, was prepared to provide a strategic plan that will plan for the future of the City in a responsible manner and reflect the aspirations of the City and its community, accommodates future needs, and creates opportunities to enhance local attributes.

The residential portion of the subject land is identified for urban development in the GBRS and the Local Planning Strategy (refer **Figure 7** below), development of this site is likely to have been incorporated into the population and housing predictions included within the Local Planning Strategy.

Residential density proposed for the subject land is consistent with the current Local Planning Strategy and the LPS 8.

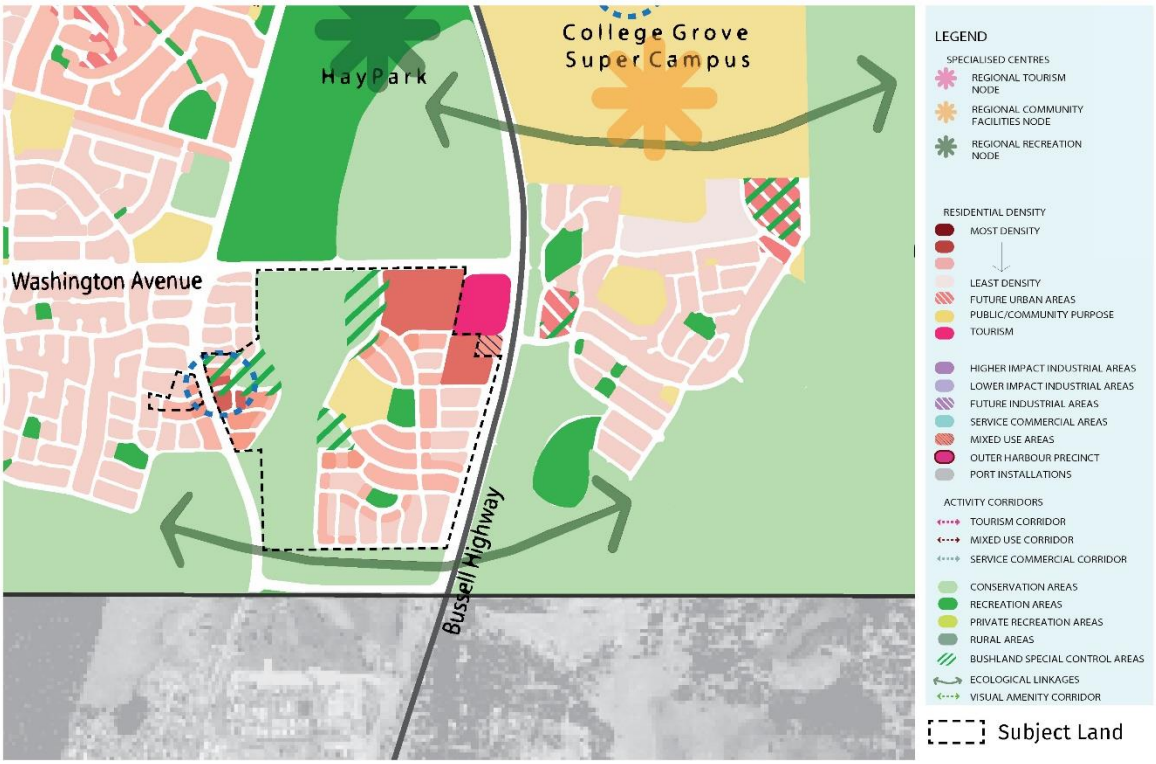

Figure 7 Local Planning Strategy

2.3.6 City of Bunbury Local Planning Scheme No. 8

The structure plan area is predominantly zoned 'Urban Development' within the City of Bunbury Local Planning Scheme No.8 (LPS 8) with a centrally located ROS reservation as identified within the GBRS into LPS 8 refer **Figure 8**.

A structure plan is required to be endorsed for land included in the 'Urban Development' zone prior to subdivision and/or development in accordance with *Schedule 5, Table 8* of LPS 8.

This report has been prepared in accordance with this requirement.

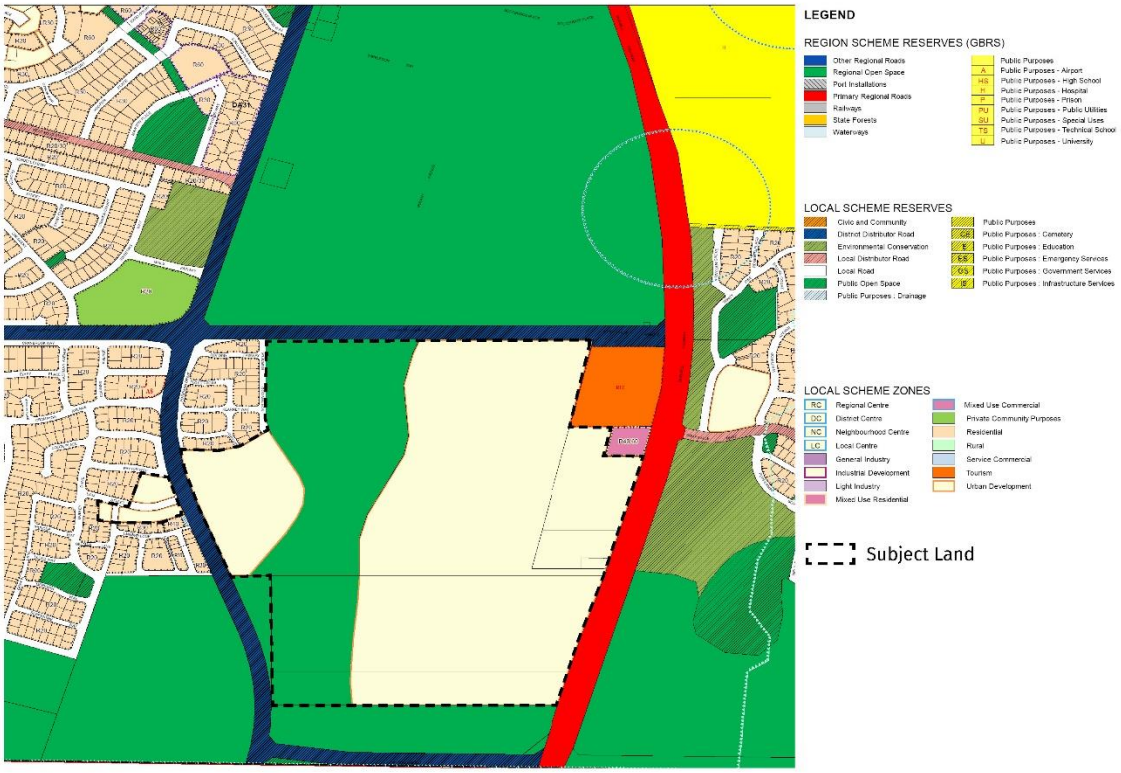

Figure 8 Local Planning Scheme No.8

2.3.7 Local Planning Strategy for Activity Centres & Neighbourhoods (LPSACN)

The Local Planning Strategy for Activity Centres & Neighbourhoods (LPSACN) adopted by the City of Bunbury in March 2011 provides a 'principles' based general strategy to guide town planning scheme zoning, policy development and decision making in relation to residential, commercial and mixed-use developments.

The principle aim of the LPSACN is to facilitate a network of mutually supportive residential neighbourhoods and activity centres that contribute to the economic, social and environmental sustainability of the City.

Based on a range of factors such as location, physical appearance, existing or proposed size and classification as well as results compiled from modelling data, the Strategy identifies centres regarded as being most suitable for designation as activity centres.

Tuart Brook is identified as hosting a future 'Mixed Use' precinct with a potential (not capped) retail floor space of 400m² per lot (max Office - 200m² per lot and max Shop – 300m² per lot).

It is intended that the land identified for commercial purpose be zoned 'Mixed Use – Residential' under the LPS 8. This zone provides flexibility for the developers at the time of development to incorporate a mixture of commercial and residential uses dependent on the needs of the area at the time. Whilst this is a slight variation from its identification within the Strategy as a Local Centre, the definition and intent of the zone with LPS 8 is consistent with the intent of a Local Centre and introducing a residential element into the area providing the potential for additional housing diversity. Further justification is provided in section 5.3 of this report.

The establishment of the Dalyellup District Centre, the Parks Centre and the South Bunbury Market Place all within 3km of the Tuart Brook Local Structure Plan area provide suitable commercial services for the structure plan area, which can be readily accessed by the surrounding road network through the use of vehicles, public transport and pedestrian footpaths.

2.3.8 Other Policies and Relevant Framework

State Planning Policy 2.9 Water Resources

SPP 2.9 provides high-level strategic guidance for policy-making and decision-making where water resources are a relevant consideration, which includes surface and groundwater resources as well as wetland, waterways and estuaries.

The policy goes on to set out a range of measures to ensure development impacts on these water resources are ameliorated.

Water management and the provision of services is discussed in further detail in Sections 3.3 and 3.5 of this report, with the LWMS and Servicing and Staging Report provided as **Appendices B** and **D** respectively.

Environmentally sensitive wetlands are onsite, located within the existing ROS reservation, the amended Structure Plan design does not impose any changes or impact on this ROS reservation and maintains the appropriate setbacks and management as included in the approved Environmental Assessments included as **Appendix A**.

State Planning Policy 3.6 Infrastructure Contributions

SPP 3.6 provides the mechanism for local governments or service providers to collect contributions towards the cost of infrastructure necessary to accommodate urban growth.

Contributions are levied directly through the subdivision and development process, or where there are multiple landowners, through Development Contribution Plans (DCP's). The development contributions may include common infrastructure such as roads, drainage and sewer as well as the equitable apportionment of public open space.

Section 5.8 details the timing and requirement for a Development Contribution Plan in relation to the Structure Plan delivery.

State Planning Policy 5.4 Road and Rail Noise

The purpose of SPP 5.4 is to minimize the adverse impact of road and rail noise on noise-sensitive land use and/or development within the specified trigger distance of strategic freight and major traffic routes and other significant freight and traffic routes. It indicates that where any part of the lot is within the specific trigger distance an assessment against the policy is required to determine the likely level of transport noise and management/mitigation required.

The eastern portion of the subject site is located within the 300m trigger distance associated with the Bussell Highway, which is considered a strategic freight route refer **Figure 9**.

Any noise-sensitive land-use and/or development within the trigger distance of a transport corridor is required to meet specific indoor and outdoor noise targets.

A Traffic Noise Assessment was prepared as part of the approved Structure Plan, which identified the need for the inclusion of a 20m Noise Buffer to be installed between the Bussell Highway and the proposed Structure Plan as identified on **Figure 1** – Structure Plan.

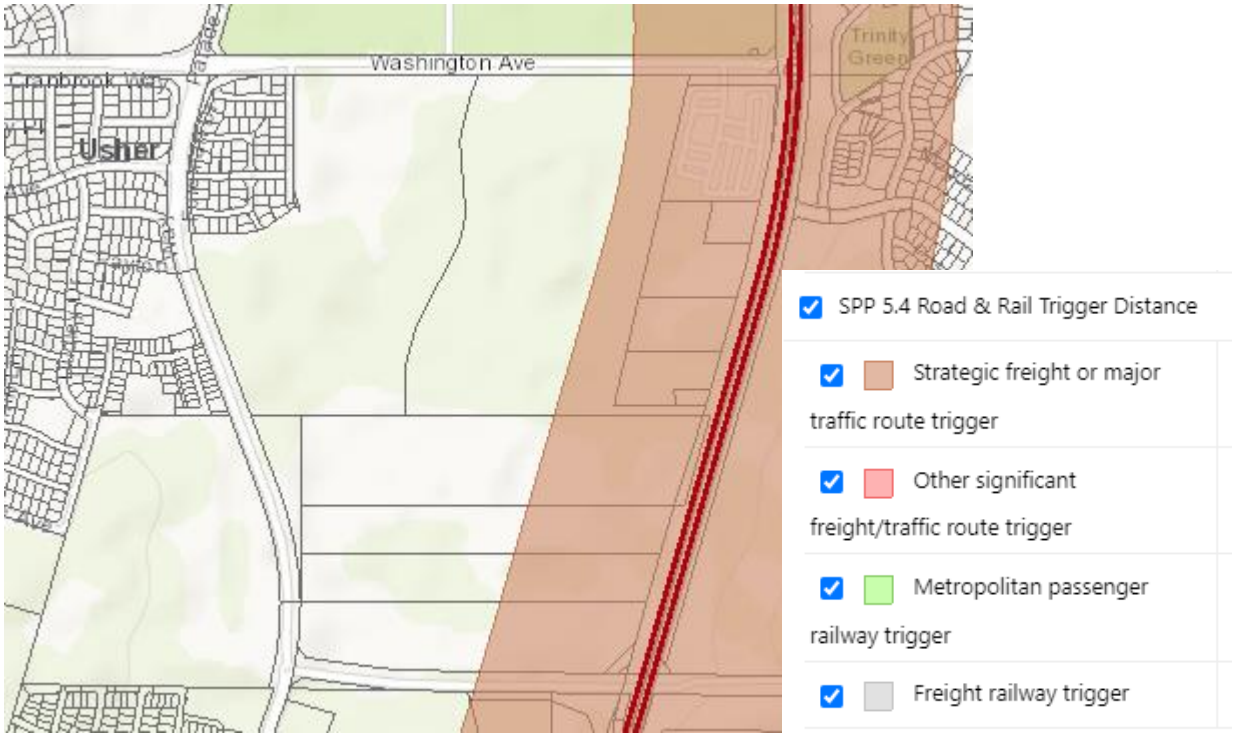

Figure 9 SPP 5.4 Trigger Distance Buffer

Government Sewerage Policy (2019)

The Government Sewerage Policy (GSP) is a whole of Government Policy, intent on establishing the governmental position on the provision of sewer services within Western Australia through the progressive planning and development of land.

The subject site is located within a sewer sensitive area in accordance with DPLH WA mapping. Connection to reticulated sewer is proposed as part of the development of the Structure Plan area, which is further detailed in Section 3.5 of this report and **Appendix D**.

Better Urban Water Management Strategy

Better Urban Water Management Strategy (BUWMS) was designed to guide water management at the regional, district, local and subdivision stages of the planning process by ensuring consideration is given to the total water cycle at each stage of planning and development.

The LWMS approved as part of the Structure Plan and the updated Servicing and Staging Report (included at **Appendices B** and **D** respectively), in addition to Sections 3.3 and 3.5 address the requirements of the BUWMs.

Residential Design Codes of Western Australia

The Residential Design Codes of Western Australia (R-Codes) provide a comprehensive basis for local governments to control residential development. They generally apply to residential development throughout Western Australia, except as otherwise prescribed by the provisions of Local Planning Scheme No.8 or as varied by City of Bunbury Policies.

R-Code density ranges have been identified on the Structure Plan map (**Figure 1**) which will guide the detailed design and lot layout and subsequently future subdivision applications which will need to be lodged in accordance with the approved Structure Plan.

City of Bunbury Housing Strategy

The City of Bunbury adopted the Housing Strategy (the Strategy) in May 2021 to guide and provide for the City's current and future housing needs for the next 15 to 20 years.

The Strategy builds on the planning principles and direction as set out in the City's Local Planning Strategy and Local Planning Scheme No.8.

The Strategy establishes that the Tuart Brook Structure Plan area is considered as Focus Area No.6, which is considered one of the 9 strategic development areas for additional new housing.

The Tuart Brook Structure Plan is consistent with the Strategy as it proposes a significant increase to residential lot yield and diversity of housing product, through the identification of density code ranges across the structure plan area.

3 OPPORTUNITIES AND CONSTRAINTS ANALYSIS

As part of the revision of the approved Tuart Brook Local Structure Plan, a Bushfire Management Plan, Servicing Strategy Report and a revised Transport Impact Assessment were undertaken, the findings of these reports required some minor adjustments to be made to the design and layout of the structure plan, however these are considered minor and do not impact the environmental or overall servicing aspects of the site.

The Tuart Brook Structure Plan area is located within an environmentally sensitive area, with the identification of wetlands and established remnant vegetation onsite. Majority of these areas have been reserved as ROS and form part of the Kalgalup Regional Park.

As part of the approved Tuart Brook Local Structure Plan a full suite of environmental assessments were undertaken. The areas of ROS and POS that were the subject of these assessments have not been modified as part of this revision and therefore updates to these reports were not considered necessary.

The findings of these environmental assessments have been detailed below and a full copy of each report is included within **Appendix A** of this report.

Similarly, a detailed Local Water Management Strategy (LWMS) was prepared as part of the approved Tuart Brook Local Structure Plan, which is included as **Appendix B** of this report. The fundamental requirements for the Structure Plan area have not changed since this reporting was completed and therefore an update to the report is not required. Future subdivision applications will provide the opportunity for an Urban Water Management Plan to be prepared in conjunction with the LWMS and will address any updates as may be required.

3.1 Biodiversity & Natural Area Assets

In May 2006, ENV was commissioned to undertake an environmental assessment of Lot 1 (now Lots 501 and 802). In addition, a Spring Survey into 'Declared Rare and Priority Flora, Threatened Ecological Community Identification and Wetland Assessment was undertaken by ENV for Lot 1 in 2006. This was followed by a Fauna Assessment (Level 1) and Western Ringtail Possum Survey (again by ENV) in January 2008 for the whole of the structure plan area. The Environmental reporting approved as part of the approved Local Structure Plan can be found in **Appendix A.**

The findings of these various studies are summarised in the following extracts from the above reports as follows.

3.1.1 Environmental Assessment

- The overall condition of vegetation on Lot 1 varies between good to degraded. This is attributed to the cleared paddocks created for grazing, and the subsequent occurrence of introduced species (predominately **Ehrharta longihflora, *Romulea rosea, *Hypochaeris radicata* and **Hydocotyle bonariensis*).
- Eight Priority Flora taxa have historically been found within the surrounding area. Due to the timing of the field survey, significant flora was only searched for on an opportunistic basis.
- Due to the timing of the survey and the scope of works, confirmation of the presence of the Threatened Ecological Community SCP18 (Shrublands on calcareous silts of the Swan Coastal plain) could not be undertaken.
- Twelve native plant taxa and five weed species were recorded during the survey.
- No Declared Rare Flora or Priority Flora species were located during the field investigation. A comprehensive Priority Flora Search could not be conducted due to the timing of the survey.
- TEC SCP18 is inferred as occurring within Site 3. This could not be confirmed however, due to the timing of the survey. (ENV 2006)

3.1.2 Spring Survey

- No additional native annual flora species were identified to the taxa contained within the earlier Environmental Report (ENV, 2006). It is assumed that this is in part attributed to existing livestock pressures and the degraded nature of the property's vegetation.
- Results of the investigation reveal that the site is degraded, with native flora taxa being widely spread across the site. Due to this fact, only two species from SCP18 were recorded within the Quadrant. A further two species, however, were recorded opportunistically. The four species recorded were:
    - *Gahnia trifida;*
    - *Melaleuca viminea;*
    - *Lepidosperma longitudinal; and*
    - *Melaleuca teretifolia.*
- Given that 4 of the 16 typical indicator species are present, with calcareous silts believed to be present, ENV concludes that the occurrence of SCP18 Shrublands on calcareous silts is a possibility. Despite the degraded nature of this potential TEC site, SCP18 occurs at only one other known location (Yalgorup).
- Conservation of the potential TEC is recommended. (ENV 2006)

3.1.3 Fauna Assessment

The Fauna Assessment report makes the following general recommendations:

<u>Western Ringtail Possum</u>

- This species was found to be utilising the Tuart/Marri/Peppermint/ Banksia habitat on site, "albeit in low numbers".
- Impacts on the Tuart/Marri/Peppermint/Banksia habitat should be avoided, or that the extent of impact reduced, for instance by inclusion of this vegetation within POS.
- Landscape planting in the portion of land proposed for development to the west of the ROS should include at least a 30% *Agonis flexuosa* component.
- Plantings, as far as practical, should aim to ultimately create a continuous link between this habitat, the ROS and other remnant vegetation in and adjacent to the project area.
- Formulation of a development specific Western Ringtail Possum (WRP) management plan which details the status and distribution of WRPs on site, impact of development and mitigation and offset measures, as required. ENV considers that this will be necessary to achieve DEC approval and to support a referral to DEHWA if WRP habitat is to be cleared.

<u>Black Cockatoo Species</u>

- The Black Cockatoo species are highly mobile and would not be specifically relying on the site.

- Where possible, retain and protect remnant vegetation on sites that is suitable for cockatoos to use for foraging. If the area of vegetation identified as WRP habitat is retained this recommendation will be achieved in any event.
- Landscaping species lists should include cockatoo food plant species (e.g. *Corymbia, Banksia, Dryandra, Hakea,* and *Allocasuarina* etc.).
- If clearing of large trees containing hollows is required then it should, if possible, be conducted outside the known breeding season of Black Cockatoo species (mainly breeding around early July to December) to avoid the potential of disturbing/harming nesting birds.
- Potentially, 11 native mammals (principally bats), 88 birds, 9 frog and 15 reptile species could be expected to occur in, or utilise at times, the study area. Nine introduced species could also occur. Of the 132 native animals that could occur, five are considered to be rare or vulnerable. The majority of the site is cleared and development in these areas will have little or no impact on fauna.
- While the study area could be considered of some local significance, it is not considered, based on this assessment, to be of regional significance given its relatively small size and history of disturbance. Despite this the site forms part of a recognised ecological linkage and its function as such should be taken into account during development planning.
- A series of targeted surveys suggest that Western Ringtail Possums are utilising sections of the site in low numbers. (ENV 2008)

3.1.4 Wetland Management Plan

A Wetland Management Plan for Lot 500 has been prepared by Bioscience and is included in the appendices **(Appendix A).**

Bioscience's report examining the wetland contained on Lot 500 showed that the centre of the wetland, besides weeds, is relatively bare with several dead trees and some salt tolerant grasses as well as evidence of pre-existing large trees. The immediate surrounding trees are in poor condition and many look to be dying also. The death of flora within the Resource Enhancement Wetlands is most likely due to high salinity. The fringing vegetation includes *Melaleuca rhaphiophylla, M. Viminea* and to a lesser extent *M. teretifolia* over patches of *Gahnia trifida* and *Lepidosperma longitudinale* over weeds. The degraded condition of the vegetation in conjunction with high salinity has left the wetland deficient in significant functions and values. (Bioscience 2011)

Vegetation within the structure plan area is generally limited to the ROS and proposed POS areas. The development footprint associated with the structure plan proposals seeks to maximise the conservation of vegetation and associated fauna habitats by ensuring location of these areas within ROS and POS areas.

In balancing these objectives with those of Liveable Neighbourhoods, the amended Local Structure Plan includes a connection with the established residential cell to the south-east of the Washington Avenue/Parade Road intersection. It is recommended that during detailed design of this location, care should be taken to minimise the extent of impacts and removal of significant vegetation where possible.

3.2 Landform & Soils

3.2.1 Soil Type

The subject site lies on the Safety Bay Sands within the Quindalup Dune System of the Swan Coastal Plain.

3.2.2 Topography

The structure plan area is considered to have low relief with some minor variations in topography. The site generally ranges from 4m AHD in the northeast to 10m AHD is the southwest corner, with the majority of the site lying at around 4m AHD.

3.2.3 Acid Sulfate Soils (ASS)

The Department of Water and Environmental Regulation (DWER) has compiled a series of maps indicating ASS risk areas. The maps indicate that the land generally has a moderate to high risk with some areas holding a low to moderate risk of ASS being disturbed (refer to **Figure 10**). The potential for ASS disturbance represents a development constraint for the structure plan area and will require further investigation and testing, which is further detailed as part of the sub consultant reports.

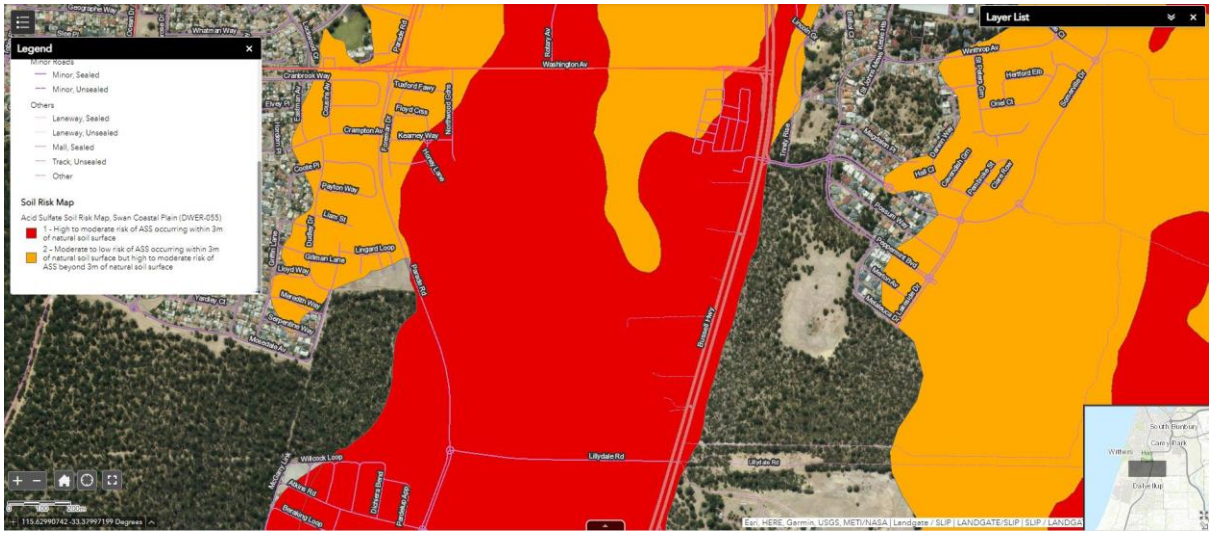

Figure 10 Acid Sulphate Soils Mapping

3.3 Water Management

A Local Water Management Strategy (LWMS) was prepared by Hyd2o Hydrology Consultants as part of the approved Tuart Brook Local Structure Plan which is attached as **Appendix B**. Details with regards to the LWMS are discussed below.

3.3.1 Surface Water

The site is predominantly low lying with sandy soils and a high groundwater table. Five Mile Brook and its floodplain and two resource enhancement wetlands are located in the central area of the site and will be maintained post development within a large ROS and POS corridor.

In accordance with Water Sensitive Urban Design (WSUD) principles, stormwater management principles for the Tuart Brook Local Structure Plan area will include:

- maintenance of existing regional surface water flow paths and catchments consistent with overarching strategies;
- retention and rehabilitation of existing resource enhancement wetlands in Regional Open Space areas;
- Use of Open Space areas for ephemeral stormwater retention and detention areas;
- Use of higher density urban residential zonings to reduce landscape nutrient input. (Hyd2o, 2012)

3.3.2 Local Surface Water Hydrology

The site has two main catchments with all flow directed towards the centre of the site from the western boundary at Parade Road and the eastern boundary at Bussell Highway. The central area of the site forms a low-lying depression with topography less than 5m AHD.

The site falls within the catchment for Five Mile Brook. Flow from Five Mile Brook predominantly heads south via a diversion drain but some flow traverses the undeveloped areas as overland flow towards the site.

Flow into the site is via two separate culverts under Centenary Road which flow into poorly defined depressions within Lot 532 and in a northerly direction through the central area of the site with a small drainage channel forming through the central area of the site.

All flows discharge via two culverts under Washington Avenue and direct flows towards the channelized Five Mile Brook Drain. (Hyd2o, 2012)

3.3.3 Five Mile Brook Hydrology

In 2012, Water Technology undertook the Five Mile Brook Hydrological Study Stage 1 Report, on behalf of the City. The aim of the study was to provide a review of previous hydrology studies that have been undertaken for the catchment, review flood extents for Five Mile Brook and develop management strategies for the City.

The modelling included the Tuart Brook Local Structure Plan area and assumed the site was developed (however this was based on a superseded version of the Local Structure Plan assuming a larger ROS area).

In summary the modelling determined the following:

- In a 1 in 100-year average recurrence interval (ARI) event, the study shows that the 35ha Regional Open Space receives floodwater from Five Mile Brook. The flood depth in this area is typically shallow and less than 0.5m over most of the flooded area.
- Five Mile Brook flows for a 1 in 100-year ARI event are estimated as approximately 4.2m³/s at Centenary Road, reducing to 2.2m³/s south of Washington Avenue due to the attenuation within the site's wetland area. (Hyd2o, 2012)

3.3.4 Groundwater

Groundwater flow is in a north-west direction. The maximum recorded groundwater levels (as recorded by ENV during Nov 2007-Oct 2009) were in September 2009. Groundwater mapping undertaken by Hyd2o shows groundwater ponds within the wetland areas during the winter months. Depth to groundwater ranges from at surface within the central area of the site to over 1.5m near the western and eastern boundaries. (Hyd2o, 2012).

Development levels in the site will be largely dominated by fill requirements to achieve adequate separation to groundwater.

Hyd2o's LWMS states that fill, in the order of 1.5 metres, is likely to be required in existing low-lying areas, ranging to no fill being required on the western side of the site near Parade Road where groundwater clearance exceeds 1.5m.

3.3.5 Wetlands

The Geomorphic Wetlands Dataset displays the location, boundary, geomorphic classification, and management category of wetlands on the Swan Coastal Plain. The dataset indicates that two Resource Enhancement Wetlands (REW's) exist within the structure plan area (refer to Figure 12). The northern REW was recently re-classified from a Conservation Category Wetland to a Resource Enhancement Wetland. Another REW is located on Lot 632 adjacent to the southern boundary of the structure plan area.

The balance of the structure plan area is classified as a Multiple Use Wetland. The EPA recommends that all reasonable measures are taken to retain the hydrological functions of such wetlands.

A Wetland Management Plan for Lot 500 has been prepared by Bioscience and is included in this report as **Appendix A.**

The report concludes that the degraded state of the REW wetland contained on Lot 500 cannot be restored to pre-European settlement conditions, however, suggests that integration of stormwater management into wetland management could innovatively and effectively restore some of the values that would have not otherwise been restored.

Additionally, the report concluded that it is unlikely that a wetland buffer zone will serve any protection value against the threats that already exist within the wetland on Lot 500. A large buffer zone could also create a sense of removal from the community which would be counterproductive to the objectives outlined in the wetland management plan. The wetland on Lot 500 does not require a buffer protection zone due to its highly degraded state.

3.3.6 Bushfire Hazard

A Bushfire Management Plan (BMP) was completed in December 2023 by JBS&G. The BMP has been prepared to address requirements under Policy Measures 6.2 and 6.3 of *State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7)* in accordance with *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (the Guidelines).

The report provides an assessment of the proposed development, bushfire risk context and required bushfire mitigation measures and includes:

- A review of pre and post-development vegetation classifications, exclusions and effective slope within the project area and surrounds
- Results of a pre and post-development Bushfire Hazard Level (BHL) assessment to determine the applicable BHLs across the project area and adjoining land
- Details of any bushfire hazard issues relevant to the site and proposed development
- A compliance assessment to demonstrate that the proposed development can comply with the bushfire protection criteria of the Guidelines at subsequent planning stages.

The BMP indicates that the broader landscape risk is considered to be manageable within the context of the proposed development and the existing development areas and access corridors surrounding the site.

The road layout enables safe vehicular and pedestrian access/egress in the event of a fire emergency. Three alternative routes of access are provided along the northern, western and eastern edges of the structure plan area. The road network also acts as a hazard separation zone between the ROS and adjoining development.

Reticulated water is also proposed to service the development which enables a source of water for firefighting purposes. Hydrant locations will be identified at detailed engineering design stage.

Development of the structure plan area is likely to be staged, the BMP indicates that the design of development staging is to ensure that at least two publicly available vehicular access routes to two different suitable directions area provided in accordance with acceptable solution A3.2a of the Guidelines. Depending on the staging, this may require provision of temporary staging measures such as temporary compliant no-through roads and/or Emergency Access Ways (EAWs) to deliver compliant access outcome to individual stages.

These aspects will be further considered as part of the future subdivision applications to ensure compliance of the guidelines.

A full copy of the Bushfire Management Plan is included at **Appendix C** of this report.

3.4 Siteworks

Site works will include earthworks (i.e. cutting and filling as required), with earthwork areas to be stabilised during construction. Existing remnant vegetation is to be kept where appropriate and mostly within the ROS and proposed POS areas.

Fill will be provided at sufficient depth above the existing water table on the site to allow disposal of roof stormwater by soakage on the lots in conjunction with a sub soil drainage system within the road reserves, and to achieve a minimum separation of 1.5m between lot level and groundwater level.

The filling of the lots will also be required in some areas to obtain the necessary clearance for flood protection purposes. The 100-year flood levels from the 5 Mile Brook Flood Study (WAWA, 1995) at Washington Avenue is given as approximately 5.1m AHD. Therefore, for flood requirements alone the minimum fill levels for the site are generally 0.5m above this flood level at 5.6m AHD.

Site works will also need to recognise the likelihood of Acid Sulphate Soils and management plans developed accordingly. A geotechnical investigation will be required to be undertaken for individual sites and would identify Acid Sulphate Soil issues and the appropriate management of these soils.

Roads may be constructed lower than the lots to reduce fill volumes and provide overland flow paths for local storm events. Detailed earthwork specifications will be investigated during the detailed design of subdivision.

3.5 Servicing

A Servicing and Strategy Report has been prepared by Edgeloe Engineering to investigate and report on servicing of the proposed Tuart Brook Development and to provide a servicing strategy to allow efficient delivery of the estate.

A full copy of the report is included as **Appendix D** with a summary of the servicing requirements included below.

3.5.1 Water Supply

The Structure Plan area is within the Aqwest service area with existing mains located along Parade Road and within the existing developments to the northwest and west of the structure plan area as identified in *Figure 27* of the Servicing Report.

The internal pipe network for the Structure Plan area would be generally 150 or 100mm diameter pipes, with initial servicing possible from the 375mm diameter main in Parade Road.

The western (Lot 800) and north-western portions of the structure plan area could be connected to existing mains in the adjoining developed estate with a link back to the Parade Road 375mm diameter main.

3.5.2 Sewer Servicing

The Structure Plan area is within the Water Corporation license area. Sewer planning indicates that the area is to be serviced by a Type 40 Sewer Pumpstation K, located in the northern central portion of the Structure Plan area.

This pumpstation will then pump north with a 250mm diameter sewer pressure main through Hay Park into existing sewers (refer *Figure 31* of the Servicing Report).

The sewer planning also shows the portion of land to the west of Parade Road to be in the gravity catchment for the proposed Pumpstation K, but the existing development on Lot 801 has been connected to existing sewers on the west side of Parade Road instead as identified in *Figure 34* of the Servicing Report.

Recent reviews of the capacity limits indicate that it is possible for Lot 800 to be developed also from the existing adjoining sewers instead of connecting across Parade Road to the proposed sewer pumpstation (refer *Figure 35* of the Servicing Report). This would provide the opportunity for Lot 800 to be developed earlier than the balance of the structure plan area.

There may also be the possibility to extend services from the development adjoining the northwest corner of the structure plan area to service a small number of lots rather than a direct connection to the pump station as well. These sewers are shown in *Figure 36* of the Servicing Report.

3.5.3 Power Reticulation

The Structure Plan area is currently serviced around its perimeter by Western Power High Voltage Distribution Lines (refer *Figure 37* of the Servicing Report).

Western Power's network mapping tool shows in *Figure 38* of the Servicing Report that there is currently less than 5MVA capacity in this area and so external upgrades are likely to be required as the area is developed. Confirmation of required upgrades will be determined at the time of development by a formal application to Western Power.

3.5.4 NBN/TELSTRA

All new lots will be required to be connected to NBN under the current WAPC Policy. The NBN rollout map (refer *Figure 40* of the Servicing Report), this area is subject to a fixed line with conduits and cables to be extended from the existing NBN network.

Optus also has services in this area with an Optic Fibre cable laid along the south side of Washington Avenue and the east side of Bussell Highway adjacent to the development.

3.5.5 GAS

If gas is required to be provided to the lots in the Structure Plan area, then extensions would likely occur from the Medium Pressure gas mains on Parade Road, Washington Avenue and Bussell Highway (refer *Figure 41* of the Servicing Report).

3.6 Heritage

A search of the DPLH Aboriginal Cultural Heritage Inquiry System reveals that Aboriginal Cultural Heritage, Site 24507 exists within the development, specifically in conjunction with Lot 507. Site 24507 contains Aboriginal Artefacts/Scatter and is an open access non-restricted site. An excerpt from the Aboriginal Cultural Heritage Inquiry System is shown below in **Figure 11.**

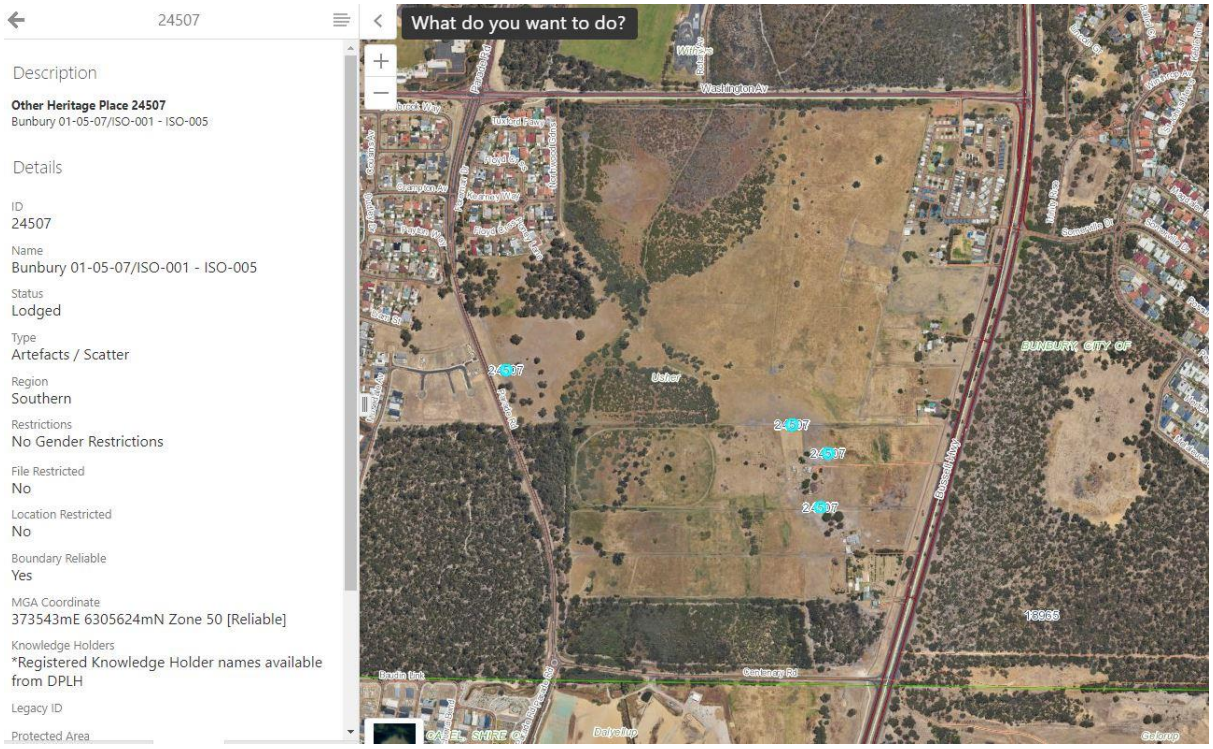

Figure 11 Aboriginal Cultural Heritage – Site 24507

Any disturbance of Aboriginal Sites requires permission from the DPLH. Separate Ethnographic and Archaeological Surveys were undertaken for Lots 500 and 501 by Ethnosciences in July 2007 (**Appendix A**).

Further consideration of these sites will be undertaken as part of the subdivision stages.

4 STAKEHOLDER AND COMMUNITY ENGAGEMENT

The Tuart Brook Local Structure Plan was approved in 2014 following an extensive public consultation process which included referral to government agencies as required.

Although only minor changes have been made as part of the preparation of this amended Local Structure Plan, consultation was undertaken with officers at the City and DPLH to ascertain their expectations regarding the revision and the appropriate path to take with regards to the approval process.

Feedback from Officers at both the City and DPLH has been positive and supportive with regards to the minor updates and revision of the Tuart Brook Local Structure Plan.

Following lodgement of the amended Local Structure Plan, the document will be assessed by the City in accordance with clause 29 of Schedule 2, Part 4 of the *Planning and Development (Local Planning Schemes) Regulations 2015 (Regulations)*. Discussions to date with officers at the City and the DPLH have indicated that the structure plan could be considered consistent with clause 29(3) of the Regulations due to the minor nature of the amendments made.

Following a determination by the City, the amended Local Structure Plan will then be forwarded to the WAPC for consideration.

5 DESIGN RESPONSE

The amended Tuart Brook Local Structure Plan is generally regarded as a self- contained greenfield site within several different ownerships. The Tuart Brook Local Structure Plan has regard to existing residential development to the west and north-west as well as the development fronting Bussell Highway which presently includes a veterinary clinic and caravan park.

The structure plan provides an alternate access opportunity for Lot 12 which should alleviate traffic congestion and concerns with the current access onto Bussell Highway. This has previously been a concern of MRWA and is supported by the vet in-principle.

The structure plan has been formulated to inter-connect with adjoining existing residential areas. It is based on a permeable road network providing for ease of access as well as a variety of areas having different outlook opportunities.

The amended Local Structure Plan will facilitate the subdivision of the site into a contemporary residential development of approximately 878 lots which will conform to the provisions of the Residential Design Codes.

With the exception of the proposed R30/60 site in the northeast portion of the site, the density allocation for all lots has been identified as R20/40 within the amended Local Structure Plan area. As subdivision applications are prepared, Density Plans will be submitted to identify the density these lots in accordance with the approved Local Structure Plan.

The preparation of Density Plan's in conjunction with future subdivision applications at the relevant time will provide the ability for a variety of housing product reflective of the current market and allowance for flexibility of future development.

The amended Tuart Brook Local Structure Plan is deemed consistent with the goals and aspirations of the State and relevant City of Bunbury planning framework, as well as proper and orderly planning.

5.1 Open Space

Public Open Space (POS) is the dominant feature of the Tuart Brook Local Structure Plan. Several areas of 'Local' and 'Regional' Open Space are proposed throughout the structure plan area as identified in **Figure 12** and summarized in **Table 6**.

The location and provision of POS and parkland areas has been determined based on both the physical attributes of the structure plan area as well as the guiding principles embodied in Liveable Neighbourhoods. The Local Structure Plan seeks to achieve a balance between Regional and Local open space requirements while having regard to the playing fields and facilities already established at Hay Park immediately to the north of the structure plan area. The percentage and land area allocated for specific areas of POS is identified in **Table 4** of the report

As referred to in **Figure 12,** POS No. 5 (adjoining the primary school site) is specifically targeted for active use. With POS No. 6 of approximately 1.53ha is proposed in the southern half of the main structure plan area and is intended for both active and passive use. These areas have been located so as to be central to residential areas to provide:

- A focal point for local neighbourhoods;
- For ease of access; and
- High levels of surveillance.

Additionally, there are several areas within the ROS that are denuded of vegetation and could be utilized for active open space precincts. The ultimate design and layout of these precinct(s) will be dependent upon further detailed planning and negotiations with relevant government agencies.

The location of POS is site responsive catering for vegetation retention objectives as well as providing opportunities for both passive and active recreational pursuits. The location of open space areas also assists in the creation of a "Sense of Place" consistent with Liveable Neighbourhood objectives. The objective of meeting the needs of a broad range of users is achieved within the structure plan.

Each open space area is located so as to achieve clear sight lines from nearby buildings and so as to be safe and conveniently located to serve the majority of future structure plan area residents.

POS Ref	Area (Ha)	Function
1	1.4894	Nature
2	3.0727	Nature
3	0.7037	Buffer
4	0.8011	Buffer
5	0.5012	Sport
6	1.5323	Recreation
7	1.4686	Nature
TOTAL	**9.569**	

Table 6 POS Calculations

Figure 12 POS Map

The location of POS is site responsive catering for vegetation retention objectives as well as providing opportunities for both passive and active recreational pursuits. The location of open space areas also assists in the creation of a "Sense of Place" consistent with Liveable Neighbourhood objectives. The objective of meeting the needs of a broad range of users is achieved within the structure plan.

Each open space area is located so as to achieve clear sight lines from nearby buildings and so as to be safe and conveniently located to serve the majority of future structure plan area residents.

5.2 Residential

Consistent with current WAPC policy (including the Residential Design Codes and Liveable Neighbourhoods), the amended Local Structure Plan provides for a range of residential densities and therefore housing choice and lifestyle opportunities. Proposed densities range from R20 through to R40 for the majority of the Structure Plan area. The northeast corner has been identified for R30/60 which is consistent with the coding identified in the approved Local Structure Plan.

The amended Local Structure Plan has been formulated to meet the requirements of Liveable Neighbourhoods. The Residential Design Codes (R-Codes), administered by the City, will provide a comprehensive basis for the control of residential development within the structure plan area. The R-Codes will "outline the 'rules' which apply to residential development".

A site specific R30/60 site has been identified in the northeast corner of the structure plan area. This site has been identified as a suitable site for higher density development due to its direct frontage to Washington Avenue and additional road frontages provided by the structure plan design. Washington Avenue is serviced by existing public transport links, providing future residents with good access to public transport.

Whilst not specifically identified on the amended Local Structure Plan, it is likely that the higher R40 densities will be generally focussed on the mixed-use centre which fronts Parade Road – a local

distributor road. These sites provide opportunities for a variety of higher density housing including multi-storey apartments. Multiple dwelling development is not permitted on land zoned for residential purposes where the residential density code (R Code) is less than or equal to R30.

The R20 sites will be the base zoning through the structure plan area and provide for single residential housing. The amended local structure plan proposes the development of this land consistent with the average 450m^2 applicable to R20 coded land. However, the proposed density split coding of R20/40 allows for the development of a variety of lot sizes to be determined at subdivision stage.

Consistent with the 'General Objectives' of the R-Codes, the Tuart Brook Local Structure Plan:

a) provides for a full range of housing types and densities that meet the needs of a broad range of people;
b) provides for local variations in neighbourhood character;
c) ensures, as far as possible, high levels of local amenity;
d) makes provision for on-site facilities;
e) seeks to protect and enhance the amenity of adjoining residential areas; and,
f) incorporates environmentally sensitive design.

The amended Local Structure Plan layout seeks to maximise the outlook opportunities for residential development taking advantage of the significant areas of local and regional POS. The grid road pattern seeks to maximise opportunities for solar orientation of housing and provide for high levels of permeability, equity, and accessibility. The road layout provides for diversity and interest in the local street environments to assist in the development of local character and a sense of place consistent with Liveable Neighbourhood objectives.

5.3 Mixed Use Residential

The amended Local Structure Plan proposes an area of 'Mixed Use' at the intersection of Parade Road and the east west distributor road of the Local Structure Plan. The mixed-use precinct will provide the opportunity for small scale commercial development to establish in conjunction with residential development. This may be through the development of 2-story development with commercial business being established as street level and residential at a second level.

This location was originally identified as a local centre in the approved Local Structure Plan, however the uses permitted within the mixed use – residential zone under LPS 8 provides for a similar range of permitted uses, whilst maintaining the ability for residential development to occur if the market demand for commercial uses is not there.

The approach has been discussed with officers at the City and was considered a better outcome given the close proximity to the Dalyellup District Centre and nearby South Bunbury Market Place and the Parks Centre being within 3km and readily accessible by personal vehicle or public transport.

5.4 Bushfire Management

The structure plan design takes into account bushfire protection requirements and includes specific bushfire protection measures by way of perimeter roads to allow separation from vegetated areas on site and adjoining properties.

The amended Local Structure Plan design achieves an appropriate balance between bushfire risk management measures and biodiversity, conservation values, and environmental protection.

A full copy of the Bushfire Management Plan is located in **Appendix C** of this report.

5.5 Noise Impacts

Noise impacting the structure plan area can be considered originating from both the Bunbury Airport and Bussell Highway. Noise modelling of Bunbury Airport was undertaken in 1999 using the Australian Noise Exposure Forecast (AENF) systems. Using this system, it is considered that areas outside of the 20ANEF contour are considered unconstrained to residential development. As such the impact of Aircraft noise on the structure plan area is considered negligible as it falls outside the contour area.

A Traffic Noise Assessment was commissioned for the structure plan area in May 2010. The Assessment concluded that:

> *"Noise modelling of future traffic flows (year 2031) indicates that the following noise amelioration measures are required to achieve compliance with the outdoor limit criteria (SPP 5.4) across the Structure Plan area:*
>
> - *A 2 metre tall berm (total berm width of 6 metres) with a 1.8m solid fence on top of the berm – in the following locations:*
> - *Along the eastern boundary of the structure plan.*
> - *Along the southern boundary of the structure plan, within a 65m distance from the eastern boundary.*
> - *Along the boundary between the 'Existing Special Use' and the R40/60 site, within a 65m distance of the eastern boundary*
> - *1.8m tall fence along the northern boundary of the R40/60 site*
> - *1.8m tall fence on the boundary between the R40/60 site and the existing Caravan Park*
> - *1.8m tall fence along the southern boundary of the structure plan, up to a distance of 180m aware from the eastern boundary."*

In addition to this, the first row of housing along Bussell Highway (the eastern edge of the structure plan) will need acoustic upgrades to achieve compliance with the indoor noise level criteria (SPP 5.4)".

Notwithstanding the recommendations contained within the above Noise Assessment, a 20m wide reserve is proposed within the structure plan adjoining the Bussell Highway to accommodate a vegetated bund in accordance with WAPC requirements for residential development abutting Regional Roads in the Greater Bunbury region.

With the nearing completion of the Bunbury Outer Ring Road, which will divert vehicles travelling South on the Forrest Highway onto Bussell Highway past the Structure Plan area (as the connection to Bussell Highway is located South of the Structure Plan area), therefore reducing the vehicles impacting this portion of Bussell Highway and the provision of the 20m wide noise attenuation bund it is unlikely that an increase in noise impacts to the structure plan area have increased since the Traffic Noise Assessment was undertaken and therefore a revision of this document was not undertaken.

Any noise mitigation measures that are required to be implemented will be undertaken as part of the subdivisional works as relevant.

5.6 Movement Networks

The internal road layout has been designed to achieve a high level of permeability as well as to provide safe and efficient access to facilities for vehicles, pedestrians, and cyclists.

The layout is well integrated with the surrounding road network and developed areas with a strong east-west link from Parade Road connecting to an access onto Bussell Highway as well as a northern entry point to the site from Washington Avenue.

Donald Veal Consultants were engaged to undertake a review of the previous Transport Impact Assessment supporting the approved Local Structure Plan, taking into account the changed circumstances, including the progression of the Bunbury Outer Ring Road (BORR) and latest traffic modelling supplied by Main Roads WA (MRWA).

The previous Local Structure Plan identified a full movement intersection onto Bussell Highway; however this option has been replaced with a simplified left-in, left-out arrangement.

The proposed access points for the amended structure plan area will be via a new left-in left-out intersection with Bussell Highway, a new intersection at Washington Avenue, a new intersection onto Parade Road and linkages to the existing road network in the Northwood Gardens area (north-west corner) (refer **Figure 13** below).

The final intersection design onto Parade Road will be determined as part of the detailed design, discussions with relevant authorities and subsequent subdivision applications as identified on the amended Local Structure Plan (**Figure 1**).

The road layout proposed in the northeast corner of the structure plan area identified as R30/60 is indicative only (as identified on **Figure 13**), should the area be developed as freehold with gazetted roads. The indicative road layout may also be used as a guide for internal roads if developed as a strata development or something similar. The connections to the abutting existing road network have been identified as the appropriate connecting points.

The Transport Impact Assessment:

- describes and justifies road network and hierarchy;
- assesses the proposed road network capacity for peak demand;
- describes existing roads and intersections together with upgrading requirements;
- discusses the level of permeability and accessibility provided by the proposed road network;
- provides estimates of traffic volumes;
- provides indicative road cross sections for each road type, showing carriageway, median and verge widths and accommodation of service infrastructure and street trees;
- describes and justifies the proposed public transport network;
- identifies required intersection controls and traffic management issues; and,
- describes the proposed major pedestrian and cyclist network and links with the strategic cycle network.

The proposed road network is shown in **Figure 13** below.

The proposed road reserve widths generally range from 18m to 20m for the major connectors to 15m for the minor access streets. These widths are consistent with the range stated in Liveable Neighbourhoods (WAPC 2009).

Cross sections for the internal road network are yet to be confirmed. *Figures 3.3, 3.4, 3.5 and 3.6* of the Transport Impact Assessment show sample cross sections for various categories of access roads as contained in Liveable Neighbourhoods (WAPC 2009).

The Transport Impact Assessment demonstrates that the neighbourhood connector roads (see **Figure 13**) are likely to carry between 1,000 and 3,000 vehicles per day making (as above) appropriate. Access Street C could be considered for streets fronting higher residential density areas.

The proposed speed limit is 50km/h, as per the requirements for built up areas apart from areas designated within the school zone.

The need for localised widening near certain intersections, and the potential for on road facilities such as cycle lanes and parking bays may affect the final widths and cross sections of the roads, which will be determined as part of the detailed design stage.

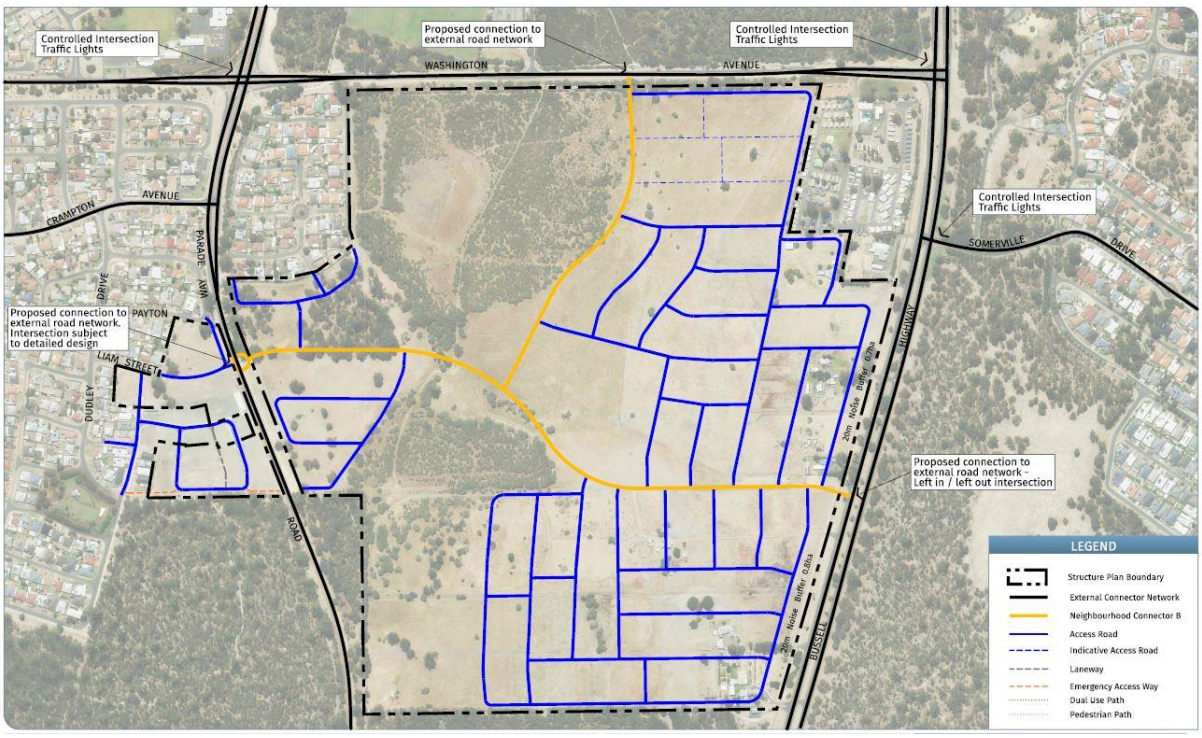

Figure 13 Road Layout and Access Points

The applicant/owner shall make provision for footpaths through the structure plan area. The location and width of footpaths are to be determined at subdivision stage and shall be in accordance with the requirements of Liveable Neighbourhoods.

A full copy of the Transport Impact Assessment is included as **Appendix E** of this report.

5.7 Education Facilities

Upon advice from the Department of Education (DoE) a Primary School has been identified within the Structure Plan area. Correspondence received from the DoE requested that a 3.75ha which includes Education Support Facilities, with an adjoining 0.5ha of shared oval/pos space should be provided for is shown on the Structure Plan map accordingly.

The co-location of POS with the Primary School and particularly where there will be a shared arrangement of playing field with members of public after school hours (via a shared use agreement with the City), the DoE requests that such arrangement does not compromise a school's ability to deliver educational and recreational/ sporting programs that support its curriculum.

Generally, the school site with co-located POS shall be configured such that it achieves the following;

- an effective school site area of 3.75 hectares (including Educational Support facilities);
- subject to the topography and shape of the school site, a maximum encroachment of 0.5 ha of oval including over-runs may be considered within the effective 3.75 ha site area;
- a standard junior football oval of 118m x 84m (total playing field area of 1 ha) is only required for a public primary school site;
- all infrastructure/facilities including lightings required for the playing field shall not be located within the effective school site area of 3.75 ha; and
- the ground level of co-located POS shall be lower than the adjoining school site to facilitate surveillance, drainage and access.

The ceding of the Primary School site to the Department of Education shall occur at the time of subdivision.

5.8 Developer & Infrastructure Contributions

A voluntary agreement between the Landowners, City of Bunbury and any other relevant stakeholders in accordance with Section 6.9 at the principles outlined in SPP 3.6 is proposed to support the implementation and funding of the required infrastructure and public open space associated with the Structure Plan area.

The Agreement will detail the infrastructure implementation and upgrade requirements, allocation of public open space, cost contributions and indicative timeframes required by all parties in accordance with the approved Local Structure Plan.

Given, approximately 75% of the area subject to the Tuart Brook Structure Plan is owned by two major landowners and the likelihood that the development of the entire Structure Plan area will occur over an extended period of time the preparation of an Agreement by all parties is considered the most suitable option. Furthermore, the Structure Plan does not propose any upgrades or establishment of community facilities, and the layout has been designed to minimise areas of public open space and road construction being reliant on multiple parties which was a deliberate consideration to assist in development of the area and to simplify the future development of individual lots.

It is anticipated that as a condition of subdivision for any land east of Parade Road the Western Australian Planning Commission will require the preparation and acceptance of the Agreement between all parties.

Appendix A Environmental Assessments

(included as part of the approved Tuart Brook Local Structure Plan)

Appendix B Local Water Management Strategy

(included as part of the approved Tuart Brook Local Structure Plan)

Appendix C Bushfire Management Plan

Tuart Brook Structure Plan

Kingslane Group

Bushfire Management Plan (Structure Plan)

JBS&G64443 | 150,630

20 December 2023

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

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Appendices

1. Proposal details

1.1 Background

Kingslane Group is seeking to lodge an updated Structure Plan to guide future urban development within Tuart Brook (the project area), located in the City of Bunbury. The updated Structure Plan (Figure 1) identifies:

- proposed residential cells zoned R20/30 and R40
- proposed mixed use residential cells
- proposed primary school site
- proposed aged care site
- proposed internal access layout
- proposed Regional Open Space (ROS)
- proposed Public Open Space (POS) and indicative drainage basins.

1.2 Site description

The project area comprises approximately of 92.2 ha within multiple lots on Bussell Highway, Washington Avenue and Parade Road, as depicted in Figure 2. The project area is surrounded by (see Figure 2):

- Washington Avenue, Hay Park Sporting Precinct and conservation category wetland to the north
- Private Lot 507, Lillydale Road and future urban development areas of the Dalyellup East Structure Plan area to the south
- Bunbury Village Caravan Park and a Veterinary Clinic to the northeast
- Bussell Highway, College Grove Estate and remnant bushland to the east
- Parade Road and existing residential areas of the Usher locality to the west.

Within and surrounding the project area is Kalgulup Regional Park (ROS), which provides landscape scale ecological links across the Greater Bunbury region. Kalgulup has been created by combining a number of smaller historically named parklands to connect and create linkages for movement of wildlife. These are:

- Hay Park to the north
- Tuart Brook and Five Mile Brook to the south and within the project area
- Manea Park to the east
- Usher Woodland and Shearwater Tuart Forest to the west and southwest.

1.2.1 Existing land uses

The project area covers approximately 92.2 ha and comprises cleared land and grazed pastures with patches of remnant native vegetation. Historically the project area has supported rural land uses such as grazing and agistment and been largely cleared of native vegetation, though some remnants remain.

There are six residences and associated outbuildings present fronting Bussell Highway and a strip of ROS is gazetted towards the west of the project area, elongated north-south. Vegetation contained within ROS will be retained.

1.2.2 Existing vehicular access

Aside from the two small development cells west of Parade Road, there is currently no public road access throughout the project area, with egress being via private gates and driveways to individual lots.

In the northwest, the site boundary intersects with three legacy no-through roads, being Northwood Gardens, Honey Lane, and Foreman Drive. These will be extended and become through roads and provide additional connections to the wider road network as part of development of the project area, as discussed in Section 5. Similarly, the proposed development will also resolve the three legacy no-through roads in Liam Street, Lingard Loop and Lobelia Lane, located west of Parade Road.

1.2.3 Existing water supply

The project area is not currently provided with an existing reticulated water supply, but existing Aqwest hydrants are located adjacent to Washington Avenue to the north, adjacent to Bussell Highway to the east and adjacent to Parade Road to the west and will be extended into the project area as part of proposed development.

1.3 Bushfire prone designation

The project area is partially designated as bushfire prone on the *Map of Bush Fire Prone Areas* (DFES 2021; see Plate 1).

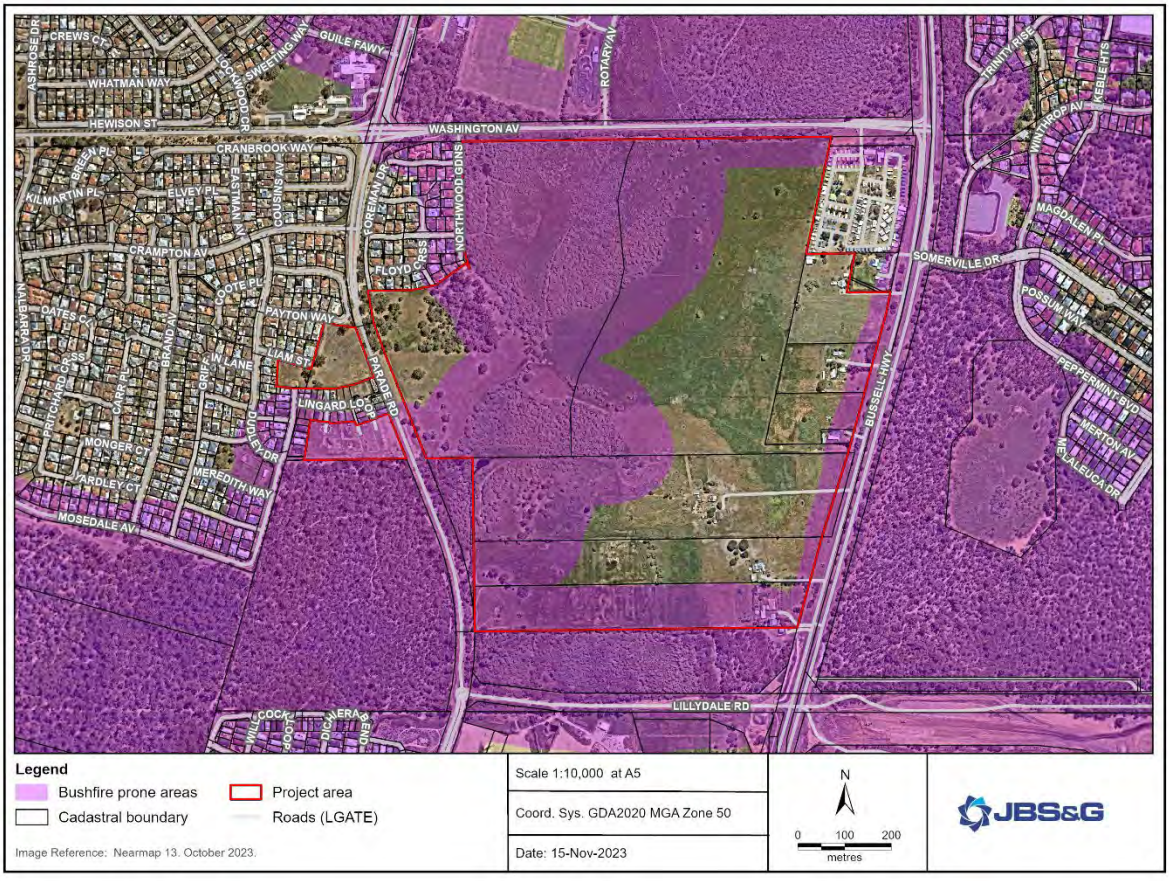

Plate 1: Map of Bush Fire Prone Areas (DFES 2021)

1.4 Purpose of this report

This Bushfire Management Plan (BMP) has been prepared to address requirements under Policy Measures 6.2 and 6.3 of *State Planning Policy 3.7 Planning in Bushfire-Prone Areas* (SPP 3.7; WAPC 2015) in accordance with *Guidelines for Planning in Bushfire-Prone Areas Version 1.4* (the Guidelines; WAPC 2021).

This report provides an assessment of the proposed development, bushfire risk context, and required bushfire mitigation measures and includes:

- a review of pre and post-development vegetation classifications, exclusions and effective slope within the project area and surrounds
- results of a pre and post-development Bushfire Hazard Level (BHL) assessment to determine the applicable BHLs across the project area and adjoining land
- details of any bushfire hazard issues relevant to the site and proposed development
- a compliance assessment to demonstrate that the proposed development can comply with the bushfire protection criteria of the Guidelines at subsequent planning stages.

1.5 Other plans/reports

Other relevant reports known to have been prepared for the project area include:

- Tuart Brook Local Structure Plan, MPM Development Consultants, May 2014.

The previous structure plan was approved by the City of Bunbury and references environmental, heritage, noise, and water management reports amongst others.

WASHINGTON AVENUE

CRAMPTON AVENUE

PARADE

DRIVE WAY

PAYTON

LIAM STREET

DUDLEY

ROAD

SOMERVILLE DRIVE

HIGHWAY

BUSSELL

POS 3.07HA

POS 1.49HA

PRIMARY SCHOOL SITE 3.75ha

POS 1.47HA

POS 0.5HA

POS 1.53HA

20m Noise Buffer 0.7ha

20m Noise Buffer 0.8ha

Intersection subject to detailed design

Left in / left out intersection

LEGEND

- Structure Plan Boundary
- Residential R20/30
- Residential R40
- Mixed Use Residential
- Primary School
- Regional Open Space
- Public Open Space
- Indicative Drainage Basin
- Possible Aged Care Site
- Neighbourhood Connector B
- Access Road
- Laneway
- Emergency Access Way
- Dual Use Path
- Pedestrian Path

TUART BROOK LOCAL STRUCTURE PLAN MODIFICATION No. 1

Plan No. | 23613-02
Date | 07/11/23
Drawn | NP
Checked | KS
Revision | A

Scale | 1:5000@A3

0 50m 100m 150m

BUNBURY OFFICE:
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ALBANY | BUNBURY | BUSSELTON | FORRESTDALE | PERTH

NOTE: This plan has been prepared for planning purposes. Areas, Contours and Dimensions shown are subject to survey

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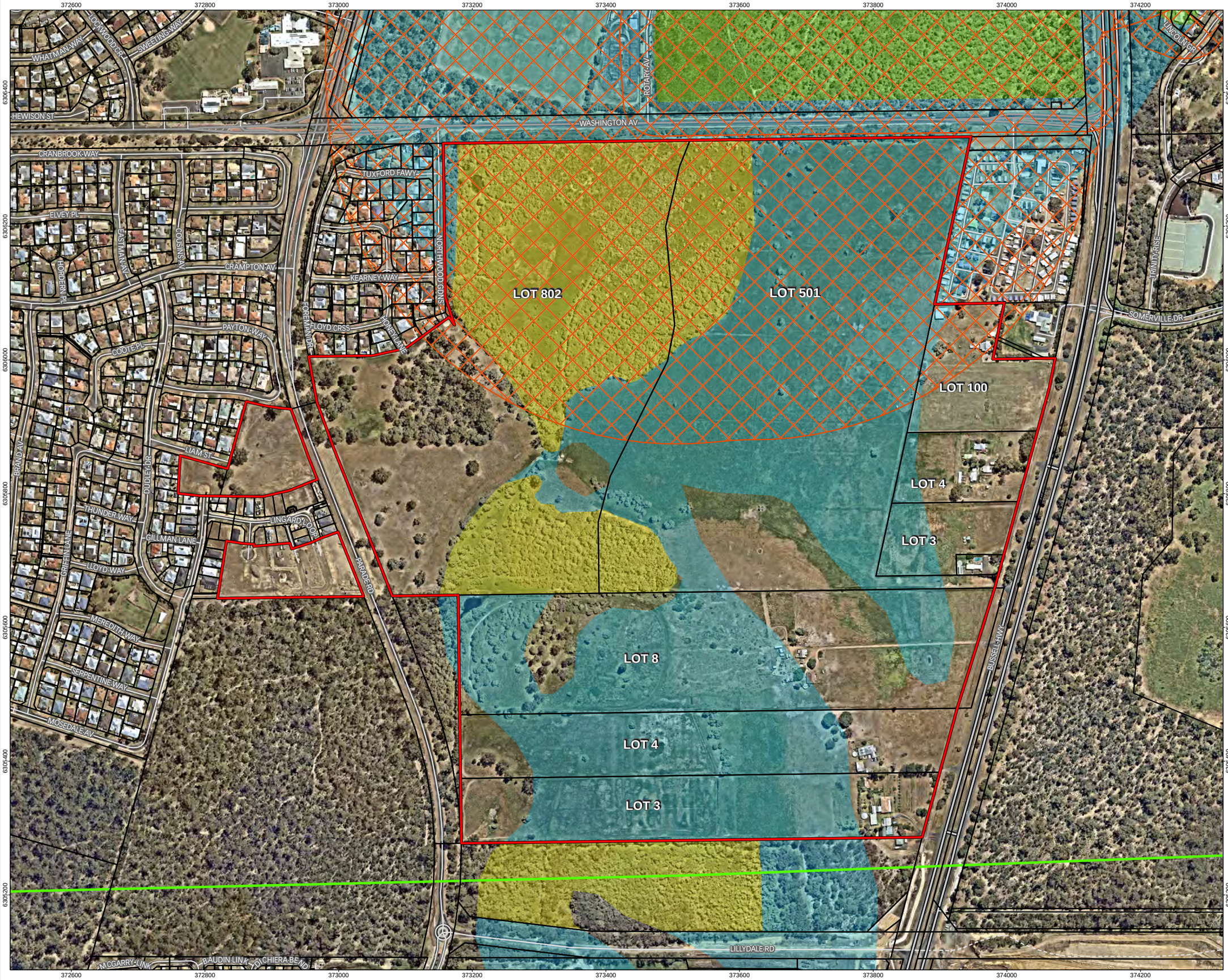


Legend

- Project area
- Cadastral boundary
- Environmentally Sensitive Areas (DWER - 046)

Geomorphic wetlands (DBCA)

- Conservation
- Multiple Use
- Resource Enhancement
- Ecological linkages
- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 64443	
Client: Kingslane Group	
Version: A	Date: 15-Nov-2023
Drawn By: jcrute	Checked By: ZC

Scale 1:5,200 at A3

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Tuart Brook Structure Plan, Usher, WA

SITE OVERVIEW

FIGURE 2

File Name: C:\Users\jcrute\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Kingslane Group\64443 Tuart Brook\GIS\02_MapProjects\64443 TuartBrook\64443 TuartBrook.aprx
Image Reference: www.nearmap.com© - Imagery Date: 13. October 2023.

2. Environmental considerations

2.1 Environmental values

A search of publicly available environmental databases and a review of the previous Tuart Brook Local Structure Plan (MPM 2014) is summarised in Table 1 to provide an overview of the environmental values associated with the project area and proposed development. Where available, this data has been mapped in Figure 2.

Potential environmental impacts resulting from implementation of the proposal will be addressed by the proponent under standard State and Federal environmental assessment and referral requirements under the *Environmental Protection Act 1986* and *Environment Protection and Biodiversity Conservation Act 1999* as required.

Table 1: Summary of environmental values

Environmental value	Present within or adjacent to the project area	Description
Environmentally Sensitive Area (ESA)	Within and adjacent	This is associated with two Conservation Category Wetlands within Hay Park adjacent north of the project area.
Swan Bioplan Regionally Significant Natural Area	N/A	N/A
Ecological linkages	Within and adjacent	Though not part of a designated ecological linkage, the Kalgulup Regional Park comprises numerous small local parks and forms a landscape scale ecological linkage connecting the coast with the Preston, Brunswick and Collie River Foreshores from Usher in the south and west to Waterloo/Roelands and Wellesley/Brunswick in the north and east.
Wetlands	Within and Adjacent	There are two Conservation Category Wetlands (UFI 915 and 15,497) within Hay Park to the north of the project area. Several Resource Enhancement Wetlands (UFI 15,493; 15,495; 15,496 and 15,502) are located within the project area. Several Multiple Use Wetlands (UFI 15,492; 15,500 and 15,501) are within and adjacent to the project area.
Waterways	N/A	N/A
Threatened Ecological Communities (TECs) listed under the EPBC Act	Potentially within and adjacent	Three TECs are listed as being potentially within the project area. These are the Critically Endangered *Clay Pans of the Swan Coastal Plain*, Critically Endangered *Tuart Woodlands and Forests of the Swan Coastal Plain* and the Endangered *Banksia Woodlands of the Swan Coastal Plain*.

Environmental value	Present within or adjacent to the project area	Description
		Approximately 360 m to the east of the project area is the Endangered *Empodisma Peatlands of Southwestern Australia*. Despite its degraded nature, it is possible that *SCP18 Shrublands on calcareous silts* TEC is present within the project area. This is a DBCA listed TEC and is adjacent to the project area and located within Hay Park to the north.
Threatened and priority flora	N/A	No declared rare or priority flora species have been located in the project area. Since proposed development will be targeted throughout existing cleared areas of the site, there will be little impact on native flora.
Fauna habitat listed under the EPBC Act	Potentially within and adjacent	The project area is mapped as being partially within a buffer for a Black Cockatoo roosting site and contains potential feeding habitat for the Endangered Baudin's Black Cockatoo, the Endangered Carnaby's Black Cockatoo and the Vulnerable Forest Red-tailed Black Cockatoo. It also has potential habitat for the Critically Endangered Western Ringtail Possum.
Threatened and priority fauna	Potentially within and adjacent	Potentially 11 mammals, 88 birds, nine frog and 15 reptile species could occur within the project area, five of which are considered rare or vulnerable. Since proposed development will be targeted throughout existing cleared areas of the site, there will be little impact on native fauna.
Bush Forever Site	N/A	N/A
DBCA managed lands and waters (includes legislated lands and waters and lands of interest)	N/A	N/A
Conservation covenants	None Known	N/A

2.2 Native vegetation – modification and clearing

The project area comprises historically cleared land and grazed pastures with patches of remnant native vegetation. It has supported rural land uses with extensive grazing and been largely cleared of native vegetation, though some remnants remain.

Whilst proposed development will be predominantly targeted throughout existing cleared areas of the site, some minor clearing will need to occur across the project area to facilitate construction of development cells, roads and certain POS cells, as per the updated Structure Plan design shown in Figure 1.

2.3 Revegetation / Landscape Plans

The majority of on-site remnant native vegetation will be retained within proposed ROS and the three western-most POS cells. The retained vegetation, which constitutes classifiable vegetation under AS3959, will maintain its vegetation classification post-development given its inclusion within the Kalgulup Regional Park. This also caters for the four proposed drainage basins located within the ROS cells.

The two eastern-most POS cells will consist of more active open spaces and school ovals adjacent to the proposed Primary School site and will be landscaped to achieve a combination of non-vegetated and low threat managed states. As such, these POS cells will be excluded under Clauses 2.2.3.2 (e) and (f) of AS3959.

The two proposed 20 m wide noise buffer POS strips in the east of the project area abutting Bussell Highway have been assigned a precautionary classification of Class D scrub due to the potential for future landscaping to result in replanting of shrubs 2–6 m in height for noise attenuation purposes and screening. However, this precautionary classification may be subject to change based on confirmation of final landscaping approach at the subdivision stage, which may result in potential exclusion under one or a combination of exclusion clauses of 2.2.3.2 of AS3959.

The above landscaping strategy presents reasonable assumptions at the strategic planning stage for the classification and exclusion of ROS and POS based on the available information and landscaping expectations. Landscape plans will be prepared at the subdivision stage to confirm final vegetation classifications and exclusions throughout proposed ROS and POS areas.

Post development classification and exclusion of proposed ROS and POS cells is considered and identified in Section 3.2.

3. Bushfire assessment results

3.1 Bushfire Hazard Level Assessment

A Bushfire Hazard Level (BHL) assessment has been undertaken in accordance with Appendix 2 of the Guidelines. The assessment methodology categorises land as having a Low, Moderate, or Extreme BHL based on the AS3959 vegetation classification and slope. BHLs provide an indication of the potential intensity of a bushfire event associated with vegetation within and adjacent to the project area.

Table 2 lists the three BHLs and their associated characteristics. BHLs have been applied to land within the project area and adjoining 150 m (the assessment area) to assess current (pre-development) bushfire hazard conditions, as well as the anticipated post-development bushfire hazard conditions.

Table 2: Bushfire hazard levels and characteristics

Bushfire hazard level	Characteristics*
Extreme	• Class A Forest • Class B Woodland (05) • Class D Scrub • Any classified vegetation with a greater than 10° slope.
Moderate	• Class B Low woodland (07) • Class C Shrubland • Class E Mallee/Mulga • Class G Grassland, including sown pasture and crops • Class G Grassland: Open woodland (06), Low open woodland (08), Open shrubland (09) • Vegetation that has a low hazard level but is within 100 metres of vegetation classified as a moderate or extreme hazard, is to adopt a moderate hazard level.
Low	• Low threat vegetation may include areas of maintained lawns, golf courses, public recreation reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks • Managed grassland in a minimal fuel condition (insufficient fuel is available to significantly increase the severity of the bushfire attack). For example, short-cropped grass to a nominal height of 100 millimetre • Non-vegetated areas including waterways, roads, footpaths, buildings and rock outcrops.
*Vegetation classifications from AS 3959-2018 Table 2.3.	

3.2 Assessment inputs

3.2.1 Vegetation classification

Classified vegetation and exclusions were assessed within the project area and adjoining 150 m (the assessment area) through on-ground verification on 22 February 2023 in accordance with AS3959 and the *Visual Guide for Bushfire Risk Assessment in Western Australia* (DoP 2016).

Georeferenced site photos and a description of the vegetation classifications and exclusions are contained in Appendix B.

Pre-development vegetation was assessed based on the current extent of classified vegetation and exclusions within the assessment area, as summarised in Section 3.2.3 and depicted in Figure 3. Pre-development vegetation classifications and exclusions consisted of the following:

- Class A forest comprising a three tiered fuel profile with a eucalyptus canopy, shrubby midstorey and grassy understorey to the southwest, south and east of the project area, as well as smaller pockets to the north of the project area and within the northwest of the site

- Class B woodland comprising sparse eucalyptus paddock trees over a grassy understorey within a small pocket to the west of the project area abutting Parade Road
- Class D scrub comprising shrubs 2–6 m in height with a continuous horizontal fuel profile contained within larger remnants within the north and central areas of the site, as well as smaller pockets to the south and north of the project area and within narrow strips along Washington Avenue to the north and Parade Road to the west
- Class G grassland comprising grasses greater than 100 mm in height at maturity throughout the majority of the project area within cleared areas and grazed pastures
- existing non-vegetated areas (i.e. buildings, roads, footpaths, driveways, sealed areas, etc) and low threat managed areas (i.e. managed gardens, irrigated turf and POS, managed urban street verges, etc), which are excluded under Clauses 2.2.3.2 (e) and (f) of AS3959.

The post-development vegetation assessment takes into consideration the anticipated clearing and modification of vegetation to a low threat state required to implement the proposed development, as well as any proposed POS landscaping works, as summarised in Section 3.2.4 and depicted in Figure 4. The assumptions for post-development classifications/exclusions are summarised as follows:

- modification of vegetation to a non-vegetated/low threat managed state to facilitate construction of internal roads, urban residential cells, primary school site and the two eastern-most POS cells adjacent to the proposed school site, as well as ongoing management of these areas as required
- vegetation retention and classification as per pre-development conditions throughout proposed ROS and the three western-most POS cells
- landscaping of the proposed 20 m wide noise buffer POS strips to the east to a Class D scrub classification.

3.2.2 Effective slope

Effective slope under classified vegetation was assessed within the assessment area through on-ground verification on 22 February 2023 in accordance with AS3959. Results were cross-referenced with DPIRD 2m contour data and are discussed in Section 3.2.3 and depicted in Figure 3 for pre-development conditions; and Section 3.2.4 and Figure 4 for post-development conditions.

The assessment area is generally flat/upslope (0°), with elevation at approximately 4 mAHD across the majority of the project area. Elevation increases throughout the assessment area to 14 mAHD in the southwest and 20 m in the east, which represent up-slopes in both instances.

3.2.3 Summary of pre-development inputs

A summary of the pre-development classified vegetation, exclusions and effective slope within the assessment area are listed in Table 3 and illustrated in Figure 3.

Table 3: Pre-development vegetation classifications/exclusions and effective slope

Vegetation Plot	Vegetation classification/ exclusion	Effective slope under classified vegetation	Comments
1	Class A Forest	Flat/upslope (0°)	Eucalyptus trees 10–30 m in height, with a scrubby middle storey and herbaceous understorey
2	Class B Woodland	Flat/upslope (0°)	A sparse canopy of eucalyptus trees 10–30 m in height with a low layer of groundcovers, lacking deep surface litter
3	Class D Scrub	Flat/upslope (0°)	Scrub vegetation 2–6 m in height with a continuous horizontal fuel profile

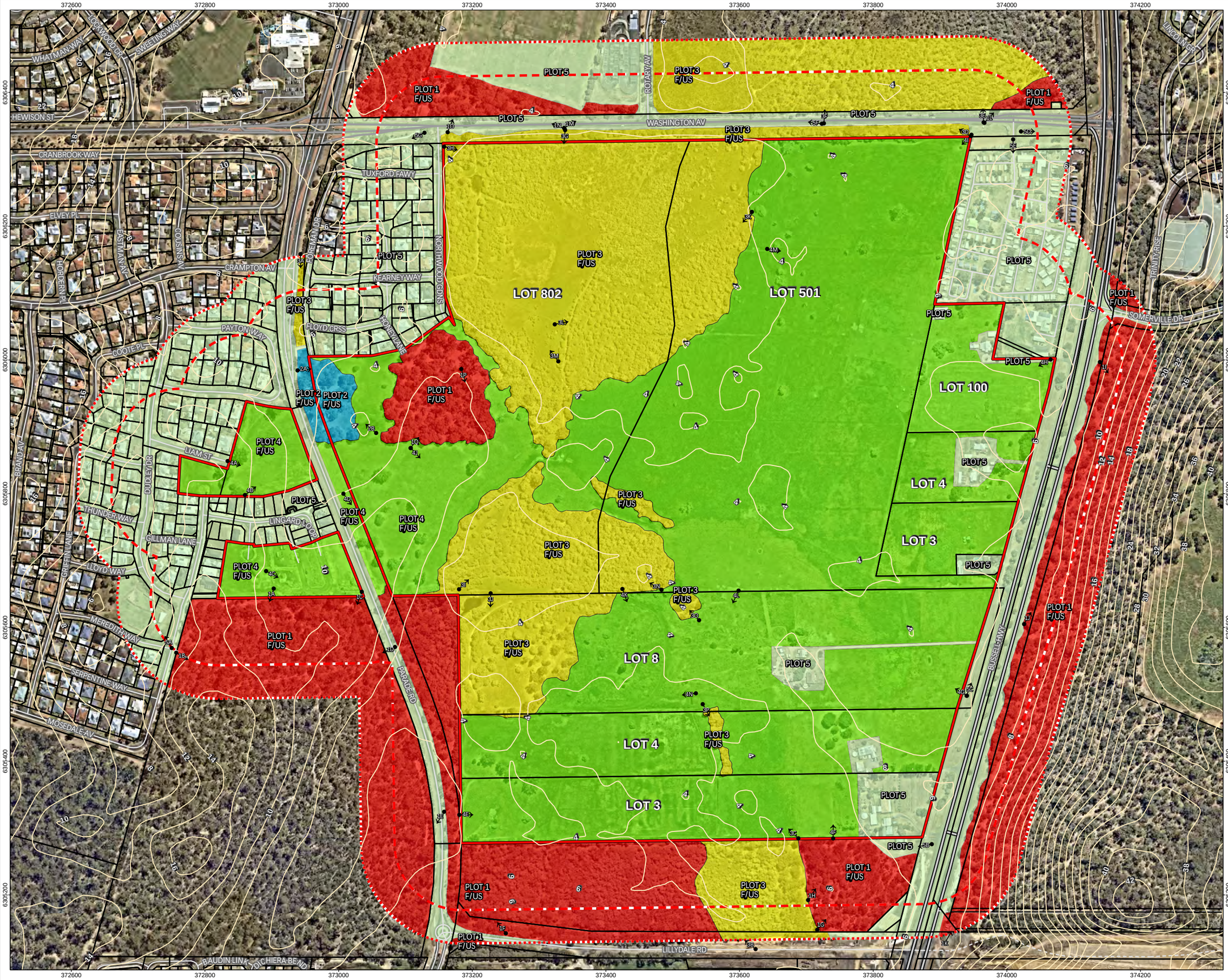
Vegetation Plot	Vegetation classification/ exclusion	Effective slope under classified vegetation	Comments
4	Class G Grassland	Flat/upslope (0°)	Grasses and weeds greater than 100 mm in height at maturity
5	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Existing non-vegetated areas (i.e. buildings, roads, footpaths, driveways, sealed areas, etc) and low threat managed areas (i.e. managed gardens, irrigated turf and POS, managed urban street verges, etc)

3.2.4 Summary of post-development inputs

A summary of the anticipated post-development classified vegetation, exclusions and effective slope within the assessment area are listed in Table 4 and illustrated in Figure 4.

Table 4: Post-development vegetation classifications/exclusions and effective slope

Vegetation Plot	Vegetation classification/ exclusion	Effective slope under the classified vegetation	Comments
1	Class A Forest	Flat/upslope (0°)	Eucalyptus trees 10–30 m in height, with a scrubby middle storey and herbaceous understorey
2	Class D Scrub	Flat/upslope (0°)	Scrub vegetation 2–6 m in height with a continuous horizontal fuel profile
3	Class G Grassland	Flat/upslope (0°)	Grasses and weeds greater than 100 mm in height at maturity
4	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Existing non-vegetated areas (i.e. buildings, roads, footpaths, driveways, sealed areas, etc) and low threat managed areas (i.e. managed gardens, irrigated turf and POS, managed urban street verges, etc)
5	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Areas to be modified to a non-vegetated/low threat managed state as part of the proposed development



Legend

- Project area
- 100m assessment area
- 150m assessment area
- Cadastral boundary

Vegetation classification

- Class A Forest
- Class B Woodland
- Class D Scrub
- Class G Grassland
- Clause 2.2.3.2 (e) & (f)
- Photo point directions
- Topographic contours (mAHD)
- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 64443	
Client: Kingslane Group	
Version: A	Date: 06-Dec-2023
Drawn By: jcrute	Checked By: ZC

Scale 1:5,200 at A3

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Tuart Brook Structure Plan, Usher, WA

PRE-DEVELOPMENT VEGETATION CLASSIFICATION AND EFFECTIVE SLOPE

FIGURE 3

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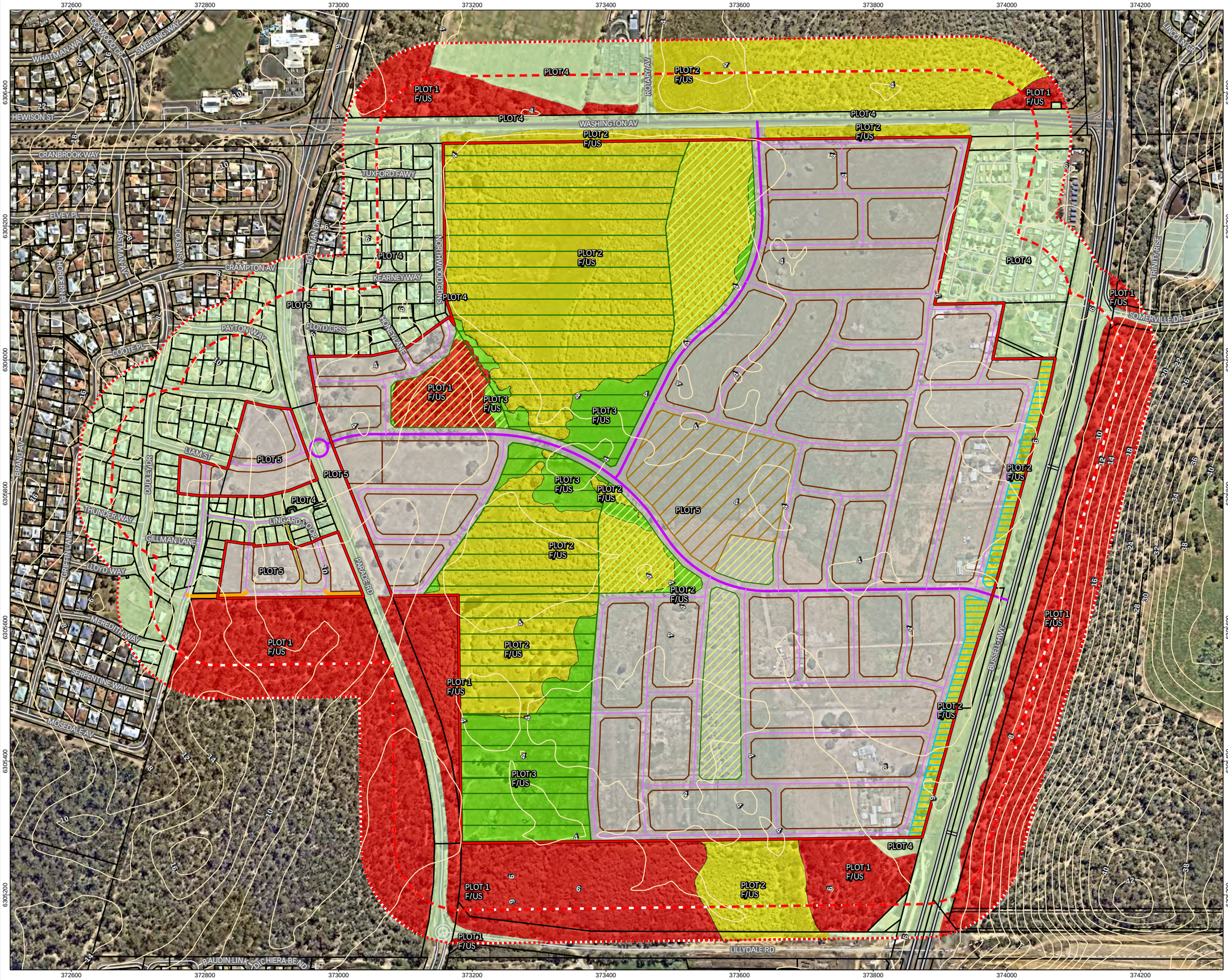
Image Reference: www.nearmap.com© - Imagery Date: 13. October 2023.



Legend

- Project area
- 100m assessment area
- 150m assessment area
- Cadastral boundary
- Proposed development cells
- Public Open Space
- Regional Open Space
- Primary School Site
- 20m noise buffer POS cells

Vegetation classification

- Class A Forest
- Class D Scrub
- Class G Grassland
- Clause 2.2.3.2 (e) & (f)
- Area to be modified to non-vegetated and low threat state
- EAW
- Laneway
- Access roads
- Neighbourhood connector B
- Topographic contours (mAHD)
- Highway
- Major road
- Minor road
- Track

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Job No: 64443	
Client: Kingslane Group	
Version: A	Date: 06-Dec-2023
Drawn By: jcrute	Checked By: ZC

Scale 1:5,200 at A3

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Tuart Brook Structure Plan, Usher, WA

POST-DEVELOPMENT VEGETATION CLASSIFICATION AND EFFECTIVE SLOPE

FIGURE 4

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3.3 Assessment outputs

3.3.1 Bushfire Hazard Level assessment results

Pre-development results

The pre-development BHLs have been mapped within the assessment area on the basis of the pre-development vegetation summarised in Section 3.2.3 and depicted in Figure 3.

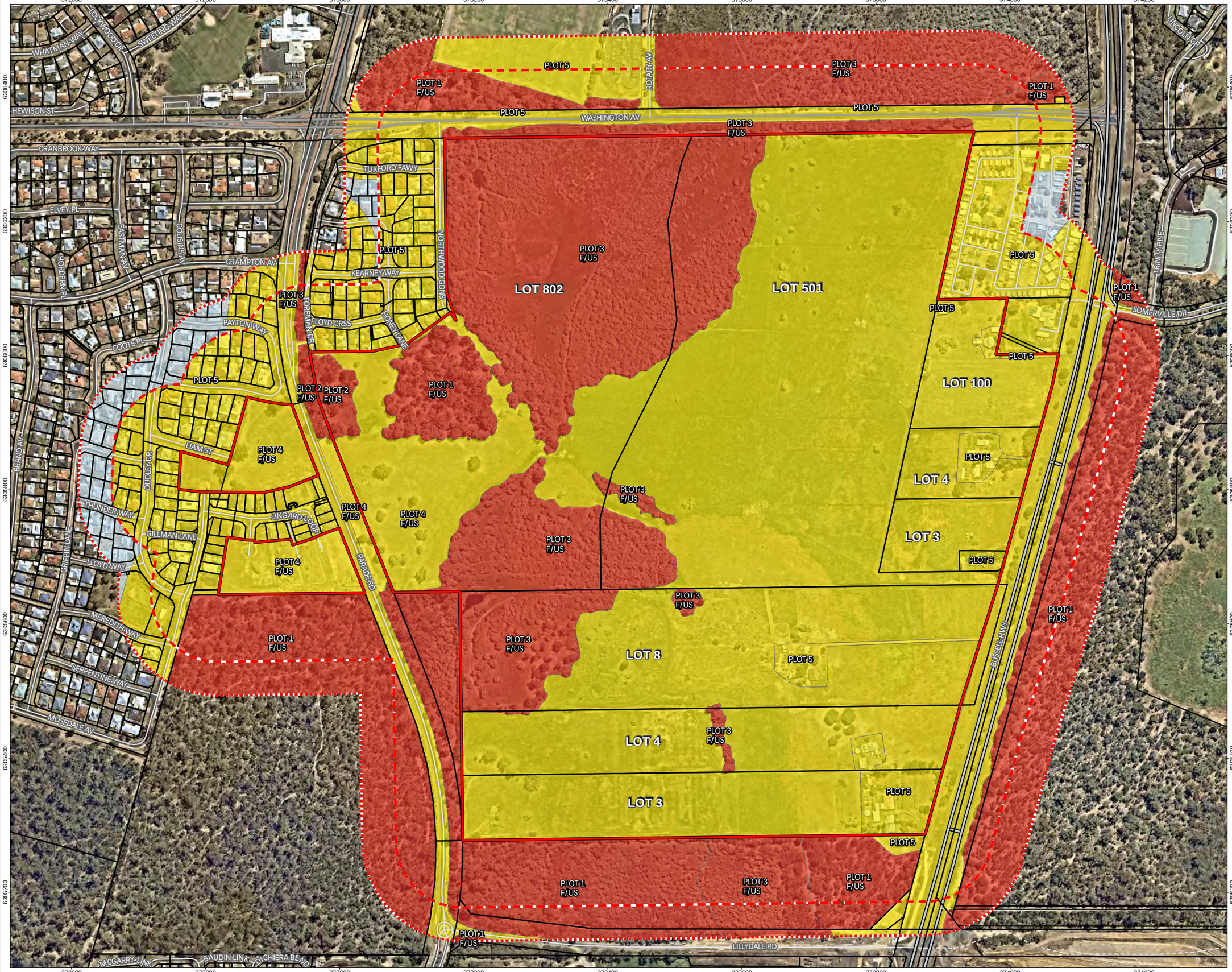
The pre-development BHL assessment map (Figure 5) demonstrates that existing land within the assessment area comprises **Moderate** and **Extreme** BHLs.

Land with an Extreme BHL is not suitable for development and the updated Structure Plan provides a design response to the bushfire hazards to ensure no development occurs within these areas.

Post-development results

The post-development BHLs have been mapped within the assessment area on the basis of the anticipated post-development vegetation summarised in Section 3.2.4 and depicted in Figure 4.

The post-development BHL assessment map (Figure 6) demonstrates that all proposed development areas will be located on land with either a **Low** or **Moderate** BHL. This achieves compliance with Element 1 of the bushfire protection criteria of the Guidelines, as discussed in Section 5.



Legend

- Project area
- 100m assessment area
- 150m assessment area
- Cadastral boundary

Hazard level

- Extreme
- Moderate
- Low

- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 64443	
Client: Kingslane Group	
Version: A	Date: 15-Nov-2023
Drawn By: jcrute	Checked By: ZC

Scale 1:5,200 at A3

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Tuart Brook Structure Plan, Usher, WA

PRE-DEVELOPMENT BUSHFIRE HAZARD LEVELS

FIGURE 5

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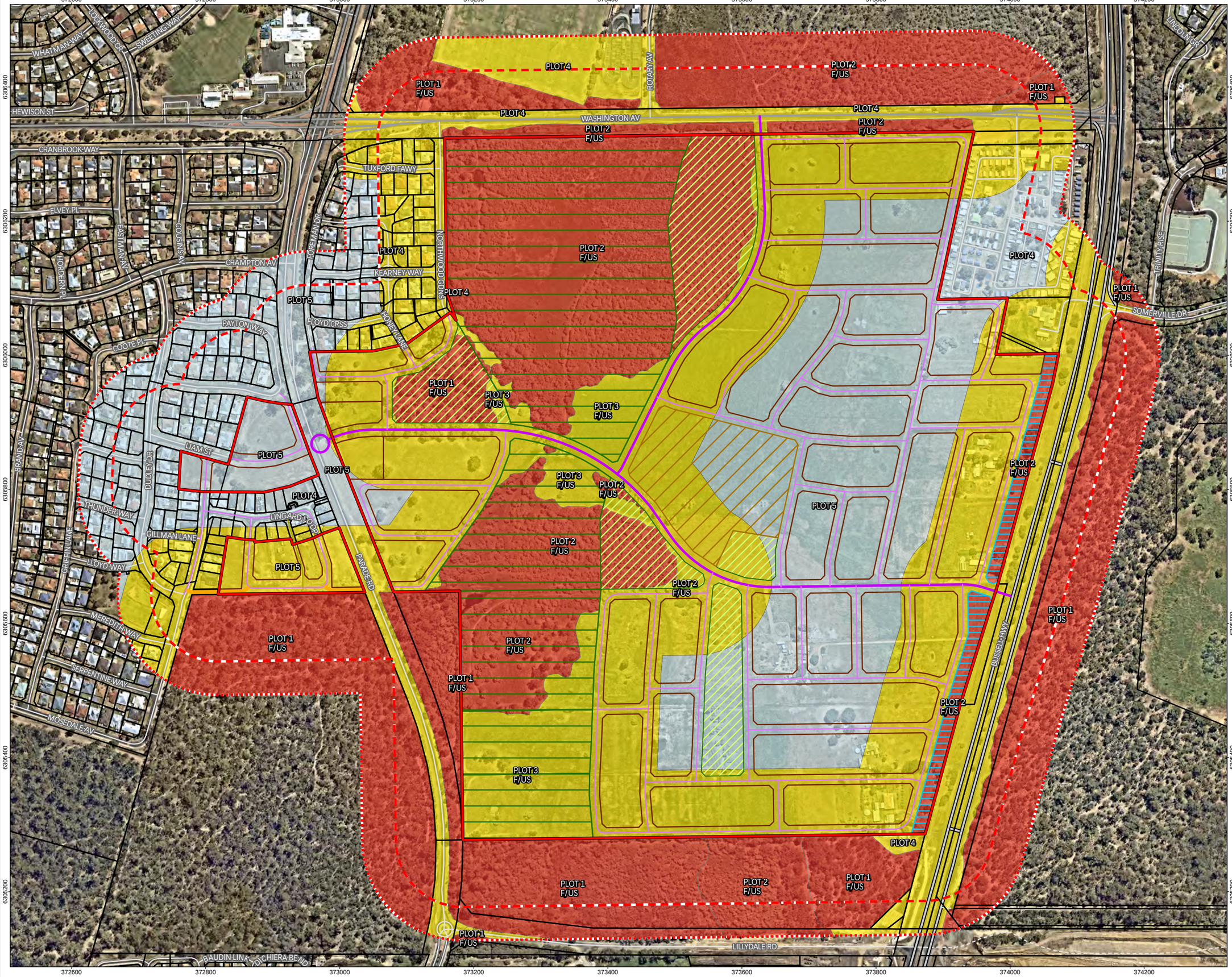

Legend

- Project area
- 100m assessment area
- 150m assessment area
- Cadastral boundary
- Proposed development cells
- Public Open Space
- Regional Open Space
- Primary School Site
- 20m noise buffer POS cells

Hazard level

- Extreme
- Moderate
- Low
- EAW
- Laneway
- Access roads
- Neighbourhood connector B
- Highway
- Major road
- Minor road
- Track

JBS&G

Job No: 64443	
Client: Kingslane Group	
Version: A	Date: 06-Dec-2023
Drawn By: jcrute	Checked By: ZC

Scale 1:5,200 at A3

0 50 100
metres

Coord. Sys. GDA2020 MGA Zone 50

Tuart Brook Structure Plan, Usher, WA

POST-DEVELOPMENT BUSHFIRE HAZARD LEVELS

FIGURE 6

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4. Identification of bushfire hazard issues

4.1 Bushfire context

Whilst the broader landscape indicates moderate landscape scale fire runs to the north (900 m), west (2.5 km) and east (4 km), the project area is situated adjacent to substantial residential areas in Dalyellup to the south, Usher to the west and College Grove to the east, as well as the Hay Park Sporting Precinct to the north and substantial arterial connector roads in Parade Road to the west, Washington Avenue to the north, Bussell Highway to the east and Lillydale Road to the south. As such, the broader landscape risk is considered to be manageable within the context of the proposed development and the existing development areas and access corridors surrounding the site.

A bushfire approaching the site from the west/southwest through forest vegetation is considered to be the worst case bushfire scenario that could impact the site, particularly under typical summer afternoon wind conditions. This bushfire scenario could escalate over the course of a moderate fire run and reach a steady state prior to reaching the project area. The resulting fire behaviour is likely to exhibit elevated levels of radiant heat and ember attack on the proposed development and sufficient defendable space, perimeter access and BAL-rated construction should be employed at this interface to mitigate this risk.

A bushfire approaching the site from the east opposite Bussell Highway, whilst having the potential to impact the site, is somewhat mitigated through the substantial defendable space and access provided by Bussell Highway reserve. Notwithstanding, the long fire run through forest vegetation, combined with typical summer morning wind conditions, has the potential to impact the project area with moderate levels of radiant heat and ember attack. Appropriate levels of BAL-rated construction should be employed at this interface to mitigate this risk.

Similarly, a bushfire approaching the site from the north opposite Washington Avenue has the potential to impact the site; however, this impact is somewhat mitigated through the defendable space and access provided by Washington Avenue, as well as the shorter fire run, reduced vegetation type (i.e. scrub) and less likely wind conditions. Appropriate levels of BAL-rated construction should be employed at this interface to mitigate this risk.

A potential bushfire approaching the site from the south within remnant forest and scrub vegetation contained within adjacent private Lot 507 also has the potential to impact proposed development with elevated levels of radiant heat and ember attack; however, the fire run is significantly reduced (approximately 160 m) and steady state bushfire behaviour may not be achieved over this distance. Notwithstanding, due to the direct proximity to the project area, sufficient defendable space, perimeter access and BAL-rated construction should be employed at this interface to mitigate this risk.

Since there will be vegetation retention of on-site forest, scrub and grassland vegetation throughout proposed ROS and POS internal to the site, appropriate bushfire responses should be considered to mitigate risk from internal hazards through provision of sufficient defendable space, perimeter access and BAL-rated construction at the relevant interfaces.

4.2 Bushfire hazard issues

Examination of strategic development design in accordance with the updated Structure Plan, bushfire context and pre/post-development BHLs has identified the following bushfire hazard issues to be considered at future planning stages.

On the basis of this information, JBS&G considers the bushfire hazards within and adjacent to the project area and the associated bushfire risks are readily manageable through adoption of standard acceptable solution management responses outlined in the Guidelines. These responses will be factored in to proposed development early in the planning process to ensure a suitable, compliant and effective bushfire management outcome is achieved for protection of future life and property assets.

4.2.1 Land with an Extreme BHL

The project area contains land with an Extreme BHL that is not suitable for habitable development. In response, the updated Structure Plan has been designed to ensure that on completion of development, all habitable development areas will be located on land with a Low or Moderate BHL, as demonstrated in the post-development BHL assessment in Figure 6. A BAL contour assessment will be commissioned at future planning stages (i.e. subdivision) to demonstrate at a more detailed level that all areas of proposed habitable development will be located in areas of BAL-29 or below. Therefore, the development can comply with Acceptable Solution A1.1 of the Guidelines.

4.2.2 Post-development on-site vegetation

Development design is likely to result in vegetation retention/replanting within proposed ROS (and associated drainage basins), the three western-most POS cells and the two 20 m wide noise buffer POS strips to the east. Due to these areas constituting classifiable vegetation under AS3959 (Class A forest, Class D scrub and Class G grassland), they result in a Moderate to Extreme BHLs. Where habitable development is proposed within proximity to these areas, low threat separation/APZs sufficient to achieve BAL-29 or lower will be employed as part of a compliant subdivision design and will be confirmed through detailed BAL contour mapping at the subdivision stage. Lot size and orientation will need to be considered at future stages to ensure appropriate setbacks from the classified vegetation extent can be achieved.

4.2.3 Habitable building setbacks to achieve BAL-29

The applicable habitable building setbacks (i.e. low threat separation distances/APZs) from internal and external bushfire prone vegetation required to achieve BAL-29 are to be determined through site-specific BAL contour map analysis at future planning stages (i.e. subdivision), but are likely to be:

Vegetation classification	Effective slope	Separation to achieve BAL-29
Class A Forest	Flat/ Upslope	21 m
Class D Scrub	Flat/ Upslope	13 m
Class G Grassland	Flat/ Upslope	8 m

4.2.4 Drainage basins

Four drainage basins are proposed throughout the ROS cells as depicted indicatively in Figure 1. The BMP has classified the proposed drainage cells as per the current pre-development vegetation classifications in the absence of a detailed Landscape Plan. Final classifications will be determined at subdivision stage through the development of detailed landscaping design.

4.2.5 POS and landscaping

The landscape strategy discussed in Section 2.3 makes the assumption that the ROS and three western-most POS cells will maintain their current vegetation extent, whilst the two eastern-most POS cells adjacent to the Primary School site will be landscaped to a low threat state and the 20 m wide noise buffer strips will be landscaped to a Class D scrub state. A detailed Landscape Plan will be required at the subdivision stage to confirm the extent and composition of future landscaping within ROS and POS cells to confirm the various assumptions made regarding vegetation classifications and exclusions. This information will inform preparation of a subdivision stage BAL contour map.

4.2.6 Implications of staged development

Development of the project area is expected to occur in stages. The design of development staging is to ensure that at least two publicly available vehicular access routes to two different suitable destinations are provided in accordance with acceptable solution A3.2a of the Guidelines. This may require provision of temporary staging measures such as temporary compliant no-through roads and/or Emergency Access Ways (EAWs) to deliver compliant access outcomes for individual stages.

As the project area currently contains areas of classified vegetation, staged construction is to consider the temporary BAL impacts from adjacent future stages that have not yet been cleared/developed. Temporary low threat staging buffers may need to be implemented around active stages of development to ensure there is no residual impact from the temporary vegetation extent contained on adjacent development stages that has not yet been cleared or landscaped to achieve a low threat state.

4.2.7 Vehicular access

On completion of development, the project area will be serviced by a comprehensive internal public road network that links to multiple external connector roads in Washington Avenue to the north, Parade Road to the west and Bussell Highway to the east. These provide access to multiple suitable destinations in different directions. Internally, all proposed public roads will be through roads, as per the design in Figure 1.

4.2.8 Perimeter roads

The existing and proposed public road network will provide perimeter access to both the surrounding and internal bushfire hazard extent. Due to legacy conditions of the existing (and partially developed) residential cell in the west (west of Parade Road), a public perimeter road cannot be provided to the adjacent forest interface to the south; therefore, the design response has resulted in provision of a permanent EAW along the forest interface linking Mosedale Avenue in the west with Parade Road in the east (Figure 1). This will not only provide the required perimeter access along the southern forest interface but will also resolve the existing legacy non-compliant one-way-in/one-way-out situation associated with Lingard Loop. The small residential cell proposed in the northeast of the site will directly abut the northern extent of the proposed 20 m wide noise buffer POS without a perimeter access road. Whilst this is currently depicted as a direct scrub interface, the residential cell is small, the affecting interface is narrow (30 m wide) and the appropriate response will either be through an APZ setback of 13 m into the development cell to achieve BAL-29, or through exclusion of the POS under Clause 2.2.3.2 of AS3959 demonstrated through a landscape plan at the subdivision stage.

4.2.9 Fire water supply

The project area will need to be provided with a firefighting water supply that is suitable for the scale of the development. The local area is currently serviced by a reticulated water supply and hydrant network that will be extended through the development area along the proposed road network in accordance with Water Corporation Design Standard 63.

5. Assessment against the bushfire protection criteria

5.1 Compliance with Elements 1 – 4

Compliance with Elements 1–4 of the bushfire protection criteria of the Guidelines (Version 1.4) is demonstrated by meeting the acceptable solutions, as detailed in Table 5.

Table 5: Compliance with the bushfire protection criteria of the Guidelines (Elements 1–4)

Bushfire protection criteria	Performance Principle	Method of compliance Acceptable solutions	Statement of development compliance	Compliance achievable at future planning stages
Element 1: Location	**P1** – The strategic planning proposal, subdivision and development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low, or a BAL–29 or below, and the risk can be managed. For unavoidable development in areas where BAL–40 or BAL–FZ applies, demonstrating that the risk can be managed to the satisfaction of the decision-maker.	**A1.1 Development location** The strategic planning proposal, subdivision and development application is located in an area that is or will, on completion, be subject to either a moderate or low bushfire hazard level, or BAL–29 or below.	The pre-development BHL assessment (Figure 5) identifies that the project area currently contains land with Moderate and Extreme BHLs. However, on completion of development and vegetation modification, all proposed habitable development will be located within areas of Low to Moderate BHL (Figure 6). Consideration at the subdivision stage will need to be given to on-site and external classified vegetation and the appropriate setbacks for habitable development to achieve BAL–29 or lower. The project area is considered of sufficient size such that any interface with post-development classified vegetation could be readily accommodated through compliant subdivision design to ensure all future habitable development achieves BAL-29 or lower. This will largely be achieved through provision of perimeter roads at vegetation interfaces.	✓
Element 2: Siting and design	**P2** – The siting and design of the strategic planning proposal, subdivision or development application, including roads, paths and landscaping, is appropriate to the level of bushfire threat that applies to the site. The proposal incorporates a defendable space and significantly reduces the heat intensities at the building surface thereby minimising the bushfire risk to people, property and infrastructure, including compliance with AS 3959 if appropriate.	**A2.1 Asset Protection Zone** Every habitable building is surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the requirements set out in Schedule 1.	Low threat separation required for future habitable development to achieve BAL–29 or lower is to be implemented for all relevant lots through one or a combination of proposed perimeter roads, low threat POS interfaces and/or APZ setbacks. The required low threat separation/APZs will be confirmed at future planning stages based on future subdivision/development design and following a BAL contour assessment. Low threat separation and APZs are to be implemented and maintained in accordance with Schedule 1 of the Guidelines (Appendix A).	✓
Element 3: Vehicular access	**P3i** – The design and capacity of vehicular access and egress is to provide for the community to evacuate to a suitable destination before a bushfire arrives at the site, allowing emergency services personnel to attend the site and/or hazard vegetation.	**A3.1 Public roads** *The minimum requirements under this acceptable solution are applicable to all proposed and existing public roads.* Public roads are to meet the minimum technical requirements in Table 6, Column 1. The trafficable (carriageway/pavement) width is to be in accordance with the relevant class of road in the Local Government Guidelines for Subdivisional Development (IPWEA Subdivision Guidelines), Liveable Neighbourhoods, Austroad standards and/or any applicable standards for the local government area.	All proposed public roads will meet the minimum technical requirements of the Guidelines (Appendix C), which will be demonstrated at the subdivision stage.	✓

Bushfire protection criteria	Performance Principle	Method of compliance Acceptable solutions	Statement of development compliance	Compliance achievable at future planning stages
		A3.2a Multiple access routes Public road access is to be provided in two different directions to at least two different suitable destinations with an all-weather surface (two-way access). If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints, the road access is to be a maximum of 200 metres from the subject lot(s) boundary to an intersection where two-way access is provided. The no-through road may exceed 200 metres if it is demonstrated that an alternative access, including an emergency access way, cannot be provided due to site constraints and the following requirements are met: • the no-through road travels towards a suitable destination; and • the balance of the no-through road, that is greater than 200 metres from the subject site, is wholly within BAL-LOW, or is within a residential built-out area – Figure 23.	On completion of development, the existing and future public road network will provide all occupants with the option of travelling to multiple suitable destinations as follows: • to Bussell Highway in the east, which is a major highway and provides access north toward Bunbury and south towards Dalyellup, both of which contain large areas of non-bushfire prone land. • to Washington Avenue in the north, which provides access west to Bussell Highway (and further to destinations north and south) and east to Parade Road and Ocean Drive, both of which provide access to multiple suitable destinations north and south with large areas of non-bushfire prone land • Parade Road in the west, which provides access to existing built-out areas in the localities of Usher, Withers, South Bunbury and Bunbury city centre to the north and Dalyellup to the south. A minimum of two access routes in two different directions to two different suitable destinations will need to be provided during staging of subdivision/development.	✓
		A3.2b Emergency access way *Where it is demonstrated that A3.2a cannot be achieved due to site constraints, or where an alternative design option does not exist, an emergency access way can be considered as an acceptable solution.* An emergency access way is to meet all the following requirements: • requirements in Table 6, Column 2; • provides a through connection to a public road; • be no more than 500 metres in length; and • must be signposted and if gated, gates must open the whole trafficable width and remain unlocked.	Updated Structure Plan design caters for a proposed permanent EAW in the west of the project area linking Mosedale Avenue in the west with Parade Road in the east in order to resolve the existing legacy non-compliant no-through road associated with Lingard Loop, as well as providing public perimeter access to the southern forest interface. The EAW will be constructed to the relevant technical requirements of the Guidelines (Appendix C). Any temporary EAWs required as a result of staged development are to be constructed to the relevant technical requirements of the Guidelines (Appendix C).	✓
		A3.3 Through-roads All public roads should be through-roads. No-through roads should be avoided and should only be considered as an acceptable solution where: • it is demonstrated that no alternative road layout exists due to site constraints; and • the no-through road is a maximum length of 200 metres to an intersection providing two-way access, unless it satisfies the exemption provisions in A3.2a of this table. A no-through road is to meet all the following requirements: • requirements of a public road (Table 6, Column 1); and • turn-around area as shown in Figure 24.	All proposed public roads are through roads and an EAW will be provided to resolve the existing legacy non-compliant no-through road in Lingard Loop (as mentioned above). Any temporary no-through roads required as a result of staged development will need to comply with relevant technical requirements under the Guidelines (Appendix C).	✓

Bushfire protection criteria	Performance Principle	Method of compliance Acceptable solutions	Statement of development compliance	Compliance achievable at future planning stages
	P3ii – The design of vehicular access and egress provides: • access and egress for emergency service vehicles while allowing the community to evacuate; • a defendable space for emergency services personnel on the interface • between classified vegetation and development site; and • hazard separation between classified vegetation and the subject site to reduce the potential radiant heat that may impact a lot(s).	**A3.4a Perimeter roads** A perimeter road is a public road and should be provided for greenfield or infill development where 10 or more lots are being proposed (including as part of a staged subdivision) with the aim of: • separating areas of classified vegetation under AS3959, which adjoin the subject site, from the proposed lot(s); and • removing the need for battle-axe lots that back onto areas of classified vegetation. A perimeter road is to meet the requirements contained in Table 6, Column 1. A perimeter road may not be required where: • the adjoining classified vegetation is Class G Grassland; • lots are zoned for rural living or equivalent; • it is demonstrated that it cannot be provided due to site constraints; or • all lots have frontage to an existing public road.	The existing and future public access network (including both public roads and the EAW) will provide perimeter access to both internal and external bushfire hazards in accordance with A3.4 and Appendix C. As previously stated, the small residential cell proposed in the northeast of the site will directly abut the northern extent of the proposed 20 m wide noise buffer POS without a perimeter access road. Whilst this is currently depicted as a direct scrub interface, the residential cell is small, the affecting interface is narrow (30 m wide) and the appropriate response will either be through an APZ setback of 13 m into the development cell to achieve BAL-29, or through exclusion of the POS under Clause 2.2.3.2 of AS3959 demonstrated through a landscape plan at the subdivision stage.	✓
	P3iii – Vehicular access is provided which allows: • access and egress for emergency service vehicles; • defendable space for emergency services • personnel on the interface between classified vegetation and development; and • hazard separation between classified vegetation and the site to reduce the potential radiant heat that may impact a lot(s).	**A3.4b Fire service access route** *Where proposed lots adjoin classified vegetation under AS3959 (excluding Class G Grassland), and a perimeter road is not required in accordance with A3.4a, a fire service access route can be considered as an acceptable solution to provide firefighter access, where access is not available, to the classified vegetation.* A fire service access route is to meet all the following requirements: • requirements in Table 6, Column 3; • be through-routes with no dead-ends; • linked to the internal road system at regular intervals, every 500 metres; • must be signposted; • no further than 500 metres from a public road; • if gated, gates must open the required horizontal clearance and can be locked by the local government and/or emergency services, if keys are provided for each gate; and • turn-around areas designed to accommodate type 3.4 fire appliances and to enable them to turn around safely every 500 metres.	No permanent FSARs are required as part of proposed development. Any temporary FSARs required during staged development to ensure firefighters are able to gain access to the site perimeter prior to future subdivision roads being constructed will need to comply with the relevant technical requirements of the Guidelines (Appendix C).	✓
	P3iv – Vehicular access is provided which allows emergency service vehicles to directly access all habitable buildings and water supplies and exit the lot without entrapment.	**A3.5 Battle-axe access legs** *Where it is demonstrated that a battle-axe cannot be avoided due to site constraints, it can be considered as an acceptable solution.*	N/A A3.5 is to be addressed at the subdivision stage where applicable.	N/A

Bushfire protection criteria	Performance Principle	Method of compliance Acceptable solutions	Statement of development compliance	Compliance achievable at future planning stages
		There are no battle-axe technical requirements where the point the battle-axe access leg joins the effective area of the lot, is less than 50 metres from a public road in a reticulated area. In circumstances where the above condition is not met, or the battle-axe is in a non-reticulated water area, the battle-axe is to meet all the following requirements: • requirements in Table 6, Column 4; and • passing bays every 200 metres with a minimum length of 20 metres and a minimum additional trafficable width of two metres (i.e. the combined trafficable width of the passing bay and constructed private driveway to be a minimum six metres).		
		A3.6 Private driveways There are no private driveway technical requirements where the private driveway is: • within a lot serviced by reticulated water; • no greater than 70 metres in length between the most distant external part of the development site and the public road measured as a hose lay; and • accessed by a public road where the road speed limit is not greater than 70 km/h. In circumstances where all of the above conditions are not met, or the private driveway is in a non-reticulated water area, the private driveway is to meet all the following requirements: • requirements in Table 6, Column 4; • passing bays every 200 metres with a minimum length of 20 metres and a minimum • additional trafficable width of two metres (i.e. the combined trafficable width of the passing bay and constructed private driveway to be a minimum six metres); and • turn-around area as shown in Figure 28 and within 30 metres of the habitable building.	N/A A3.6 is to be addressed at the Development Application stage where applicable.	N/A
Element 4: Water	No performance principle applies	**A4.1 Identification of future water supply** Evidence that a reticulated or sufficient non-reticulated water supply for bushfire fighting can be provided at the subdivision and/or development application stage, in accordance with the specifications of the relevant water supply authority or the requirements of Schedule 2. Where the provision of a strategic water tank(s) is required a suitable area within a road reserve or a dedicated lot the location should be identified, should be identified on the structure plan, to the satisfaction of the local government.	Reticulated water supply services will be extended throughout the project area from services currently present within surrounding areas of development, which will result in provision of a reticulated mains water supply and network of street hydrants for future habitable development in accordance with Water Corporation Design Standard 63.	✓

Bushfire protection criteria	Performance Principle	Method of compliance Acceptable solutions	Statement of development compliance	Compliance achievable at future planning stages
	P4 – Provide a permanent water supply that is: • sufficient and available for firefighting purposes; • constructed from non-combustible materials (e.g. steel), or able to maintain its integrity throughout a bushfire; and • accessible, with legal access for maintenance and re-filling by tankers and emergency service vehicles.	**A4.2 Provision of water for firefighting purposes** Where a reticulated water supply is existing or proposed, hydrant connection(s) should be provided in accordance with the specifications of the relevant water supply authority. Where these specifications cannot be met, then the following applies: • The provision of a water tank(s), in accordance with the requirements of Schedule 2; and • Where the provision of a strategic water tank(s) is applicable, then the following requirements apply: – land to be ceded free of cost to the local government for the placement of the tank(s); – the lot or road reserve where the tank is to be located is identified on the plan of subdivision; – tank capacity, construction, and fittings, provided in accordance with the requirements of Schedule 2; and – a strategic water tank is to be located no more than 10 minutes from the subject site (at legal road speeds). Where a subdivision includes an existing habitable building(s) that is to be retained, a water supply should be provided to this existing habitable building(s), in accordance with the requirements listed above.	N/A A4.2 is applicable to the subdivision stage.	N/A

5.2 Compliance with Element 5

Element 5 relates specifically to vulnerable tourism land uses and is therefore not applicable to the proposed Structure Plan.

6. Responsibilities for implementation and management of the bushfire measures

This BMP has been prepared as a strategic guide to demonstrate how development compliance will be delivered at future planning stages in accordance with the Guidelines. Aside from the preparation of future BMPs to accompany future subdivision and/or Development Applications where appropriate, there are no further items to implement, enforce or review at this strategic stage of the planning process.

Future BMPs prepared for subsequent subdivision and/or Development Applications are to meet the relevant commitments outlined in this strategic level BMP, address the relevant requirements of SPP 3.7 (i.e. Policy Measures 6.4 or 6.5 respectively) and demonstrate in detail how the proposed development will incorporate the relevant acceptable solutions or meet the performance requirements of the Guidelines. Future BMPs are to include the following detailed information:

- proposed lot layout to inform BAL contour mapping
- landscaping plans to confirm vegetation classifications and exclusions within on-site ROS and POS areas
- confirmation of the extent of on-site retained vegetation/revegetation
- confirmation of the post-development classified vegetation extent, exclusions, effective slope and separation distances to inform BAL contour mapping
- preparation of a BAL contour map demonstrating that proposed development areas will achieve a rating of BAL–29 or lower
- width and alignment of compliant low threat separation or APZs, including any APZ setback requirements into proposed lots
- confirmation of how BAL management will be addressed during development staging with regards to temporary bushfire hazards on adjacent future development stages, including provision of low threat staging buffers or temporary quarantining of lots where required
- vehicular access provisions, including demonstration that a minimum of two access routes will be achieved for each stage of development , which may require consideration of temporary compliant staged access provisions such as no-through roads and EAWs
- future requirements for any proposed vulnerable land uses (i.e. for the future Primary School site), including provision of a BMP and Bushfire Evacuation Plan
- provisions for notification on Title for any future lots with a rating of BAL-12.5 or greater as a condition of subdivision
- compliance with the City of Bunbury annual firebreak notice (see Appendix D)
- assessment against the bushfire protection criteria of the Guidelines
- proposed implementation and audit program outlining all measures requiring implementation and the appropriate timing and responsibilities for implementation.

On the basis of the information contained in this BMP, JBS&G considers the bushfire hazards within and adjacent to the site and the associated bushfire risks are readily manageable through application of standard acceptable solutions outlined in the Guidelines, which will be implemented as required throughout future planning stages. JBS&G considers that on implementation of the proposed management measures, the site will be able to be developed with a manageable level of bushfire risk whilst maintaining full compliance with the Guidelines.

7. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

8. References

Department of Fire and Emergency Services (DFES) 2021, *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from: https://maps.slip.wa.gov.au/landgate/bushfireprone/, [15/11/2023].

Department of Planning (DoP) 2016, *Visual guide for bushfire risk assessment in Western Australia*, Department of Planning, Perth.

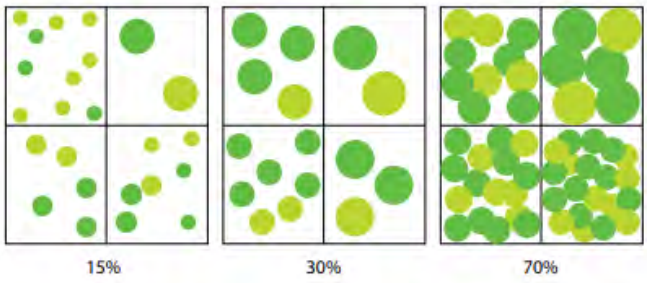
MPM Development Consultants (2014), *Tuart Brook Local Structure Plan: City of Bunbury*, MPM Development Consultants, Bunbury.

Standards Australia (SA) 2018, *Australian Standard AS 3959–2018 Construction of Buildings in Bushfire-prone Areas*, Standards Australia, Sydney.

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Western Australian Planning Commission, Perth.

Western Australian Planning Commission (WAPC) 2021, *Guidelines for Planning in Bushfire Prone Areas*, Version 1.4 December 2021, Western Australian Planning Commission, Perth.

Appendix A Asset Protection Zone standards and explanatory notes

Schedule 1: Standards for Asset Protection Zones	
Object	**Requirement**
Fences within the APZ	• Should be constructed from non-combustible materials (for example, iron, brick, limestone, metal post and wire, or bushfire-resisting timber referenced in Appendix F of AS 3959).
Fine fuel load (Combustible, dead vegetation matter <6 millimetres in thickness)	• Should be managed and removed on a regular basis to maintain a low threat state. • Should be maintained at <2 tonnes per hectare (on average). • Mulches should be non-combustible such as stone, gravel or crushed mineral earth or wood mulch >6 millimetres in thickness.
Trees* (>6 metres in height)	• Trunks at maturity should be a minimum distance of six metres from all elevations of the building. • Branches at maturity should not touch or overhang a building or powerline. • Lower branches and loose bark should be removed to a height of two metres above the ground and/or surface vegetation. • Canopy cover within the APZ should be <15 per cent of the total APZ area. • Tree canopies at maturity should be at least five metres apart to avoid forming a continuous canopy. Stands of existing mature trees with interlocking canopies may be treated as an individual canopy provided that the total canopy cover within the APZ will not exceed 15 per cent and are not connected to the tree canopy outside the APZ. **Figure 19:** Tree canopy cover – ranging from 15 to 70 per cent at maturity 
Shrub* and scrub* (0.5 metres to six metres in height). Shrub and scrub >6 metres in height are to be treated as trees.	• Should not be located under trees or within three metres of buildings. • Should not be planted in clumps >5 square metres in area. • Clumps should be separated from each other and any exposed window or door by at least 10 metres.
Ground covers* (<0.5 metres in height. Ground covers >0.5 metres in height are to be treated as shrubs)	• Can be planted under trees but must be maintained to remove dead plant material, as prescribed in 'Fine fuel load' above. • Can be located within two metres of a structure, but three metres from windows or doors if >100 millimetres in height.
Grass	• Grass should be maintained at a height of 100 millimetres or less, at all times. • Wherever possible, perennial grasses should be used and well-hydrated with regular application of wetting agents and efficient irrigation.

Schedule 1: Standards for Asset Protection Zones	
Defendable space	Within three metres of each wall or supporting post of a habitable building, the area is kept free from vegetation, but can include ground covers, grass and non-combustible mulches as prescribed above.
LP Gas Cylinders	Should be located on the side of a building furthest from the likely direction of a bushfire or on the side of a building where surrounding classified vegetation is upslope, at least one metre from vulnerable parts of a building. The pressure relief valve should point away from the house. No flammable material within six metres from the front of the valve. Must sit on a firm, level and non-combustible base and be secured to a solid structure.

***** *Plant flammability, landscaping design and maintenance should be considered – refer to explanatory notes*

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Element 2 Explanatory Notes
E2 Managing an Asset Protection Zone (APZ) to a low threat state
An APZ is a low fuel area maintained around a habitable building to increase the likelihood that it will survive a bushfire, by providing a defendable space and reducing the potential for direct flame contact, radiant heat exposure and ember attack. Vegetation management within an APZ should provide defendable space and be maintained to a low threat state, in perpetuity, in accordance with the requirements outlined in Schedule 1. The width of an APZ varies with slope and vegetation type, however it should only be as wide as needed to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL-29), or 10kW/m² where a building is identified for use as an on-site shelter. An APZ is generally not required where a building or development site achieves 29kW/m² (BAL-29) or lower in its pre-development state (prior to any vegetation clearing or modification). An APZ should include an area of defendable space immediately adjoining a building, that is kept free from combustible items and obstructions, within which firefighting operations can be undertaken to defend the structure. Where a lot contains a building envelope, it may not be necessary for the entire building envelope to achieve 29kW/m² (BAL-29) as this may result in significant unnecessary clearing. It is recommended that the BMP identifies that a sufficient APZ can be accommodated within the building envelope, with the development site and associated APZ to be determined at the development approval stage. An APZ should be contained within the boundaries of the lot on which the building is situated, except in instances where it is demonstrated that the vegetation on the adjoining land is managed in a low threat state, as per cl. 2.2.3.2 of AS 3959, such as a road, managed park, rocky outcrop or a water body. The siting of a habitable building and associated APZ should aim to minimise the clearing of vegetation. The BMP should demonstrate that the proposed APZ has minimised the unnecessary loss of vegetation or potential for conflict with landscape or environmental objectives; and complies with environmental approvals/exemptions (where necessary). A re-design or reduction in lot yield may be necessary to minimise the removal and modification of remnant vegetation. It is recommended that development be located on flat areas or slopes less than 20 degrees (especially where classified vegetation is located downslope to a building) and away from ridge tops, crests or narrow gullies, as bushfire can spread rapidly in these areas. Circumstances where these locations may be suitable for development to occur include where the land is already cleared, and 29kW/m² (BAL-29) or lower can be achieved for the whole development

Element 2 Explanatory Notes

site without the use of an APZ. To ensure soil stability within an APZ, vegetation removal on slopes exceeding 18 degrees is discouraged.

Fine fuel load should be maintained to less than two tonnes per hectare, however this is often a subjective assessment. Reducing fuel load levels does not necessarily require the removal of existing vegetation. A combination of methods can be utilised to reduce fuel load such as raking, weed removal, pruning, mulching and/or the removal of plant material.

A simple method to estimate fuel load is to roughly equate one tonne of fuel load per hectare as 100 grams per square metre. For example, two tonnes per hectare of leaf litter is roughly 200 grams of leaf litter per square metre and eight tonnes per hectare is roughly 800 grams. Eucalyptus leaf litter is approximately 100 grams per handful, so two handfuls of litter per square metre will roughly equate to two tonnes per hectare. Different types of fine fuel, like mulch or pine needles may be more or less than a handful, however the 100 grams per square metre rule of thumb can still be used.

The landowner or proponent is responsible for maintaining an APZ in accordance with Schedule 1 - Standards for Asset Protection Zones. Ongoing maintenance of an APZ is usually enforced through the local government firebreak notice issued under section 33 of the Bushfires Act 1954, and/or through a condition of a development approval, which requires the implementation of measures identified within a BMP.

A copy of the firebreak notice and Schedule 1 should be included in a BMP specifically as a how-to guide for the landowner, and to demonstrate to decision-makers that the measures outlined in the BMP to achieve the appropriate BAL rating through provision and ongoing management of an APZ, can be implemented.

E2 Landscaping and design of an Asset Protection Zone

Landscaping, design, and maintenance of an APZ in a bushfire prone area can significantly improve the bushfire resilience of a building. An APZ should not be seen as an area entirely cleared of vegetation, but as a strategically designed space that gives holistic consideration to how existing or proposed vegetation or non-combustible features interact with, or affect the building's bushfire resilience.

A well designed APZ provides a greater level of vegetation management within the first few metres of a building with, for example, less vegetation or inclusion of non-combustible materials. The vegetation within the remainder of an APZ can increase further away from the building with carefully considered plant selection and landscaping techniques.

Strategic landscaping measures can be applied, such as replacing weeds with low flammability vegetation (refer to E2 Plant Flammability) to create horizontal and vertical separations between the retained vegetation. The accumulation of fine fuel load from different plants is an important consideration for ongoing maintenance in accordance with Schedule 1. For example, when planting ground covers under deciduous trees within an APZ, the total fine fuel load prescribed in Schedule 1 will include any dead plant material from ground covers and leaf litter from the trees.

Plant density and final structure and form of mature vegetation should be considered in the initial landscaping stages. For example, clumps of sapling shrubs planted at a density without consideration of future growth, may increase the bushfire risk as a clump will quickly grow to exceed $5m^2$. It should be noted that in some cases, a single shrub in a mature state may be so dense as to fill a $5m^2$ clump alone.

The location of plants within an APZ is a key design technique. Separation of garden beds with areas of low fuel or non-combustible material, will break up fuel continuity and reduce the likelihood of a bushfire running through an APZ and subjecting a dwelling to radiant heat or direct flame contact. It is important to note, where mature trees are separated from a building

Element 2 Explanatory Notes

by six metres, but the canopy has grown to extend or overhang a building, maintenance and pruning to remove the overhanging branches should be undertaken without the entirety of the tree being removed.

Mulches used within the APZ should be non-combustible. The use of stone, gravel, rock and crushed mineral earth is encouraged. Wood mulch >6mm in thickness may be used, however it is recommended that it is used in garden beds or areas where the moisture level is higher by regular irrigation. These materials could be sourced from non-toxic construction and demolition waste giving the added benefit of reducing the environmental impact of any 'hard landscaping' actions.

Combustible objects, plants, garden supplies such as mulches, fences made from combustible material, should be avoided within 10 metres of a building. Vines or climbing plants on pergolas, posts or beams, should be located away from vulnerable parts of the building, such as windows and doors. Non-flammable features can be used to provide hazard separation from classified vegetation, such as tennis courts, pools, lawns and driveways or paths that use inorganic mulches (gravel or crushed rock). Consider locating firewood stacks away from trees and habitable buildings.

Incorporation of landscaping features, such as masonry feature walls can provide habitable buildings with barriers to wind, radiant heat and embers. These features can include noise walls or wind breaks. Use of Appendix F of AS 3959 for bushfire resistant timber selection within areas of 29kW/m² (BAL-29) or below, or the use of non-combustible fencing materials such as iron, brick, limestone, metal post and wire is encouraged.

In addition to regular maintenance of an APZ, further bushfire protection can be provided at any time by:

- ensuring gutters are free from vegetation;
- installing gutter guards or plugs;
- regular cleaning of underfloor spaces, or enclosing them to prevent gaps;
- trimming and removing dead plants or leaf litter;
- pruning climbing vegetation (such as vines) on a trellis, to ensure it does not connect to a building, particularly near windows and doors;
- removing vegetation in close proximity to a water tank to ensure it is not touching the sides of a tank; and/or
- following the requirements of the relevant local government section 33 fire break notice, which may include additional provisions such as locating wood piles more than 10 metres from a building.

Preparation of a property prior to the bushfire season and/or in anticipation of a bushfire is beneficial even if your plan is to evacuate. As embers can travel up to several kilometres from a bushfire and fall into small spaces and crevices or land against the external walls of a building, best practice recommends that objects within the APZ are moved away from the building prior to any bushfire event. Objects may include, but are not limited to:

- door mats;
- outdoor furniture;
- potted plants;
- shade sails or umbrellas;
- plastic garbage bins;
- firewood stacks;
- flammable sculptures; and/or
- playground equipment and children's toys.

E2 Plant flammability

There are certain plant characteristics that are known to influence flammability, such as moisture or oil content and the presence and type of bark. Plants with lower flammability

Element 2 Explanatory Notes

properties may still burn during a bushfire event, but may be more resistant to burning and some may regenerate faster post-bushfire.

There are many terms for plant flammability that should not be confused, including:

- Fire resistant – plant species that survive being burnt and will regrow after a bushfire and therefore may be highly flammable and inappropriate for a garden in areas of high bushfire risk.
- Fire retardant – plants that may not burn readily or may slow the passage of a bushfire.
- Fire wise – plants that have been identified and selected based on their flammability properties and linked to maintenance advice and planting location within a garden.

Although not a requirement of these Guidelines, local governments may develop their own list of fire wise or fire retardant plant species that suit the environmental characteristics of an area. When developing a recommended plant species list, local governments should consult with ecologists, land care officers or environmental authorities to ensure the plants do not present a risk to endangered ecological communities, threatened, or endangered species or their habitat.

When selecting plants, private landholders and developers should aim for plants within the APZ that have the following characteristics:

- grow in a predicted structure, shape and height;
- are open and loose branching with leaves that are thinly spread;
- have a coarse texture and low surface-area-to-volume ratio;
- will not drop large amounts of leaves or limbs, that require regular maintenance;
- have wide, flat, and thick or succulent leaves;
- trees that have bark attached tightly to their trunk or have smooth bark;
- have low amounts of oils, waxes, and resins (which will often have a strong scent when crushed);
- do not produce or hold large amounts of fine dead material in their crowns; and/or
- will not become a weed in the area.

Refer to the WAPC Bushfire and Vegetation Fact Sheet for further information on clearing and vegetation management and APZ landscaping, design and plant selection reference material.

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Appendix B Georeferenced site photos and descriptions of vegetation plots

Plot 1		
Vegetation classification	**Pre-development**	Class A Forest
	Post-development	Class A Forest
Description / justification		
Eucalyptus trees 10–30 m in height, with a scrubby middle storey and herbaceous understorey		

Photo ID: 1a

Photo ID: 1b

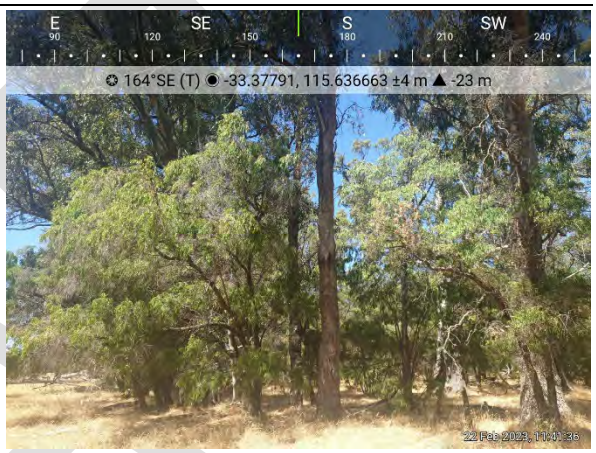
Photo ID: 1c

Photo ID: 1d

Photo ID: 1e

Photo ID: 1f

Plot 1	
 **Photo ID:** 1g	 **Photo ID:** 1h
 **Photo ID:** 1i	 **Photo ID:** 1j
 **Photo ID:** 1k	 **Photo ID:** 1l

Plot 1	
 **Photo ID:** 1m	 **Photo ID:** 1n
 **Photo ID:** 1o	 **Photo ID:** 1p
 **Photo ID:** 1q	

Plot 2		
Vegetation classification	**Pre-development**	Class B Woodland
	Post-development	Modified to non-vegetated and/or low threat (Clauses 2.2.3.2 [e] and/or [f])
Description / justification		
A sparse canopy of eucalyptus trees 10–30 m in height with a low layer of groundcovers, lacking deep surface litter		

Photo ID: 2a

Photo ID: 2b

Plot 3		
Vegetation classification	**Pre-development**	Class D Scrub
	Post-development	Class D Scrub and Modified to non-vegetated and/or low threat (Clauses 2.2.3.2 [e] and/or [f])
Description / justification		
Scrub vegetation 2–6 m in height with a continuous vertical and horizontal fuel structure		

Photo ID: 3a

Photo ID: 3b

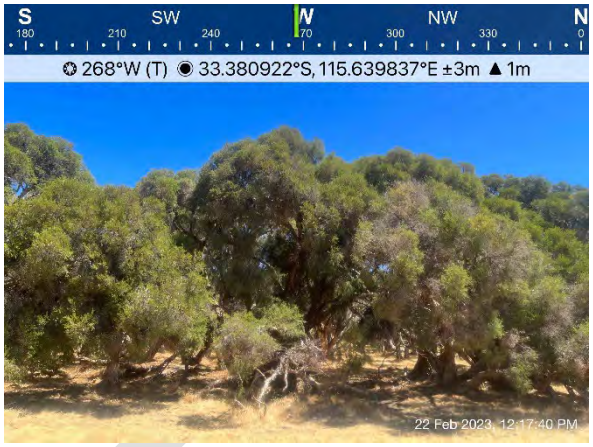
Photo ID: 3c (Background)

Photo ID: 3d

Photo ID: 3e

Photo ID: 3f

Plot 3	
	
Photo ID: 3g	**Photo ID:** 3h
	
Photo ID: 3i	**Photo ID:** 3j
	
Photo ID: 3k	**Photo ID:** 3l

Plot 3	
	
Photo ID: 3m	**Photo ID:** 3n

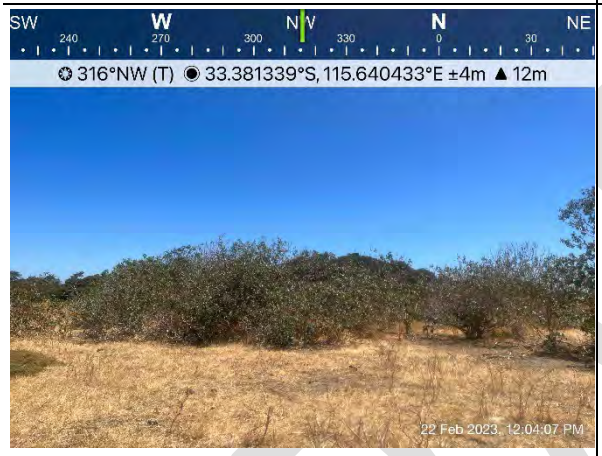



Photo ID: 3o	**Photo ID:** 3p

Plot 4		
Vegetation classification	**Pre-development**	Class G Grassland
	Post-development	Class G Grassland and Modified to non-vegetated and/or low threat (Clauses 2.2.3.2 [e] and/or [f])
Description / justification		
Grasses and weeds greater than 100 mm in height at maturity		

Photo ID: 4a

Photo ID: 4b

Photo ID: 4c

Photo ID: 4d

Photo ID: 4e

Photo ID: 4f

Plot 4	
	
Photo ID: 4g	**Photo ID:** 4h
	
Photo ID: 4i	**Photo ID:** 4j
	
Photo ID: 4k	**Photo ID:** 4l

Plot 4	
	
Photo ID: 4m	**Photo ID:** 4n

Plot 5		
Vegetation classification	**Pre-development**	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
	Post-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])

Description / justification

Existing non-vegetated areas (i.e. buildings, roads, footpaths, driveways, sealed areas, etc) and low threat managed areas (i.e. managed gardens, irrigated turf and POS, managed urban street verges, etc)

Photo ID: 5a

Photo ID: 5b

Photo ID: 5c

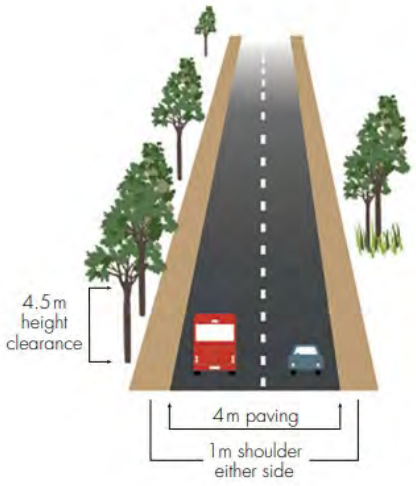
Photo ID: 5d

Photo ID: 5e

Photo ID: 5f

Plot 5	
 **Photo ID:** 5g	

Appendix C Vehicular access explanatory notes

Acceptable Solution A3.1 – Public Roads
Explanatory Note E3.1
These Guidelines do not prescribe values for the trafficable (carriageway/pavement) width of public roads as they should be in accordance with the class of road as specified in the IPWEA Subdivision Guidelines, Liveable Neighbourhoods, Austroad Standards and/or any applicable standard in the local government area. The IPWEA Subdivision Guidelines, Liveable Neighbourhoods, Austroad Standards do not prescribe a horizontal clearance. However, it is recommended that a traversable verge is provided to allow for emergency services vehicles to stop and operate on the side of the public road, specifically where the public road may traverse large areas of classified vegetation. Where local government roads are proposed to be widened by the proponent, they must obtain approval from the local government.    **Figure 20:** Example of a public road

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Acceptable Solution A3.2a – Multiple access routes

Explanatory Note E3.2a

Two-way public road access is public road access from a lot in at least two different directions to two suitable destinations, and provides residents and the community, as well as emergency services, with access and egress from both the subdivision and individual habitable buildings/development in the event of a bushfire emergency. A single road provides no alternative route if the access becomes congested or is unable to be traversed due to smoke and/or fallen trees during a bushfire.

Two-way public road access applies to access/egress routes leading into a subdivision, as well as those within a subdivision. A road that loops back onto itself does not constitute the option of two different directions.

Two-way public road access should always be the first option. Where the site is not able to achieve two-way access within 200 metres of the lot boundary, due to demonstrated site or environmental constraints, the proponent should identify options for an emergency access way from the subject site to a suitable destination. Where an emergency access way cannot be provided, the proponent should demonstrate compliance with the performance principle.

Subject sites or proposed lots greater than 200 metres from an intersection, which provides two-way access, do not satisfy the requirement for two-way access unless they meet the provisions which allow for no-through roads greater than 200 metres in A3.2a.

To demonstrate compliance with the performance principle for two-way access, the bushfire planning practitioner may have regard to:

a. the extent of the bushfire hazard, location and vegetation classification, the likelihood, potential severity and impact of bushfire to the subject site and the road network;
b. time between fire detection and the onset of conditions in comparison to travel time for the community to evacuate to a suitable destination;
c. available access route(s) travelling towards a suitable destination; and
d. turn-around area for a fire appliance for no-through roads.

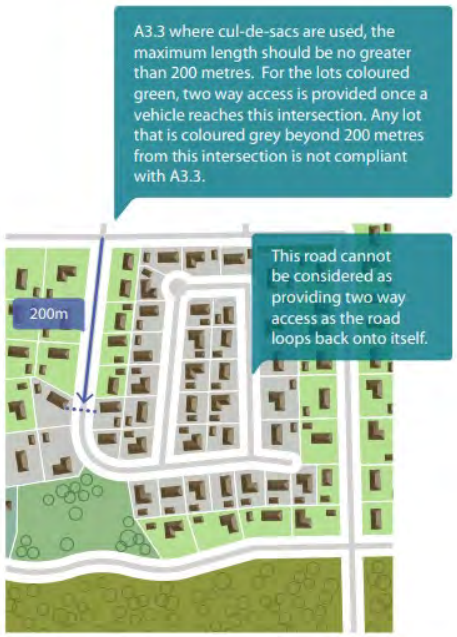


Figure 21: Example of compliant and non-compliant two-way

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Acceptable Solution A3.2b – Emergency access way

Explanatory Note E3.2b

An emergency access way is not a preferred alternative to through public road access and should only be considered acceptable where it has been demonstrated that it will provide the safety and performance needs of emergency services and the community, including consideration for future needs, and that public road access to satisfy A3.2a cannot be achieved due to site constraints, such as an established road network with no opportunity to provide a public road for secondary access. Acceptance of an emergency access way should also consider the ability to accommodate reasonable worst-case vehicle volumes.

The principle function of the emergency access way is to provide a contingency (second) community evacuation route and simultaneously provide access for emergency services, in the event of a bushfire emergency. Where an emergency access way traverses classified vegetation, which has the potential to create a bushfire hazard, an emergency access way performs the secondary function of providing access by emergency services to this vegetation.

Emergency access ways should connect to a public road to allow alternative two-way through access. An emergency access way should not exceed 500 metres in length as they may not be as safe for road-use due to not being designed or constructed to the full requirements of a public road and may present uncertainties to emergency service personnel and the public as they are not part of the daily road network and not identified on Maps.

Permanent public emergency access way

An emergency access way can be provided as either a public easement in gross or a right-of-way. In both approaches, the management of the emergency access way is by the local government as the grantee of the easement or management body of the right-of-way. The proponent must obtain written consent from the local government that the local government will accept care, control and management of the easement or right-of-way; this must be provided to the decision-maker prior to granting planning approval. The approach taken is at the discretion of the decision-maker and/ or the local government and is also dependent on whether the land is to remain in private ownership or be ceded to the Crown. Consultation with Land Use Management at the Department of Planning, Lands and Heritage should also be considered if the land is to be ceded to the Crown or if the local government is uncertain of which approach to take.

If the emergency access way is provided as an easement, it should be provided as a public easement in gross under sections 195 and 196 of the Land Administration Act 1997 in favour of the local government and/or public authority, to ensure accessibility for emergency services and the public at all times. To be provided as a right-of-way the emergency access way should be vested in the Crown under section 152 of the Planning and Development Act 2005 as a right-of-way and such land to be ceded free of cost and without any payment or compensation by the Crown. If gates are used to control traffic flow during non-emergency periods, these will be managed by the local government and must not be locked. Gates should be double gates wide enough to access the full pavement width and accommodate Type 3.4 fire appliances with the design and construction to be approved by the relevant local government.

Temporary public emergency access way

A temporary emergency access way may be proposed to facilitate the staging arrangements of a subdivision. The provision of two public roads may not be possible in the first stage of the subdivision and an emergency access way can be provided as an interim access route until the second public road is developed and gazetted in a subsequent stage of the subdivision (see figure 22). The emergency access way should be provided in the same manner as a permanent emergency access way, but it should be removed from the certificate of title once the public road

Acceptable Solution A3.2b – Emergency access way
Explanatory Note E3.2b

is developed and gazetted. Where an emergency access way is proposed as an alternative to a public road, the Bushfire Management Plan should provide thorough justification for its use.

Restricted public emergency access way

There may be some instances where a restricted emergency access way is proposed as a performance principle based solution where access is only available to the public in the event of a bushfire emergency. This option can only be considered where the local government or Main Roads WA have advised that vehicular access on the emergency access way is not allowed during non-emergency periods, as it provides an additional thoroughfare and entry point on a local or State road. In this scenario, the emergency access way can be provided as an easement under section 195 of the Land Administration Act 1997, as public access in the event of a bushfire emergency or vested in the Crown as a reserve under section 152 of the Planning and Development Act 2005. Such land is to be ceded free of cost without any payment or compensation by the Crown. The proponent must obtain written consent from the local government that the local government will accept care, control and management of the proposed reserve and agree to the terms of the Management Order Conditions (if applicable); this must be provided to the decision-maker prior to granting planning approval.

The purpose of the reserve should be for a public purpose specified in the condition related to the subdivision, for example for emergency access only, or for emergency access and recreation. A reserve for emergency access and recreation can optimise the land-use as a dual purpose where it provides vehicular access in the event of a bushfire emergency, but can be accessed by the public (on foot) on a day-to-day basis as a recreation link. Appropriate signage can ensure the general public is aware of the purpose of the reserve. The approach taken is at the discretion of the decision-maker and/or local government.

Right-of-carriageway emergency access way

There may be some instances where a right-of-carriageway easement is proposed as a performance principle-based solution. This may be where particular landowner(s) and emergency services, but not the public, require access over a neighbouring lot(s). A right-of-carriageway easement should be provided under section 195 of the Land Administration Act 1997. The easement is to provide alternative access for the particular landowner(s) in the event of a bushfire emergency and not for use by the public. In this scenario, support will be necessary from the adjoining lot owner(s). The easement is to be granted to the local government and it is to agree with the landowner on the arrangements of the management of the easement area by deed. These management arrangements will be at the discretion of the local government. If gated, the easement area can be locked to restrict day-to-day vehicular access.

Acceptable Solution A3.2b – Emergency access way
Explanatory Note E3.2b

Figure 22: Example of an emergency access way

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Acceptable Solution A3.3 – Through roads

Explanatory Note E3.3

In bushfire prone areas, a proposed structure plan or subdivision that incorporates no-through roads should be avoided because they do not provide a connected and legible design that allows for easy access and egress by the community, residents and emergency services in the event of a bushfire. No-through roads also reduce the options available for access and egress in the event of a bushfire emergency.

There will however be situations where a subject site is accessed via an existing or proposed no-through road and alternative access cannot be provided. In these situations, the proponent should demonstrate to the decision-maker, that all efforts have been made with the local government and/or adjoining landowners to secure alternative public road access or an emergency access way and that a redesign has been explored. The bushfire planning practitioner may need to develop a performance principle-based solution or address the non-compliance and demonstrate to the decisionmaker why discretion should be exercised in accordance with section 2.6 of these Guidelines.

No-through roads will only be considered an acceptable solution where it is demonstrated by the proponent, to the satisfaction of the decision maker, that a no through-road cannot be avoided due to site constraints. For example, the internal road design of a structure plan or subdivision where site constraints, such as a water body or Bush Forever, prevent the ability to create a through-road and a no through road may be a more appropriate road layout.

No-through roads should be a maximum of 200 metres from the lot(s) boundary to an intersection where two-way access is provided and may only exceed 200 metres if it meets the provisions which allow for no-through roads greater than 200 metres in A3.2a.

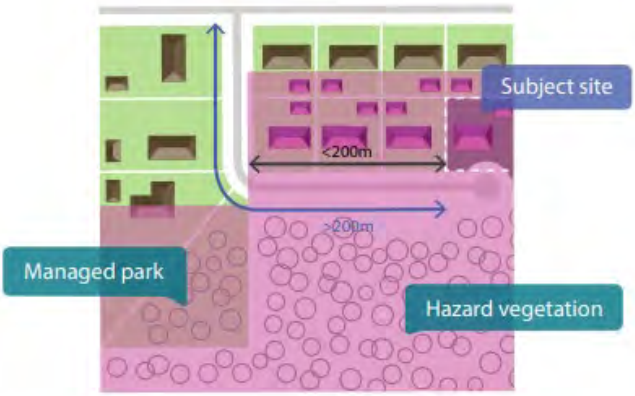


Figure 23: Example of a site on a no-through road greater than 200 metres from the intersection, but within 200 metres of BAL-LOW

Acceptable Solution A3.3 – Through roads
Explanatory Note E3.3

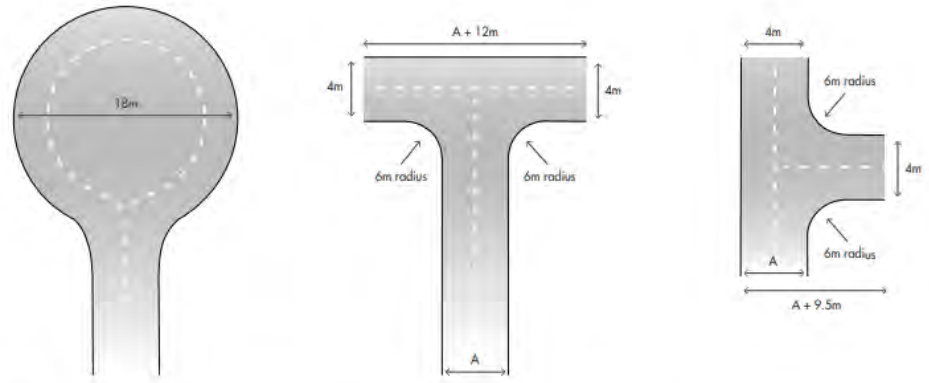


Figure 24: Turn-around area dimensions for a no-through road

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Acceptable Solution A3.4a – Perimeter roads
Explanatory Note E3.4a

Where a planning proposal includes the creation of 10 or more lots adjacent to each other, which adjoin classified vegetation under AS 3959 with the exception of Class G Grassland, as part of a greenfield development or large urban infill site, hazard separation and defendable space should be provided in the form of a perimeter road. Greenfield is 'undeveloped or minimally developed areas that have been identified for urban development'; and urban infill is 'the redevelopment of existing urban areas at a higher density than currently exists'. The creation of 10 or more lots includes cumulative subdivision applications where the subdivision application may be part of a staged subdivision.

A perimeter road should be in accordance with the class of road as specified in the IPWEA Subdivision Guidelines, Liveable Neighbourhoods, Austroad Standards and/or any applicable standard in the local government area as per the requirements of a public road in Table 6, Column 1.

As the road is likely to function as a key neighbourhood distributor, or similar, consideration should be given to the provision of additional width to allow for emergency services vehicles to stop and operate on the side of the perimeter road, whilst simultaneously proving for the evacuation of the community (Figure 20).

When designing a strategic planning proposal and/or subdivision, creating a large setback between classified vegetation and proposed lots with a perimeter road, and orientating habitable buildings to front onto (rather than back onto) areas of vegetation has many benefits, including:

- passive surveillance;
- defendable space for firefighting and emergency management purposes;
- reducing the potential radiant heat that may impact a habitable building in a bushfire event;
- reducing the need for battle-axe lots; and
- unconstrained public access/egress for the community in the event of a bushfire.

In developments where no perimeter road exists, property defence in a bushfire event is difficult and can be impossible. Where proposed lots have frontage to an existing public road and abut the hazard at the rear or side, it may be an undesirable planning outcome to create lots which front the existing public road and back onto a perimeter road. In this instance, consideration should be given to a fire service access route. Refer to E3.4b below.

Acceptable Solution A3.4a – Perimeter roads
Explanatory Note E3.4a

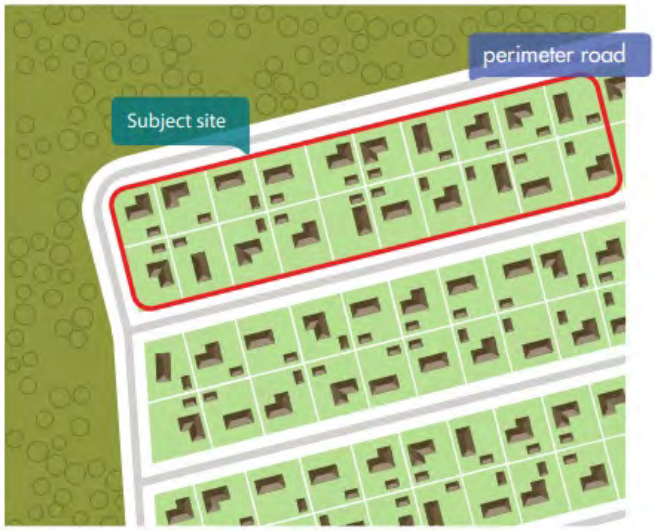


Figure 25: Example of a perimeter road

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Acceptable Solution A3.4b – Fire service access route

Explanatory Note E3.4b

Where a subdivision adjoins classified vegetation and where A3.2a has been satisfied, hazard separation and defendable space across multiple lots may be required in the form of a fire service access route.

A fire service access route is not intended to provide residents and the general public with emergency egress and therefore is not a suitable second access or substitute for a public road. A fire service access route is to provide access for emergency services to classified vegetation for firefighting and fire management purposes.

A fire service access route can be provided as either an easement in gross over private or Crown land, or ceded to the Crown as a reserve. In both approaches, the management of the fire service access route is by the local government as the grantee of the easement or management body of the reserve. Determining which approach to take is dependent on what the intended tenure of the fire service access route is, which is explained further below. The proponent must obtain written consent from the local government that the local government will accept care, control and management of the easement or reserve and agree to the terms of the Management Order Conditions (if applicable); this must be provided to the decision-maker prior to granting planning approval. The approach taken is at the discretion of the decision-maker and/or the local government. Consultation with Land Use Management at the Department of Planning, Lands and Heritage should also be considered if the land is to be ceded to the Crown or if the local government is uncertain of which approach to take.

Figure 26: Example of a fire service access route

Acceptable Solution A3.4b – Fire service access route
Explanatory Note E3.4b
Where gates are used, these should be double gates wide enough to access the full required horizontal clearance and accommodate type 3.4 fire appliances with the design and construction to be approved by the relevant local government. Gates on fire service access routes may be locked to restrict access, provided a common key system is used, and such keys are made available for emergency services and designated fire officers within the local government area and/or surrounding district. Gates should be installed where fences cross fire service access routes. If an easement in gross is proposed, such arrangements for gates should be included in the deed of easement and be agreed to by the local government. **Fire service access route to remain in private ownership of multiple landowners** Where a fire service access route is proposed to traverse multiple private lots and they are intended to remain in the private ownership of the multiple landowners, it should be provided as an easement in gross under section 196 of the Land Administration Act 1997, to ensure accessibility for fire emergency services and not for use by the public. The easement is to be granted to the local government and/or public authority for firefighting and emergency management purposes. **Fire service access route to be created under State ownership** Where a fire service access route is proposed to traverse multiple private lots, but the decision-maker and/or local government prefer for the fire service access route to remain in one ownership under the State for management purposes, the fire service access route can be vested in the Crown under section 152 of the Planning and Development Act 2005 as a reserve, such land to be ceded free of cost without any payment or compensation by the Crown. The purpose of the reserve should be for a public purpose specified in the condition related to the subdivision, for example for vehicular access for emergency services and the local government only, or for vehicular access for emergency services and the local government and recreation. A reserve for emergency services access and recreation can optimise the land-use as a dual purpose, where it provides vehicular access for emergency services, but can be accessed by the public (on foot) on a day-to-day basis as a recreation link. Appropriate signage will ensure the general public is aware of the purpose of the reserve. The approach taken is at the discretion of the decision-maker and/or local government.

Source: *Guidelines for Planning in Bushfire Prone Areas (WAPC 2021)*

Technical requirement	1	2	3	4
	Public road	Emergency access way[1]	Fire service access route[1]	Battle-axe and private driveways[2]
Minimum trafficable surface (m)	In accordance with A3.1	6	6	4
Minimum horizontal clearance (m)	N/A	6	6	6
Minimum vertical clearance (m)	4.5	4.5	4.5	4.5
Minimum weight capacity (t)	15	15	15	15
Maximum grade unsealed road[3]	As outlined in the IPWEA Subdivision Guidelines	1:10 (10%, 6°)	1:10 (10%, 6°)	1:10 (10%, 6°)
Maximum grade sealed road[3]		1:7 (14.3%, 8°)	1:7 (14.3%, 8°)	1:7 (14.3%, 8°)
Maximum average grade sealed road		1:10 (10%, 6°)	1:10 (10%, 6°)	1:10 (10%, 6°)
Minimum inner radius of road curves (m)		8.5	8.5	8.5

[1] To have crossfalls between 3 and 6%

[2] Where driveways and battle-axe legs are not required to comply with the widths in A3.5 or A3.6, they are to comply with the Residential Design Codes and Development Control Policy 2.2 Residential Subdivision

[3] Dips must have no more than a 1 in 8 (12.5% -7.1 degree) entry and exit angle.

Appendix D City of Bunbury Annual Firebreak Notice

CITY OF BUNBURY

FIRE BREAK NOTICE AND BUSH FIRE INFORMATION

BUSH FIRE SEASON 2023-24

BUNBURY.WA.GOV.AU
DFES.WA.GOV.AU

Fire break/hazard prevention work to be completed by 13 November 2023

Fire break/hazard prevention work to be maintained until 5 May 2024

	Less than 2024m²	Greater than 2024m²
Mow/slash all grass less than 10cm	✓	✓
Remove all flammable material	✓	✓
Install 3m by 4m fire break	✗	✓

FIRE BREAK EXEMPTIONS
Application required in writing to the City of Bunbury prior to 1 November

RESTRICTED BURNING PERIOD
Burn permits required - 1 November until 10 December

PROHIBITED BURNING PERIOD
No fires permitted - 11 December until 24 March
(Subject to extensions)

RESTRICTED BURNING PERIOD
Burn permits required - 25 March until 5 May
(Subject to extensions)

Fire prevention is everyone's responsibility, and all property owners/occupiers have a duty to help us reduce the risk of fire.

Scan the QR code to view the City of Bunbury's Fire Prevention Handbook, Fire Control Notice, and other fire safety information.

Document Status

Rev No.	Purpose	Author	Reviewed and approved for Issue	
			Name	Date
Rev A	Draft for review by client	Michelle Gellender	Zac Cockerill (BPAD 37803, Level 2)	20 December 2023

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Awabakal/Worimi Country | 61 / 63
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Perth
Whadjuk Nyoongar Country | Allendale Square,
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Gadigal Country | Level 1, 50
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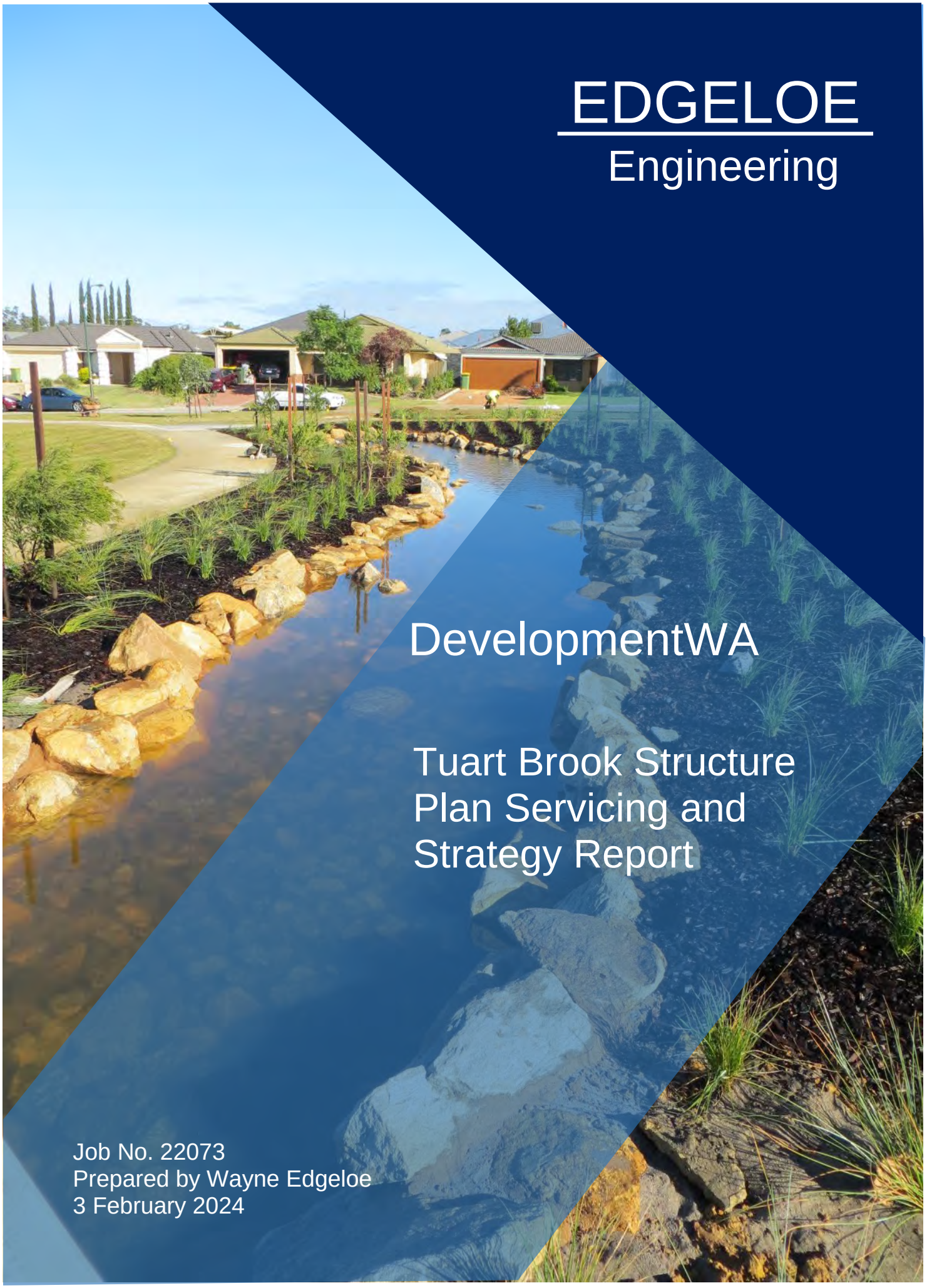
Wollongong
Dharawal Country | Suite 1A, 280 - 286
Keira Street, Wollongong, NSW 2500
T: 02 4225 2647

Appendix D Servicing and Staging Report

EDGELOE
Engineering



DevelopmentWA

Tuart Brook Structure Plan Servicing and Strategy Report

Job No. 22073
Prepared by Wayne Edgeloe
3 February 2024

Edgeloe Engineering Pty Ltd

ABN 31 639 695 088

Unit 7 & 8 45 Marlston Drive Bunbury WA

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This document has been produced to consider the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is taken to any third party.

Document Status

Rev No.	Author	Issued for	Signature	Date
1	W Edgeloe	Review		2 October 2023
2	W Edgeloe	Final Issue		3 February 2024

EDGELOE Engineering

Contents

1 INTRODUCTION

Edgeloe Engineering Pty Ltd have been engaged by Kingslane Group on behalf of DevelopmentWA to investigate and report on servicing of the proposed Tuart Brook Development and provide a servicing strategy to allow efficient delivery of the estate.

An existing Structure plan exists for the landholding, **MPM (2014)** as shown in Figure 1, but an updated Structure plan has been produced for consideration as shown in Figure 2, **Harley Dykstra (2023)**.

The revised structure plan proposes a yield of 878 lots and the previous structure plan had 648 lots and an aged persons site with a total 1,142 dwellings.

This servicing assessment and strategy is based on the new draft layout.

Figure 1 Approved Structure Plan (MPM 2013)

Figure 2 **Draft Structure Plan (Harley Dykstra 2023)**

2 SITE DETAILS

2.1 LOCATION AND SITE CONDITION

The land subject of this development and the Landownership is summarised as follows in Table 1.

Lot	Road	Plan No.	Area (ha)	Proprietor
800	Parade Rd	P65631	1.7408	[redacted]
9001	Parade Rd	P65631	1.6181	
57	Lingard Loop	P420373	0.1557	
300	Lingard Loop	P286927	0.0388	
802	Washington Ave & Parade Rd	P65631	25.826	
501	Washington Ave	P46368	28.325	
100	Bussell Hwy	P57761	3.0175	
4	Bussell Hwy	D31183	2.0234	
3	Bussell Hwy	D31183	1.8251	
7	Bussell Hwy	D69285	0.2009	
8	Bussell Hwy	D75424	13.864	
4	Bussell Hwy	D30204	6.9882	
3	Bussell Hwy	D30204	6.8164	
		Total Area	**92.4399**	

Table 1 **Land Ownership (Harley Dykstra 2023)**

Figure 3 Lot Details (MPM 2013)

The site is bounded by Washington Avenue to the north, Bussell Highway to the East, Lillydale Road to the south and Parade Road to the east with only Lots 500 and 501 being on the west side of Parade Road.

The site is largely cleared with heavy vegetation remaining in the central drainage area through the estate and on the western side adjacent Parade Road.

The vegetated portion to the south adjacent Centenary Road is also to be retained as part of the Preston to Ocean link.

The site is a rural type property with livestock grazing and number of small residential dwellings.

Lot 801 is currently being developed by the Catholic Diocese as shown in Figure 4.

The current stage Flynnwood Estate Stage 3, consists of 14 lots leaving only a 10 lots stage to complete it.

Figure 4 **Lot 801 Development, Flynnwood Estate Stage 3 (Edgeloe Engineering 2023)**

2.2 GEOLOGY

Geological Surveys of Western Australia mapping of the site as reported by Hyd2o (2013) and shown in Figure 5 indicates the soils on the site to be:

- Qha – SAND- Safety Bay sands, alluvium.
- Qts – SAND – associated with Tamala Limestone.
- Qhw – SAND – Swamp deposits, mainly peaty sand

Geotechnical investigations have been previously undertaken over the Structure plan area Lots 4 and 8 Bussell Highway by **Douglas Partners (2011) and Douglas Partners (2013)**.

Field work was carried out with the excavation of test pits and three in situ permeability tests. All test pits were excavated to a maximum depth of 3.2 m using an 8 tonne Kubota excavator and logged by Douglas Partners staff.

The generalised subsurface profile encountered was reported as follows:

- Filling- loose to very dense, fine to medium grained sand, silty sand and gravelly sand uncontrolled filling with pieces of wood, concrete, asphalt, plastic and brick encountered in some holes to depths ranging between 0.4 m and 1.8 m.

- Topsoil- dark grey, silty sandy topsoil with some roots and rootlets was encountered in most of the test pits to depths between 0.1 m and 0.4 m.
- Sand- medium dense, light grey, grey, brown, and grey-brown fine to medium grained sand with varying amount of gravel, silt, and occasional low plasticity clay was encountered from depths of between 0.5 m and 1.4 m and thickness of between 0.3 m and 0.9 m. Weakly cemented sand with thickness ranging between 0.2 m and 0.7 m was encountered in some holes. The cemented layer was penetrated when using an 8-tonne excavator equipped with an 800 mm wide rock bucket.
- Clayey sand- medium dense, blue-grey, low to medium plasticity clayey sand was encountered at some of the test locations underlying or between the sandy layer from depths of between 1.2 m and 2.9 m.
- Limestone- extremely low to low strength, white limestone encountered in some holes from depths of between 0.25 and 2.1 m.

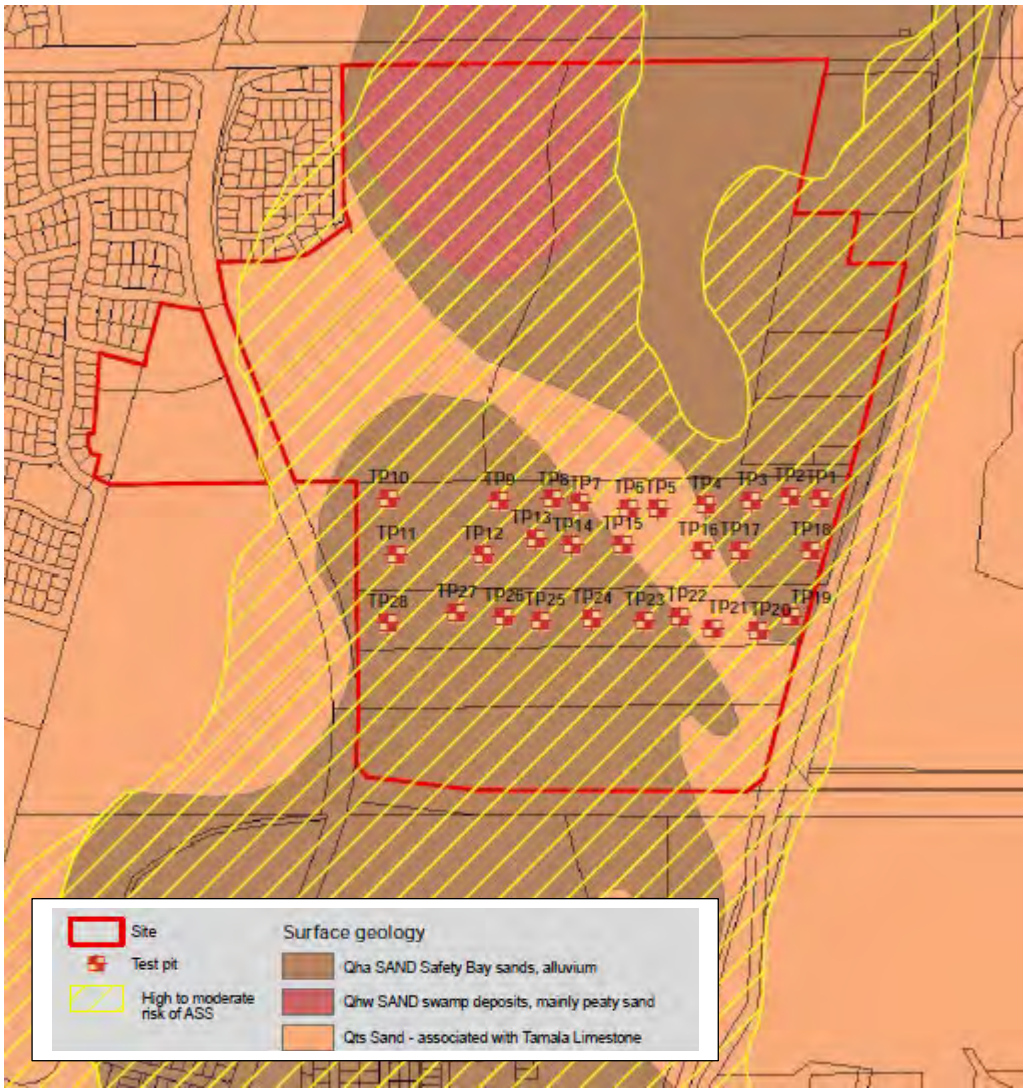


Figure 5 Geotechnical Plan (Hyd2o 2013)

Groundwater levels were approximated by Douglas Partners using available topographic data and were estimated at between 2.1 mAHD to 3.15 mAHD.

Permeability tests were undertaken using the falling head method and figures of approximately 22 to 25m/ day were recorded.

Douglas Partners concluded that on-site stormwater disposal using soakwells and sumps is feasible where sufficient thickness of sand with low fines content exists above clayey sand, cemented sand and limestone.

2.3 TOPOGRAPHY

Topography of the site is characterised by the central drainage area running from south to north and draining to Five Mile Brook, with the landform rising to dunal systems on the east side of Bussell Highway and west side of Parade Road as shown in Figure 6.

Figure 6 Site Levels (Hyd2o 2013)

2.4 ACID SULPHATE SOILS

Acid Sulphate Soils mapping as shown in Figure 7 indicate the majority of the site has a moderate to high level risk of acid sulphate soil (ASS) disturbance occurring within 3 m of natural soil surface, with a small area in the north-west of the site in Lot 501 and all of Lot 800 defined as having a low to moderate risk.

Any excavations into the Moderate to High Risk areas such as to create proposed drainage basins or for deep sewer and sewer pumpstation excavations will require a full ASS assessment and ASS Management Plan to be prepared, approved by DWER and implemented.

Any dewatering in these areas will also need to be assessed and undertaken in accordance with a DWER approved Dewatering Management Plan.

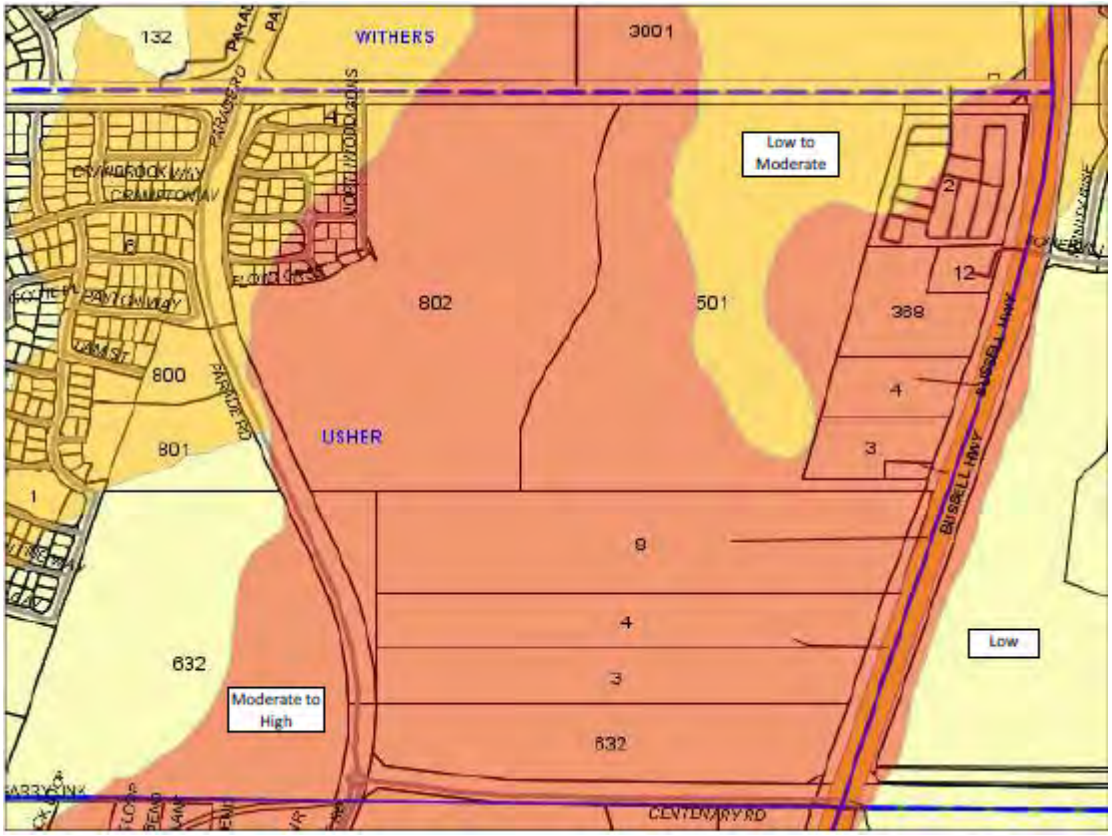


Figure 7 Acid Sulphate Soil Risk Mapping (MPM 2013)

2.5 CONTAMINATED SITES

No contaminated sites were identified from the Contaminated – Reported Sites (DER-015) data set.

2.6 GROUNDWATER

Groundwater levels on the site as reported by **Hyd$_2$o (2013)** are shown in Figure 8.

Hyd2o (2013) reported that groundwater monitoring was undertaken from November 2007 to October 2009 and was taken from a network of 14 groundwater monitoring bores across the site.

Water quality samples were also taken from the bores.

It was found by **Hyd$_2$o (2013)** that the groundwater levels on the site are very high with much of the site inundated through the winter with water at the surface.

The groundwater was also found to flow in a north west direction along the general flow path of the Five Mile Brook Drain.

These areas of ponding are shown in Figure 8.

At the most elevated portions of the site in excess of 1.5m to groundwater is achieved.

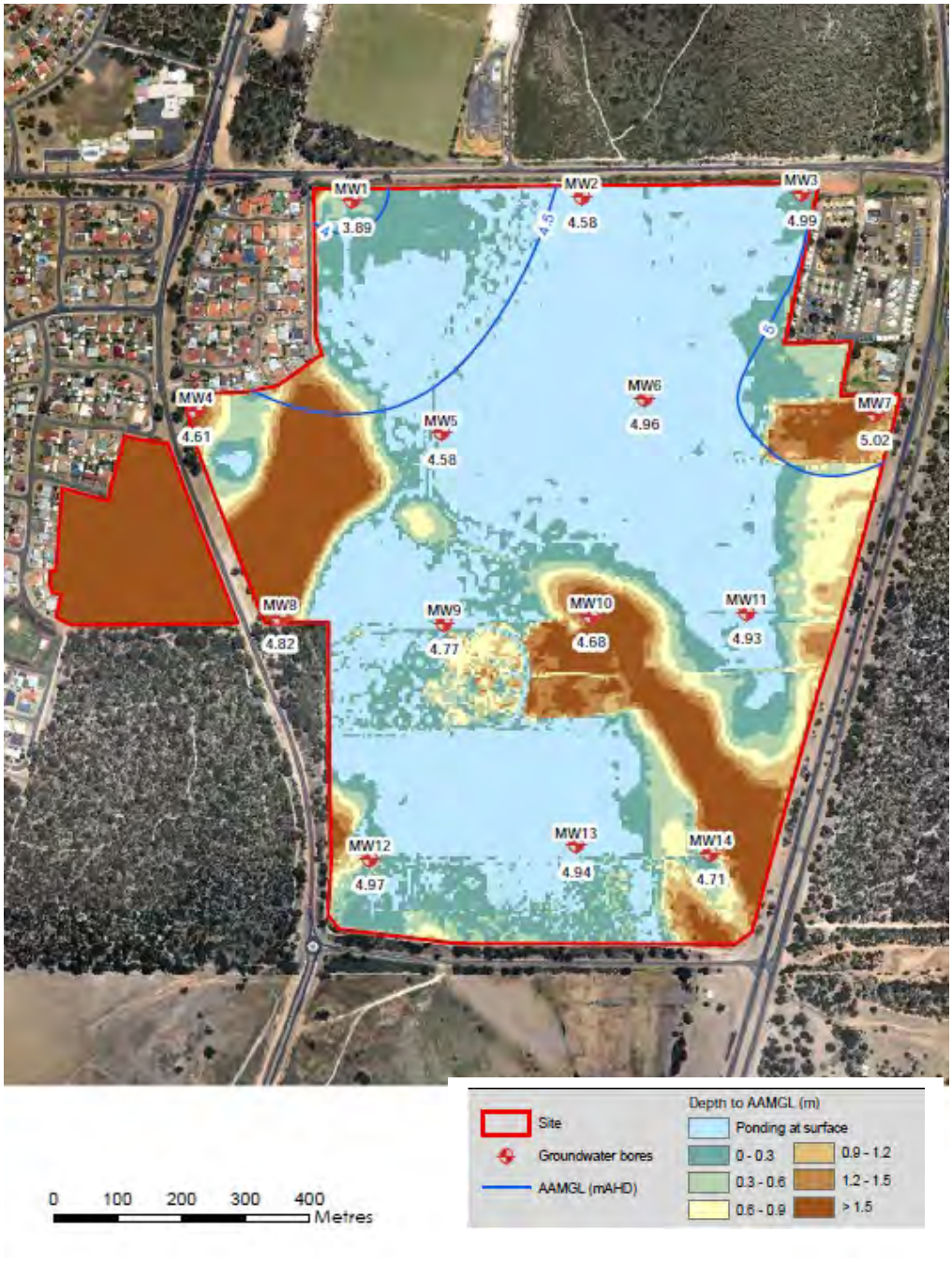


Figure 8 Groundwater Plan (Hyd$_2$o (2013))

2.7 WETLANDS

According to Wetland mapping there are Resource Enhancement and Multiple Use wetlands on the site as shown in Figure 9.

There are no EPP Wetlands or RAMSAR Wetlands in the site.

A Wetland Management Plan has been prepared previously for the site by **Bioscience (2011).**

Bioscience provided an assessment of the wetland function and native vegetation to determine future management objectives of the wetland. All recourse enhancement wetland areas are proposed to be maintained in regional open space and public open space.

Due to the highly degraded state of the wetlands and their surrounding areas it is considered that wetland buffers will not be required to maintain wetland function, **Bioscience (2011).**

Figure 9 Wetlands (Hyd2o 2013)

2.8 FLOOD LEVELS

Flood Levels were presented by Hyd2o in Figure 10 but these have been more recently updated by DWER as shown in Figure 11.

Figure 10 Five Mile Brook 100 Year Flood Depth Estimates (Hyd2o 2013)

The DWER levels are approximately 200mm higher than those presented by Hyd2o.

The 100-year flood level at the southern end of the site is RL 5.06 and at the northern end is 5.10

All development on the site will need to achieve a minimum 500mm from the flood level to building floor levels.

Roads are permitted to be partially inundated in the 100-year event as long as safe exit is provided for vehicles.

Flow velocities in the flood area are expected to be very low as this area acts as a flood storage area for flows before they flow under Washington Avenue to the north and continue along Five Mile Brook.

Previous flood modelling works reported 100-year flows at Centenary Road of 4.2 m^3/s reducing to 2.2m^3/s south of Washington due to attenuation within the site's wetland area.

Figure 11 **DWER Flood Plain Mapping (DWER 2023)**

3 DEVELOPMENT SITE WORKS

3.1 EARTHWORKS

To develop the site will require filling and retaining to achieve the various engineering requirements on the site.

The levels across the site will be determined based on a combination of the requirements to

- Achieve the required 0.5m separation from 100-year flood levels to finished floor levels of developments
- achieve the recommended 1.2 to 1.5m groundwater separation for lots
- achieve suitable drainage flow grades overland and in piped drainage systems
- achieve suitable flows in subsoil drainage system
- allow connection to the Water Corporation gravity sewer network
- to achieve acceptable site classifications

It would be proposed to cut, fill and retain all lots within the development area to achieve flat, level building lots.

In the POS area careful design will be required to maximise retention of existing large vegetation and minimise earthworks intrusions in to the POS areas.

The general process to be undertaken during the earthworks would consist:

- Clearing of site and removal of any surface rubbish or dumped materials
- Inspection during works to identify any indigenous heritage items of significance
- Topsoil removal, stockpiling and screening for possible reuse in blending with imported fill for upper layers of fill,
- Cut to fill to shape existing surface,
- Import of sand fill to site and blending with topsoil where appropriate
- Compaction to achieve geotechnical requirements
- Acid Sulphate Soils treatment and management in any affected areas,
- Dust and sediment management during the work
- Stabilisation of the earthworked areas at completion.

3.2 RETAINING WALLS

Given the relatively flat nature of the site only minimal retaining walls are likely to be required to achieve level building lots which has generally become a sales requirement of purchasers of small residential lots.

Where possible 0.1m steps would be sued between adjoining lots to minimise the need for retaining walls within individual development cells.

Reconstituted Limestone block walls are likely to be used in keeping with current industry standards.

3.3 LANDSCAPING

The development site contains large areas of existing vegetation and the majority of this could likely be retained in the proposed POS/ Central Drainage area by careful attention to earthworks levels and through integration with a Landscape plan.

3.4 FENCING

Fencing may be required to drainage basins should the batter slope of the basins be steeper than 1 in 6, in order to prevent public access to potential deep-water areas.

The City of Bunbury will likely request the provision of a mechanism such as bollards to prevent vehicle access to the proposed POS areas, particularly at anticipated path locations that may traverse through the POS area.

4 SERVICING INFRASTRUCTURE

4.1 ROADWORKS

The site is generally bounded by Washington Avenue to the north, Bussell Highway to the east, Parade Road to the west, with an area of bushland between it and Lillydale Road to the south. A small portion of the landholding lies to the west of Parade Road as shown in Figure 12.

A Traffic Study has been previously undertaken **DVC (2023)** on the current proposed Structure Plan and identified a road network with traffic generations as shown in Figure 13 and suggested road widths as shown in Figure 14.

Figure 12 Existing Road network (DVC 2023)

The road widths will be finalised in conjunction with the City of Bunbury and internal roads will generally be 6m, 7.4m or dual 5.0m wide carriageways where required.

The roads will generally be constructed with a limestone sub base layer, gravel base course, primer seal and then asphalt surfacing with kerbing each side.

Given that the majority of the development area will be filled then a CBR value for the sand subgrade of 10 to 12 would be expected with a total pavement thickness of 250mm.

A path network will also be constructed as part of the works to integrate to the adjoining path network. Paths will be normally 1.5m wide pedestrian paths or 2.2m wide dual use paths.

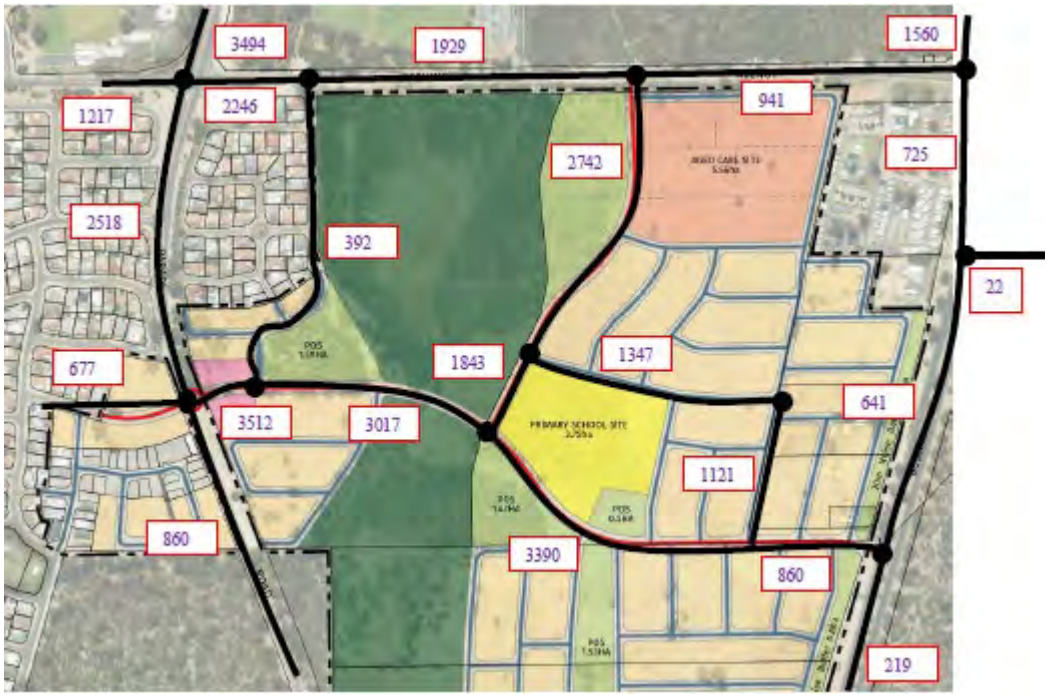


Figure 13 **Daily Link Volumes generated by the development (DVC 2023)**

Figure 14 **Road Reserve Widths (DVC 2023)**

At Lot 800 on the east side of Parade Road there is interface to the existing road network as shown in Figure 15.

Development of this portion of land will require simple connection to the existing Mosedale Avenue and Liam Street, with Liam Street connecting through to Parade Road.

Figure 15 Lot 800 (Nearmap 6 Aug 2023)

The remnant portion of Lot 801 is currently being developed and is connecting to the existing adjoining road network.

At the north west corner of the development the roads will connect to existing roads as shown in Figure 16 at locations A and B.

Figure 16 Road connections in North West Corner (Nearmap 6 Aug 2023)

For the balance of the estate 3 new major intersections were identified by **DVC (2013)** at:

- Road 1 with Parade Road;
- Road 1 with Bussell Highway;
- Road 3 with Washington Avenue; and

The intersection of Road 1 with Parade Road will form a roundabout, whilst the other three will be T-intersections.

DVC (2023) proposes a 4-leg roundabout at Parade Road with one lane on each approach.

Parade Road is dual carriageway with 5m lanes and so the roundabout would likely match built on the extension of Parade Road to the south as shown in Figure 17.

Figure 17 Existing Parade Road / Atkins Road roundabout in Dalyellup (Nearmap 6 Aug 2023)

For the intersection of Road 1 with Bussell Highway DVC (2023) proposes a left in left out intersection.

This would be built to Main Roads requirements.

At the northern intersection of Road 3 with Washington Avenue a simple Tee Junction is recommended with appropriate turn pockets.

DVC (2023) refers to the impact of the reduced traffic on Bussell Highway resulting from the BORR and the proposed roundabout, currently under construction on the intersection of Centenary Road and Bussell Highway as shown in Figure 18.

This roundabout and the adjoining roads are scheduled to be completed late 2024.

No works are proposed on Lillydale Road as part of this development.

Proposed paths for the development would be integrated with the existing path and cycle networks as shown in Figure 19.

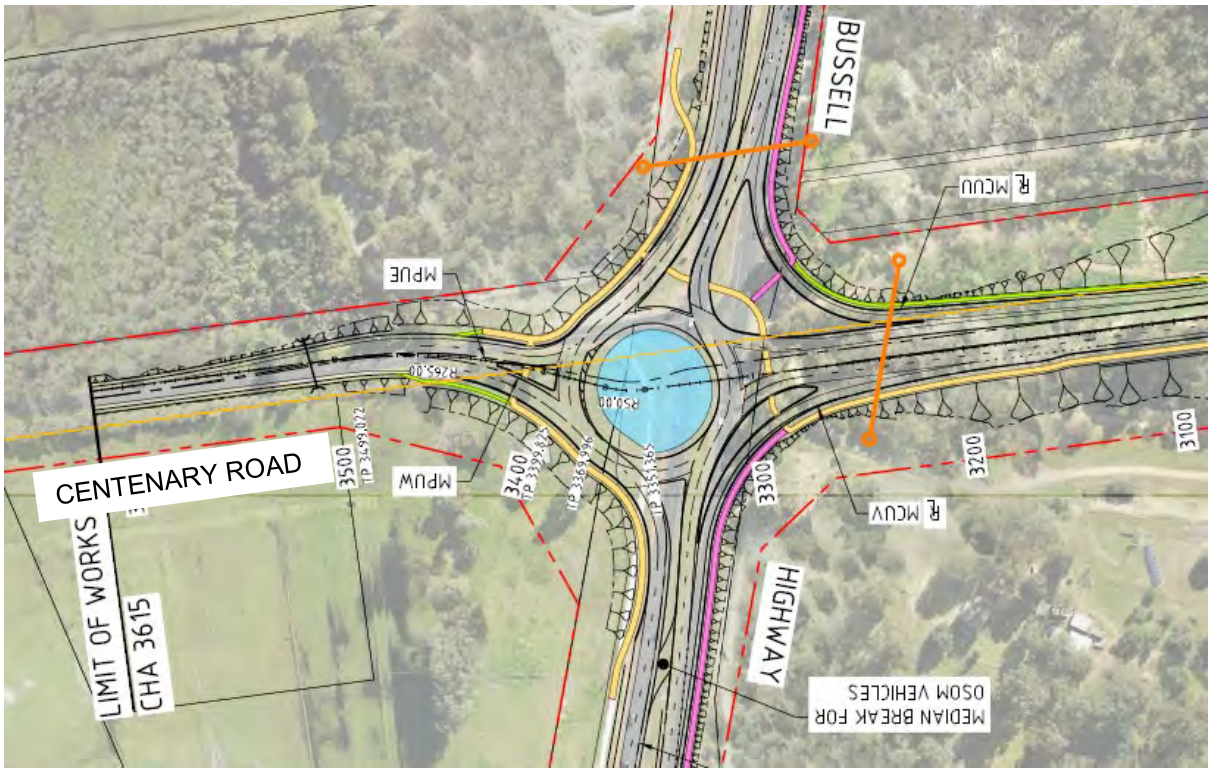


Figure 18 Main Roads proposed roundabout on Bussell Highway/ Centenary Road Intersection

Figure 19 Existing path and cyclist network (DVC 2023)

4.2 STORMWATER DRAINAGE

Hyd$_2$o (2013) have previously undertaken a Local Water Management Strategy to support the Structure Plan.

The LWMS Strategy is summarised as follows by **Hyd$_2$o (2013)**

Local and Regional Stormwater	
Flood Protection	• Five Mile Brook floodplain maintained within ROS/POS • Local stormwater attenuated within ephemeral storage areas located in POS areas and integrated with adjacent ROS area. • Total 100 year ARI storage volume required : 5414 m3 • Overland flow paths within road reserves identified for safe conveyance of flows exceeding pipe drainage system capacity • Habitable building levels set at 0.5m above 100 year flood levels
Serviceability	• Piped drainage system sized to convey 5 year event • 1 in 5 year ARI event to be infiltrated • Total 5 year ARI storage volume required : 3163 m3 • All subsoil drainage to be free draining
Ecological Protection	• Use of native plantings in POS/ROS areas to minimise nutrient input. • Rehabilitation of wetland area • Bioretention systems to be established at 2% of equivalent impervious area (0.45ha) • Non structural control commitment, details at UWMP stage • Use of soakwells at lot scale • Total 1 year 1 hour storm volume : 3503 m3
Groundwater	
Fill & Subsoil Drainage	• Development levels to ensure suitable clearance above regional groundwater levels. • AAMGL adopted as the controlled groundwater level (CGL) for the site • Subsoil drainage at CGL proposed to control post development groundwater rise.
ASS & Contamination	• ASS to be investigated as a separate process and reported in UWMP.

Hyd$_2$o (2013) found that the site has two main catchments with all flow directed towards the centre of the site from the western boundary at Parade Rd and the eastern boundary at Bussell Highway as shown in Figure 20.

Figure 20 Surface Water Plan (Hyd$_2$o (2015))

The central area of the site forms a low-lying depression with topography less than 5 mAHD and creating a flow path from south to north with an ill-defined drainage path along its length which flows to the Five Mile Brook Drain to the north.

The site captures portion of the flow from the Five Mile Brook catchment to the south with some flow via two separate culverts under Lillydale Road which then flow through the site.

The flows then eventually flow via two culverts under Washington Ave and direct flows towards the channelized Five Mile Brook Drain that then flows to the north to Big Swamp and then eventual discharge to the ocean.

A small portion of flow is also indicated to flow under Parade Road via a 450-diameter culvert draining the land to the east.

This culvert under Parade Road is shown in original feature survey of the site in Figure 21.

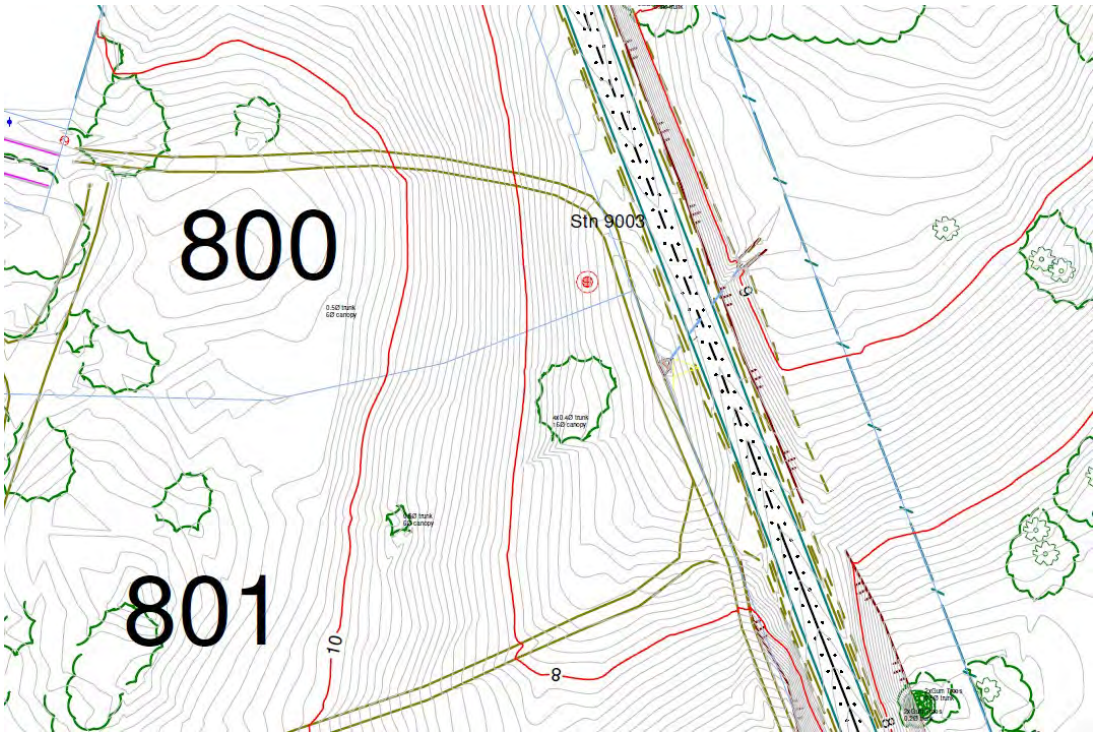


Figure 21 Extract from site feature survey (BCE 2013)

In development of the drainage strategy for the development of Lot 801 **MPM (2015)** mapped the catchments as shown in Figure 22.

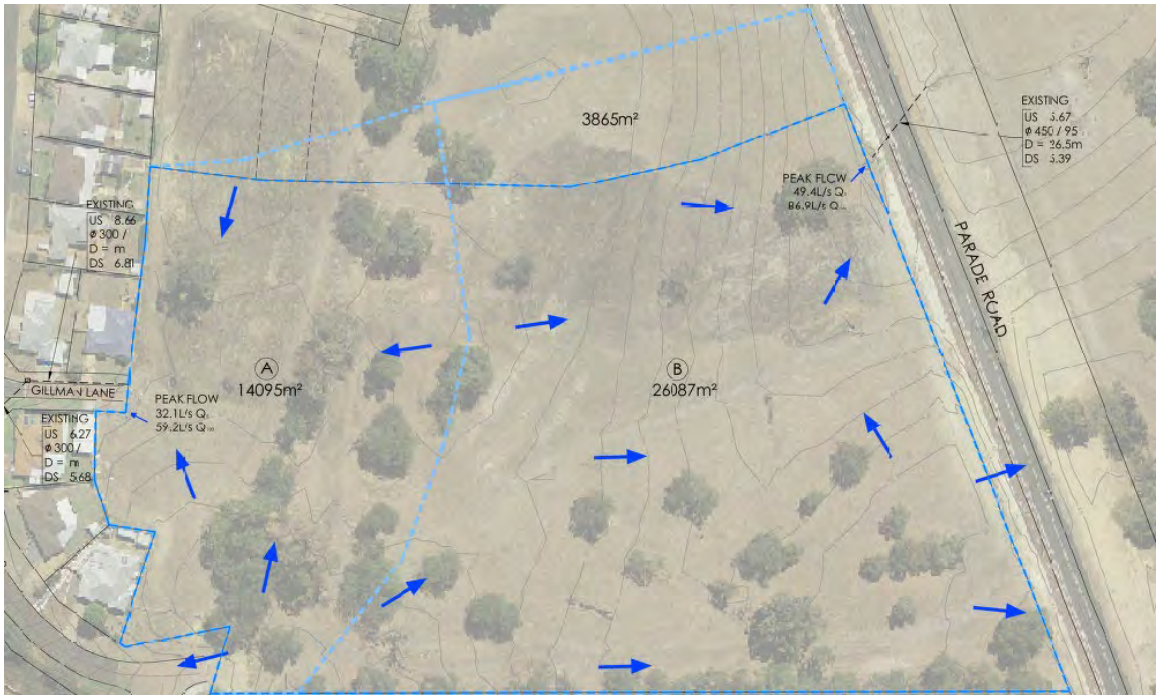


Figure 22 Lot 801 Catchments (MPM 2015)

This indicated portion of the catchment flowed to the west with the balance flowing through the culvert under Parade Road.

In the final development plan though **MPM (2015)** retained the flows on site on Lot 801 to ensure the 100-year flows through the culvert remained at predevelopment levels. Figure 23 shows the drainage Basin that was designed for the top north east corner of the lot to detain these flows.

Figure 23 Lot 801 Drainage Strategy (MPM 2015)

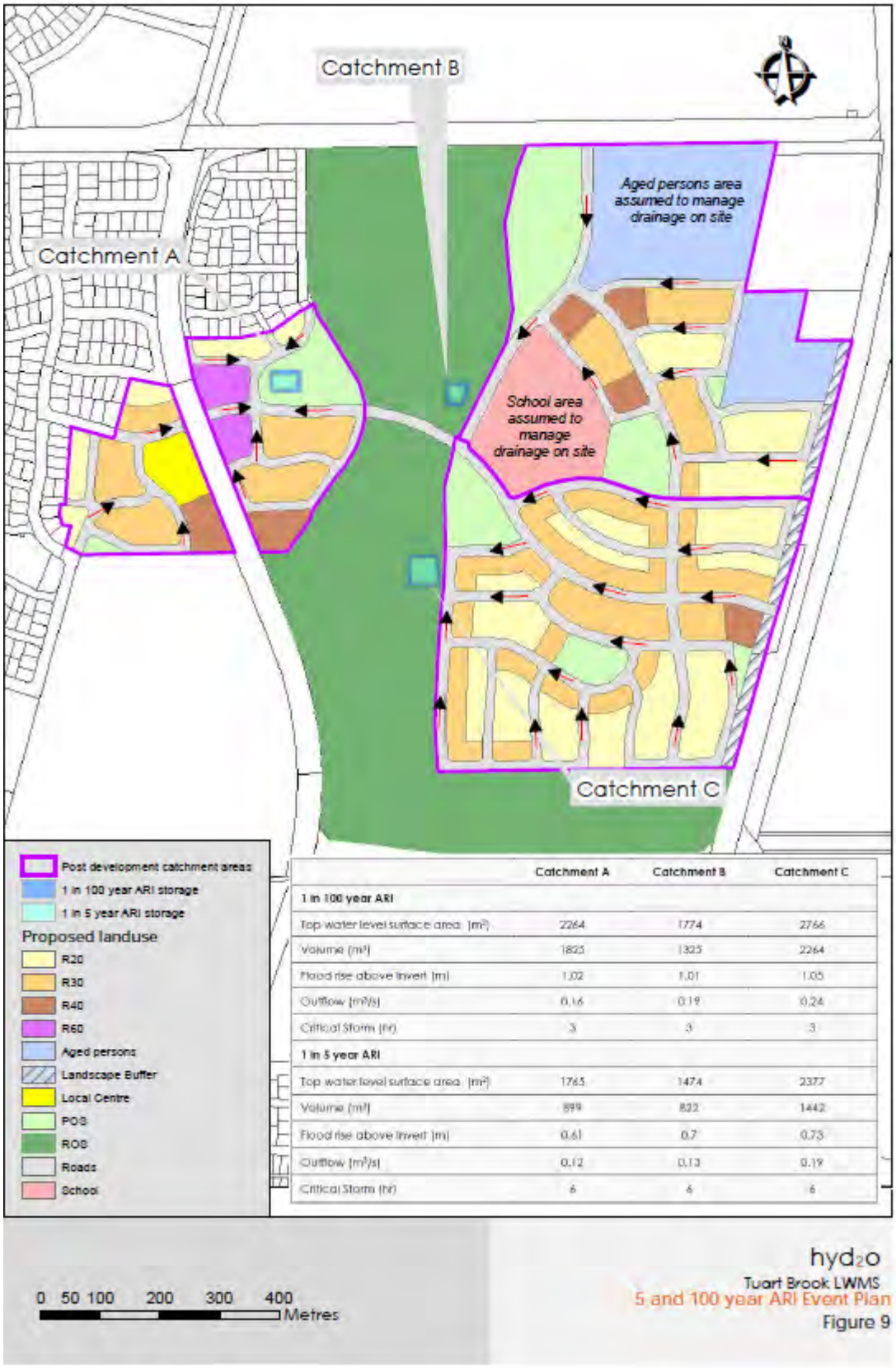
In assessing the water management requirements for the Structure Plan area **Hyd2o (2013)** have developed a plan as shown in Figure 24.

This shows 3 main catchments each with its own basin site.

For Catchment A to the west side of the site the basin allows for full compensation of flows from the Lot 801 area, but as MPM (2015) have already compensated those flows then the basin for Catchment A could be reduced in size.

Also at the time of subdivision of the land the **Hyd2o (2013)** strategy should be updated as part of the UWMP for site to suit the new structure plan layout and conversion of the group housing site to residential as this will increase the basin size required for Catchment B.

Multiple smaller basins are also recommended along the ROS area so pipe sizes and depths can be reduced and better distribute the flows into the adjoining ROS area in larger events.



	Catchment A	Catchment B	Catchment C
1 in 100 year ARI			
Top water level surface area (m²)	2264	1774	2766
Volume (m³)	1825	1325	2264
Flood rise above invert (m)	1.02	1.01	1.05
Outflow (m³/s)	0.16	0.19	0.24
Critical Storm (hr)	3	3	3
1 in 5 year ARI			
Top water level surface area (m²)	1765	1474	2377
Volume (m³)	899	832	1442
Flood rise above invert (m)	0.61	0.7	0.73
Outflow (m³/s)	0.12	0.13	0.19
Critical Storm (hr)	6	6	6

Figure 24 Stormwater Management Plan (Hyd$_2$o (2013))

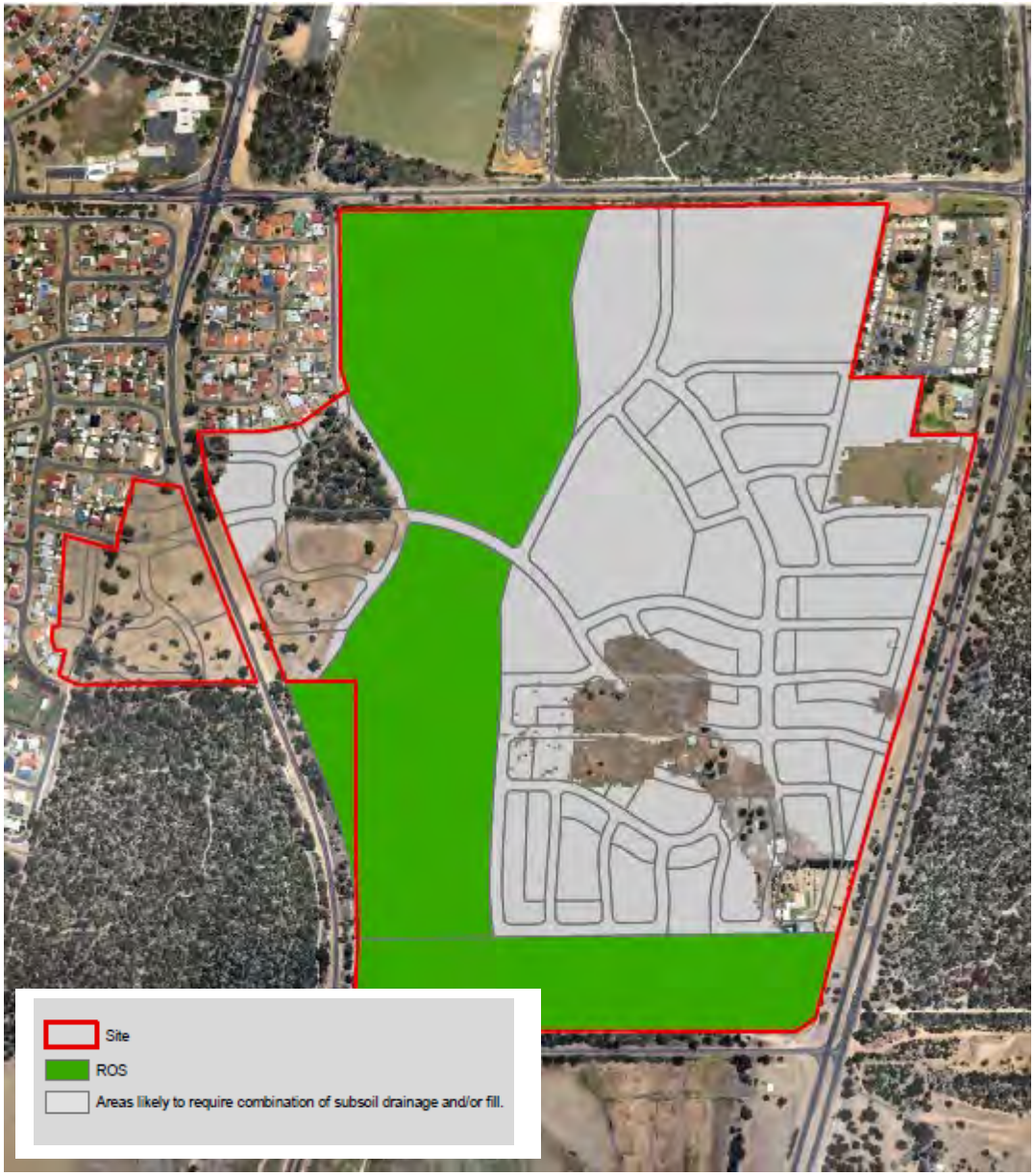


Figure 25 Groundwater Management Plan (Hyd$_2$o (2013))

Development of the site in accordance with the principles of the LWMS will largely be dominated by fill requirements to achieve adequate separation to groundwater.

The internal drainage within the site will consist of a system of piped drains and subsoil drains all collecting runoff from the lots and roads and conveying it for treatment and infiltration in the proposed Basins.

The site will need fill above the flood levels on the site but this will only require fill to a minimum of approximately RL 5.60m AHD.

The groundwater level across the site is between RL 4.5 and 5.0m AHD so final lot fill levels with vary generally between RL 6.0 and 6.5m AHD. Areas of likely fill are shown in Figure 25.

This can be minimised by careful definition of the predevelopment groundwater level and using a system of subsoil drains in the road reserve to create a controlled groundwater level (CGL) and minimise any rise in groundwater as a result of development.

All drainage infrastructure construction will be to the City of Bunbury requirements and current applicable Australian standards, including ARR and the IPWEA Guidelines for Subdivision Development.

Drainage detailed design will be undertaken in conjunction with the UWMP for the site undertaking as a condition of subdivision.

4.3 NOISE

Noise modelling of future traffic flows by **GED (2010)** indicated that the following noise amelioration measures are required for the Tuart Brook Structure Plan:

- A 2m tall berm (total berm width of 6 metres) with a 1.8m solid fence on top of the berm – in the following locations:
  - Along the eastern boundary of the structure plan.
  - Along southern boundary of the structure plan, within a 65m distance from the eastern boundary.
  - Along the boundary between the 'Existing Special Use' and the former Aged / Grouped Housing, within a 65m distance of the eastern boundary.
- 1.8m tall fence along the northern boundaries of the former Aged Housing (and Aged / Grouped Housing).
- 1.8m tall fence on the boundary between the former Aged Housing and the existing Caravan Park.
- 1.8m tall fence along the southern boundary of the structure plan, up to a distance of 180 metres away from the east boundary.

In addition to this, the first row of housing along Bussell Highway (the eastern edge of the structure plan) will need acoustic upgrade to achieve compliance with the indoor noise level criteria.

MPM (2013) also reported that noise modelling of Bunbury Airport was undertaken in 1999 using the Australian Noise Exposure Forecast (ANEWF) System and that is was considered using this system that areas outside of the 20 ANEF Contours are considered unconstrained to residential development.

As such the impact of noise on the Structure Plan area was considered to be negligible as it fell outside of the contour area.

Figure 26 **Recommended Noise Attenuation Measures (GED 2010)**

4.5 WATER SUPPLY

The Structure plan area is part of the Aqwest Service area.

Existing mains servicing the area are shown in Figure 27.

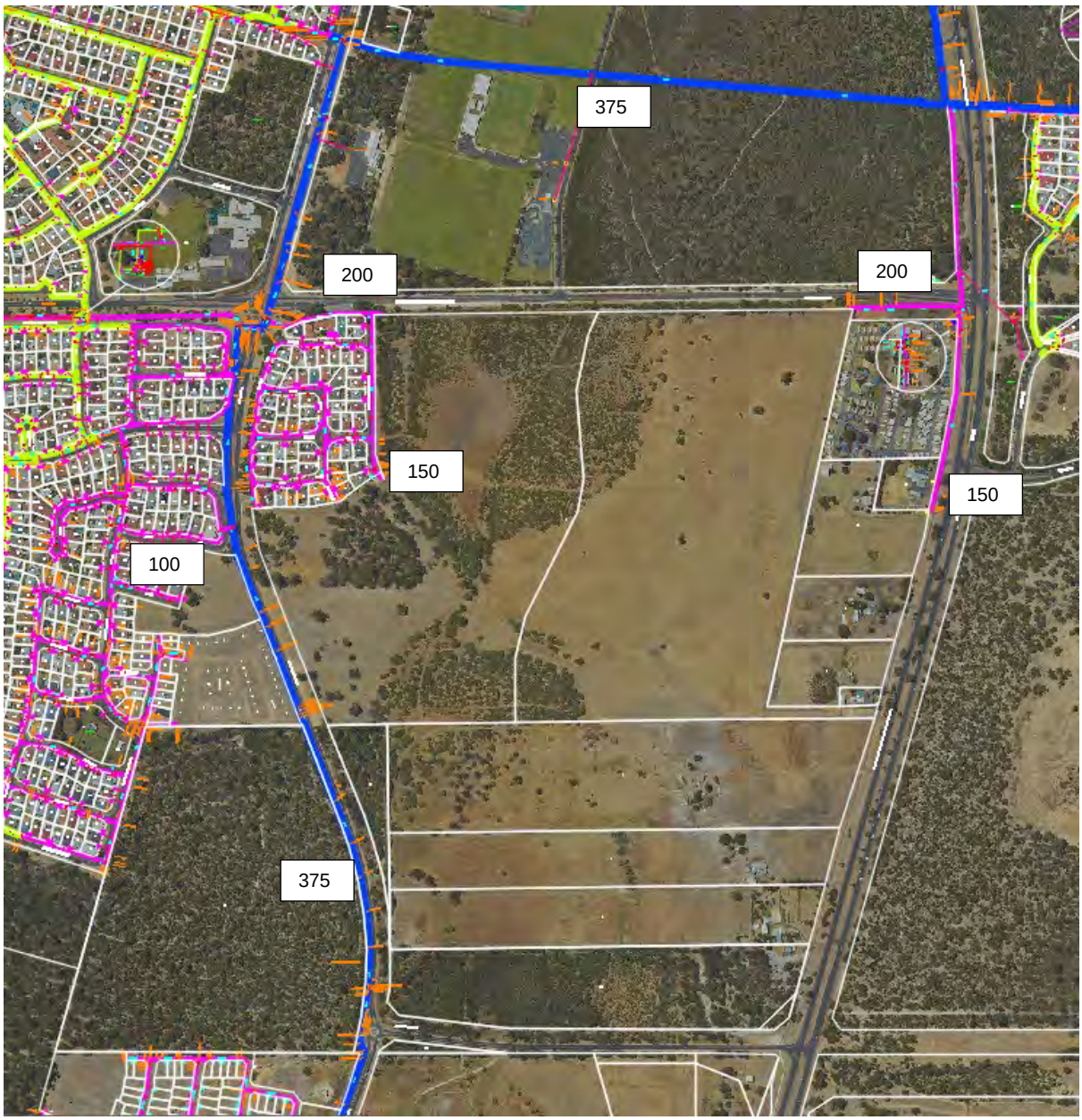


Figure 27 Existing Water Mains (Aqwest)

Aqwest have also provided details of possible mains upgrades as shown in Figure 28.

This was based on an old Structure Plan layout but will be upgraded to suit the new Structure Plan.

The main objective of the upgrades will be to provide a new link to the south to Dalyellup to supplement the existing 375 diameter pipe servicing Dalyellup.

This link will likely be a 200 diameter (or possibly 300 diameter) pipe along Bussell Highway, if permitted by Main Roads.

Alternatively, it may be simpler for them to construct a new link through the centre of the development from north to south via proposed subdivisional roads. This would avoid the Bussell Highway Reserve and also supplement supply into the structure plan area.

Figure 28 Possible mains upgrades (Aqwest)

The internal pipe network for the Structure Plan area would be generally 150 or 100 diameter pipes.

Initial servicing would be possible from the 375-diameter main in Parade Road.

The western portion of the site at Lot 800 could be connected to existing mains shown in Figure 29 with a link back into the Parade Road 375 diameter main.

Figure 29 Water mains servicing Lot 800 (Aqwest)

For development in the north west corner of the site direct connection could also occur to existing mains as shown in Figure 30. This may allow for an early release of lots in this location.

Figure 30 Existing water mains (Aqwest)

4.6 SEWER SERVICING

The Structure plan area is within the Water Corporation license area.

The sewer planning is shown in Figure 31 and indicates that the area is to be serviced by a Type 40 Sewer Pumpstation K located in the northern central portion of the Structure Plan area.

This pumpstation will then pump north with a 250-diameter sewer pressuremain through Hay Park into existing sewers.

This pumpstation is on the Water Corporation Capital Investment Plan for the next 5 years and so would be a fully prefundable asset with full costs reimbursed one year after completion.

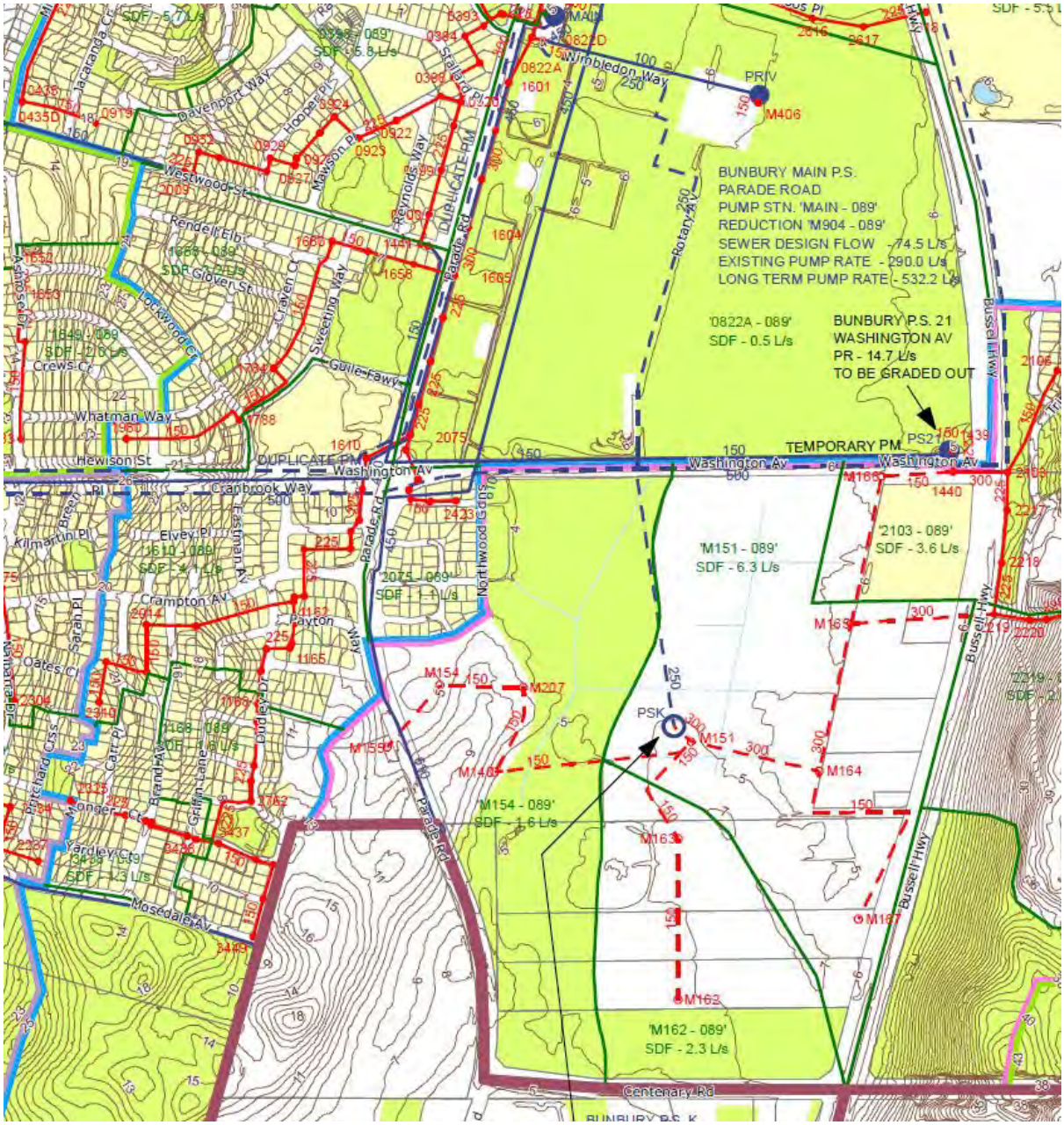


Figure 31 Sewer Planning (Water Corporation)

A 300-diameter gravity sewer is planned out of this pumpstation to grade out existing Sewer Pumpstation 21 in the north east corner of the Structure plan area as well as to take flows from the College Grove area.

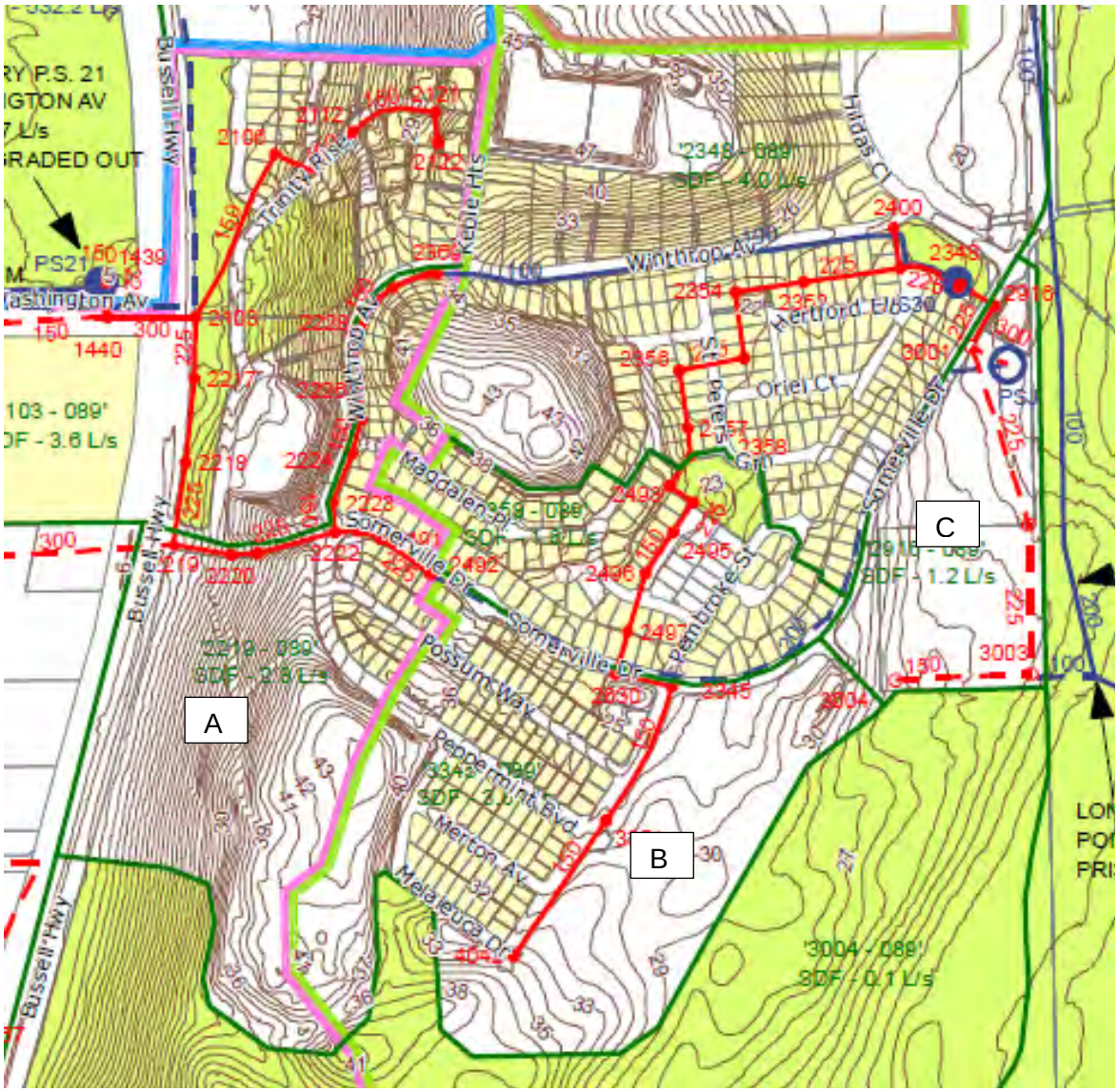


Figure 32 College Grove Sewer Planning (Water Corporation)

This sewer planning however needs to be updated to account for the removal of sections A, B and C of College Grove, as shown in Figure 32, from future development as these parcels have now all been reserved as Environmental Conservation in the City of Bunbury's Local Planning Scheme so no development is possible on these parcels.

This will thus reduce flows to the proposed sewer pumpstation and also change the route of the 300 diameter gravity sewer pipe such that it just needs to grade out Pumpstation 21 and not also flow to the eastern boundary of the site to collect flows from College Grove.

The sewer planning as shown in Figure 33 also currently shows the portion of land to the west of Parade Road also planned to be in the gravity catchment for the Proposed Pumpstation K but the existing development on Lot 801 has been connected to existing sewers on the west side of Parade Road instead as shown in Figure 34.

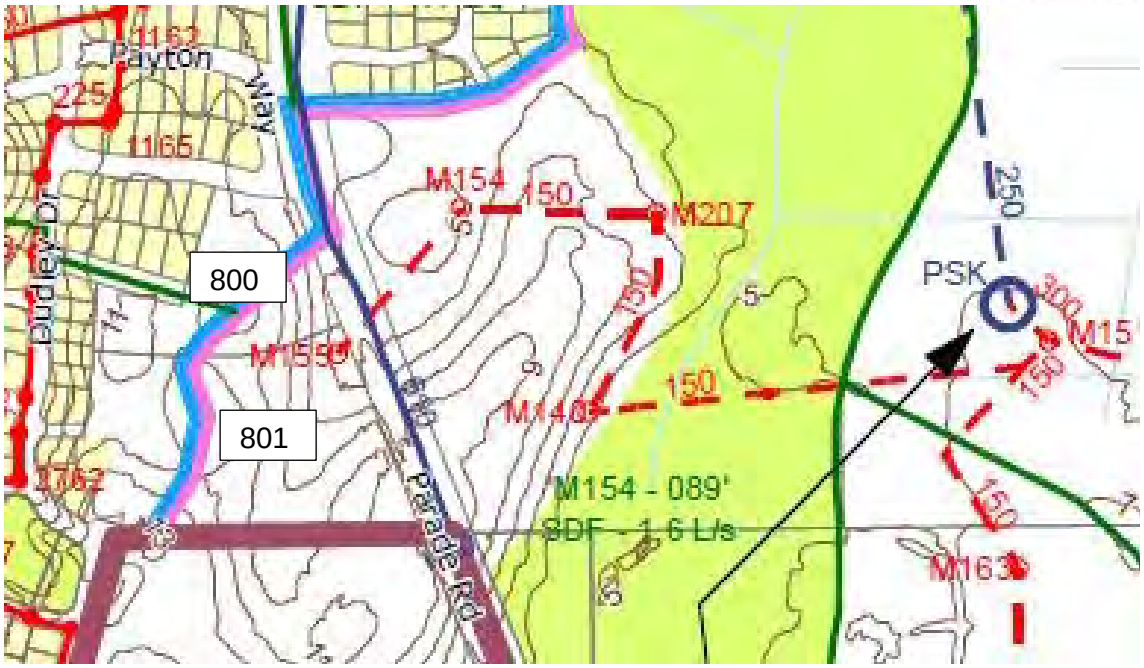


Figure 33 **Sewer Planning for lots 800 and 801**

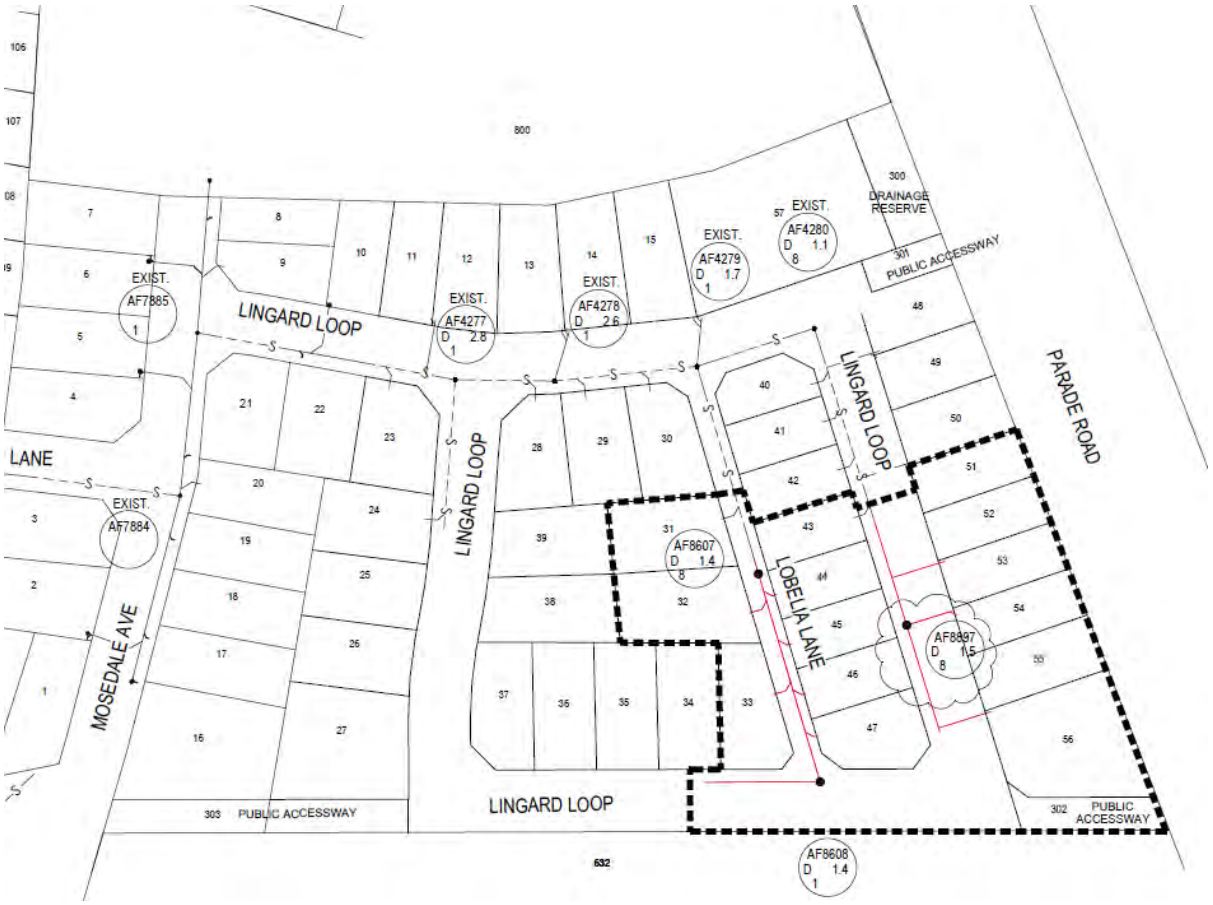


Figure 34 **Sewer layout for Lot 801 development**

It has been checked and it was found that it is possible for lot 800 to be developed also from existing adjoining sewers instead of connecting across Parade Road to the proposed sewer pumpstation.

This would then potentially allow early development of that portion of the land.

Existing sewers adjacent Lot 800 are shown in Figure 35 and extensions to serve the Lot could occur from locations A and B.

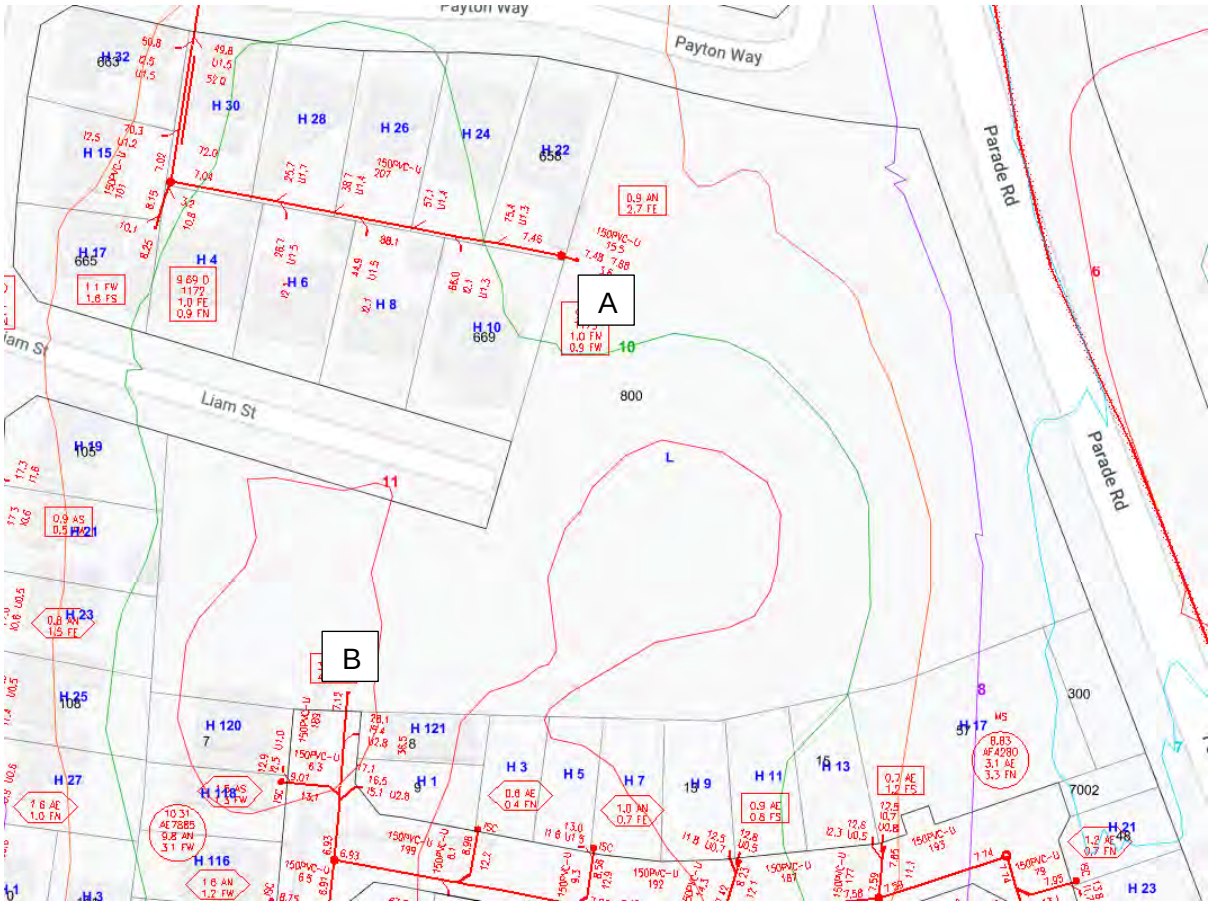


Figure 35 Lot 800 existing sewers

There may also be a possibility of extending the sewers from the north west portion of the Tuart Brook site to service a small number of lots in that corner rather than direct connection to the pumpstation as well.

These sewers are shown in Figure 36 and the level of extension possible will depend on final adjoining lot and road levels selected.

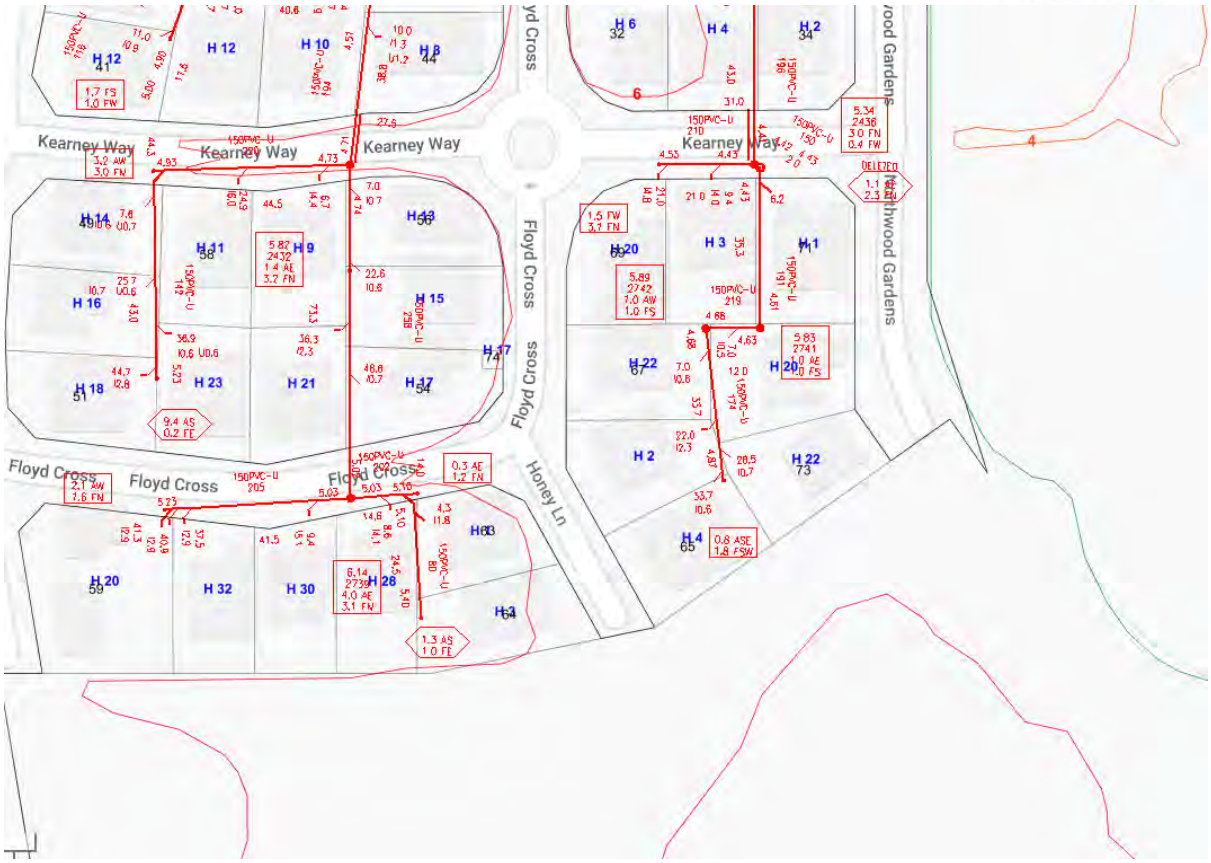


Figure 36 **Existing sewers north west portion of Structure plan area**

4.7 POWER RETICULATION

The Structure plan area is currently serviced around its perimeter by Western Power High Voltage Distribution Lines as shown in Figure 37.

The need to upgrade any of these assets is not known and would be determined at time of development by a formal application to Western Power.

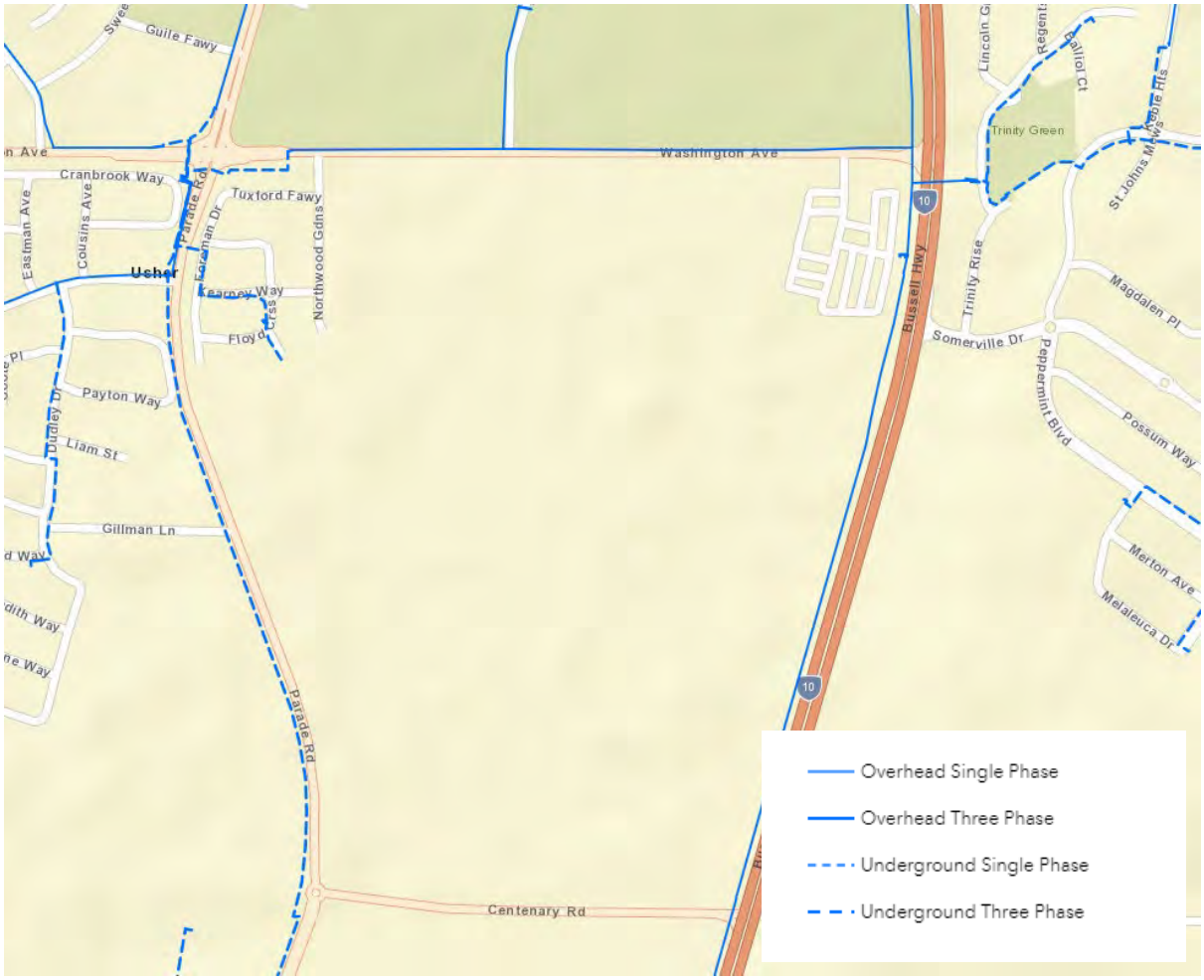


Figure 37 Existing Power Network

The existing residences will be connected by low voltage connections off the high voltage networks

Based on the Western Power (WP) UDS manual requirements the loads are calculated for subject area as follows:

Load Type	Number	Required kVA	Total	Comments
Residential Lots	911	4.7	4281kVA	Estimated 911 lots
Total			**4.2 MVA**	

Western Power's network mapping tool shows in Figure 38 that there is currently less than 5MVA capacity in this area and so external upgrades are likely to be required as the area is developed.

Figure 38 Western Power Network Capacity 2023.

4.8 NBN/ TELSTRA

The existing Telstra/ nbn network in the Tuart Brook Structure Plan is shown in Figure 39.

Figure 39 Existing Telstra Network (DBD Request October 2023)

All new lots will be required to connect to NBN under current WAPC Policy.

According to the NBN rollout map a shown in Figure 40, this is a fixed line area with conduits and cables to be extended from the existing nbn network.

The need for any upgrades is not known at this time.

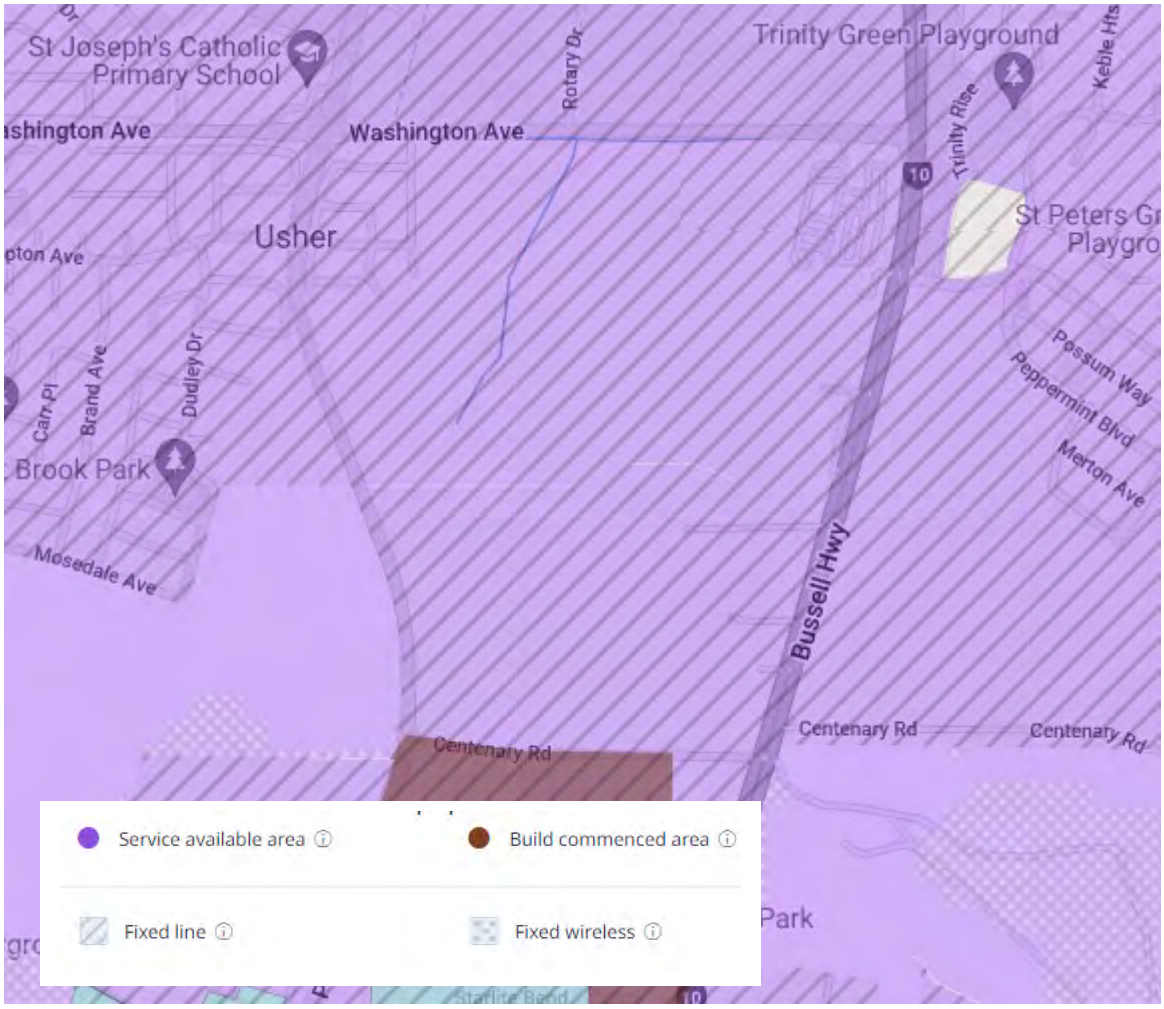


Figure 40 NBN Service map

Optus also have services in this area with an Optic Fibre cable laid along the south side of Washington Avenue and the east side of Bussell Highway adjacent the development.

4.9 GAS

There are multiple gas lines on the roads bounding this development as shown in Figure 41.

If gas is required to be provided to the lots in the development then extensions would occur form the Medium Pressure gas mains on Parade Road, Washington Avenue and Bussell Highway.

The High Pressure gas main on the east side of Bussell Highway is a critical asset and strict controls will be placed on any works in its proximity.

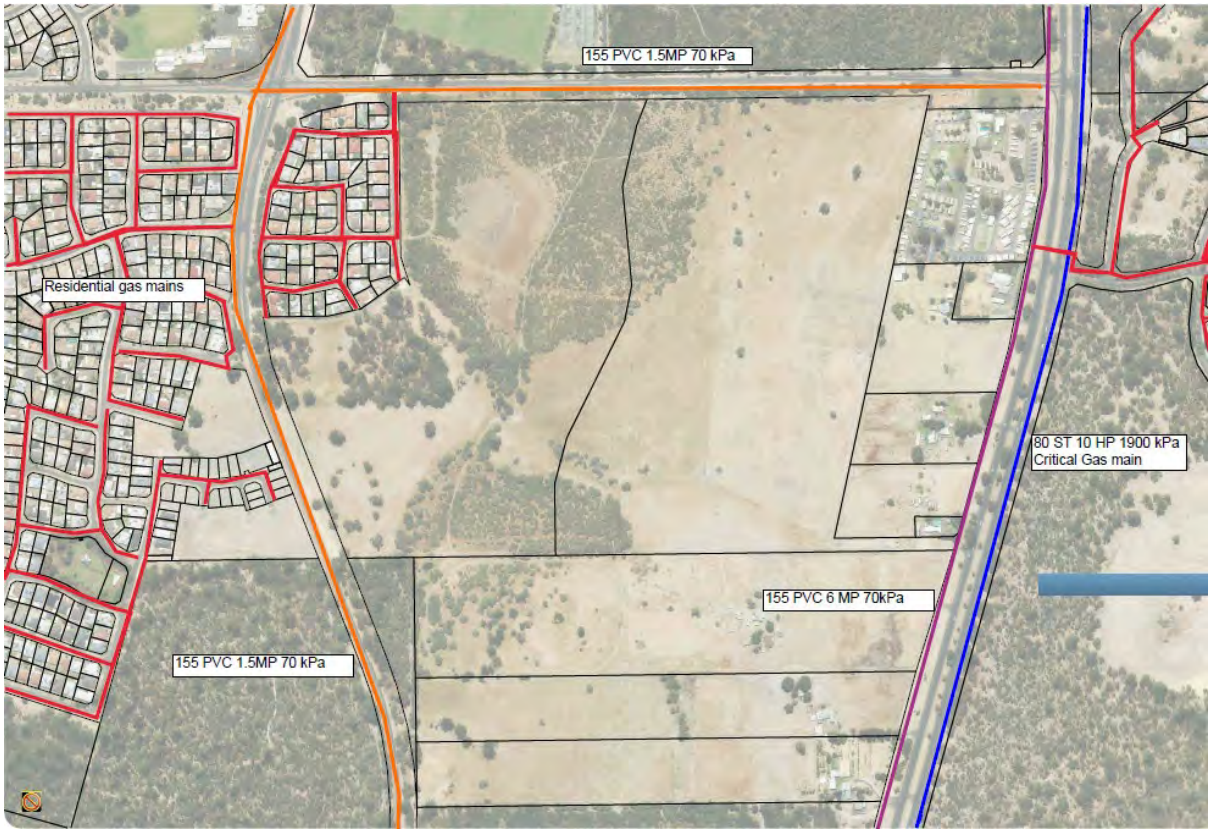


Figure 41 ATCO Gas Mains (DBD Oct 2023)

5 STAGING AND SERVICING STRATEGY

The development of the lots in the Tuart Brook Structure Plan area is suggested in a staged manner as shown in Figure 42.

Figure 42 Suggested Staging

Stage 1 allows early release of lots to the west of Parade Road in Lot 800 that can be serviced from existing sewers. A connection to Parade Road is also constructed in this stage. This could possibly be a simple Tee junction with construction of the full roundabout deferred to stage 4 when more lots are connected to the intersection.

Stage 2 then includes the construction of the sewer Pumpstation and pressuremain and the 300-diameter sewer link to grade out the existing Sewer Pumpstation 21. This generates sufficient flow then for operation of the sewer pumpstation before full development occurs.

The sewer pumpstation is prefundable by the Water Corporation and so full costs is refunded one year after construction. The 300 sewer is also reimbursed by Water Corp at a rate of $600/m after completion of construction and handover.

This also allows for initial entry into the estate from Washington Avenue and extension of water into the estate from the north.

The earthworks from the entry road also allows a route for the sewer pressuremain to be installed.

Stage 3 would create the link to Bussell Highway and allow lots to be continued to be released to the south in a frontal manner. This could be an initial unsignalized intersection with later signalisation as traffic numbers require it.

Stage 4 would then create lots accessed from Parade Road and linking back into the estate so that a loop through the estate is established with a crossing of the Regional Open Space link.

Stages 5 and 6 then allow completion of the estate by releasing of the remaining lots at the southern end of the estate.

Key in keeping costs to a minimum on this estate will be the minimisation of earthworks.

The fill levels are controlled by the groundwater levels on the site and the ability to control any rise with a subsoil system.

As a first step these groundwater levels should be reviewed and refined to determine the lowest possible Controlled Groundwater level that will be possible on this site. This will then set the required fill levels for the site.

Secondly the drainage strategy for the site should be reviewed to possibly increase the number of basins at the outlets so as to minimise pipe run lengths and sizes to each discharge point.

The flows from the already developed Lot 800 also need to be removed from modelling figures to again reduce basin sizes for the western catchments.

The sewer planning also requires updating to reflect

- Reduced flows from College Grove as some areas now sterilised from development as reserved for Conservation Purposes
- Lots west of Parade Road are connected to existing sewers and no longer grade to the new proposed sewer pumpstation.

Early application should also be made to Western Power for the first stage of development to determine the point of supply and any upgrades required to service the new sewer pumpstation and associated lots. This can currently take in excess of 12 months for a response from Western Power.

6 REFERENCES

BCE (2013) Tuart Brook Site Feature Survey

Bioscience (2011), Wetland Management Plan 500 Washington Avenue Usher

DVC (2023) Donald Veale Consultants Tuart Brook Structure Plan Transport Assessment Report, May 2013.

Douglas Partners (2011) Geotechnical Investigation on Lots 4 and 8 Bussell Highway

Douglas Partners (2013) Geotechnical Investigation on Lots 800 to 802 and 501 Bussell Highway

DWER (2023) DWER Floodplain mapping tool

Edgeloe Engineering (2023) Flynnwood Stage 3 Engineering Plans

GED (2010) Gabriels Environmental Design, Tuart Brook Structure Plan, Traffic Noise Assessment, May 2010

Harley Dykstra (2023) Tuart Brook Draft Structure Plan

Hyd2o (2013) Tuart Brook Precinct, Local Water Management Strategy

MPM (2014) Tuart Brook Local Structure Plan, May 2014 (Final)

MPM (2015) Local Water Management Strategy Lot 8 Parade Road, Usher

Appendix E Transport Impact Assessment

November 2023

Final Rev.3

Structure Plan for Tuart Brook, Usher

Prepared For:

Kingslane Group

Transport Impact Assessment Review Report

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DOCUMENT ISSUE AUTHORISATION

Issue	Rev	Date	Description	Prepared By	Checked By	Approved By
0	0	16/05/2023	Draft Report	SGY	DNV	DNV
1	0	31/05/2023	Final Report	SGY	CS	SGY
1	1	25/10/2023	Final Report Rev.1 – Revised Plan	SGY	DNV	DNV
1	2	31/10/2023	Final Report Rev. 2	SGY	DNV	DNV
1	3	2/11/2023	Final Report Rev. 3 – Conclusions added	SGY	DNV	DNV

Donald Veal Consultants Pty Ltd

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PAGE

1. INTRODUCTION

1.1 BACKGROUND

The Tuart Brook Structure Plan was approved in 2013. The proposed development, located in Usher within the City of Bunbury, included residential lots with densities of R20, R30, R40 and R60; a local centre; a primary school; and regional and public open space. However, the original Transport Impact Assessment supporting the approved Structure Plan relied on traffic modelling and assumptions that have since changed, particularly with the approval and commencement of the Bunbury Outer Ring Road.

Kingslane Group has therefore commissioned Donald Veal Consultants to prepare this report as a review of the previous Transport Impact Assessment. The review has taken account of the changed circumstances and incorporates the latest traffic modelling supplied by Main Roads WA.

1.2 SCOPE OF THIS REPORT

The structure and scope of this Transport Assessment are in accordance with Volume 2 (Planning Schemes, Structure Plans and Activity Centre plans) of the Western Australian Planning Commission's (WAPC) Transport Impact Assessment Guidelines (2016).

This revised version of the report also reflects the most recent development layout plans, which includes an area of aged care housing in the north-east section, and a revised access arrangement from the site onto Bussell Highway, which is now limited to left in and left out movements only.

1.3 CONSULTATION WITH AUTHORITIES

DVC has contacted both the City of Bunbury and MRWA to discuss their position regarding the provision of a Left in – left out only access from the development onto Bussell Highway, but has not received any response as yet.

Given that the originally approved application included a full movement intersection, and that the construction of the BORR will reduce traffic flows on Bussell Highway once completed, it is envisaged that the new proposal, including a left in – left out arrangement, will result in a lower overall impact on Bussell Highway than previously forecast.

2. EXISTING SITE CONDITIONS

2.1 LOCATION

The site lies within the City of Bunbury, in the suburb of Usher. It is located approximately 800m south of the South West Health Campus, and only 6.5km south of the City of Bunbury CBD. Major arterial roads within close proximity include Bussell Highway to the east. **Figure 2.1** indicates the location of the site in a regional context. **Figure 2.2** shows the locality of the site.

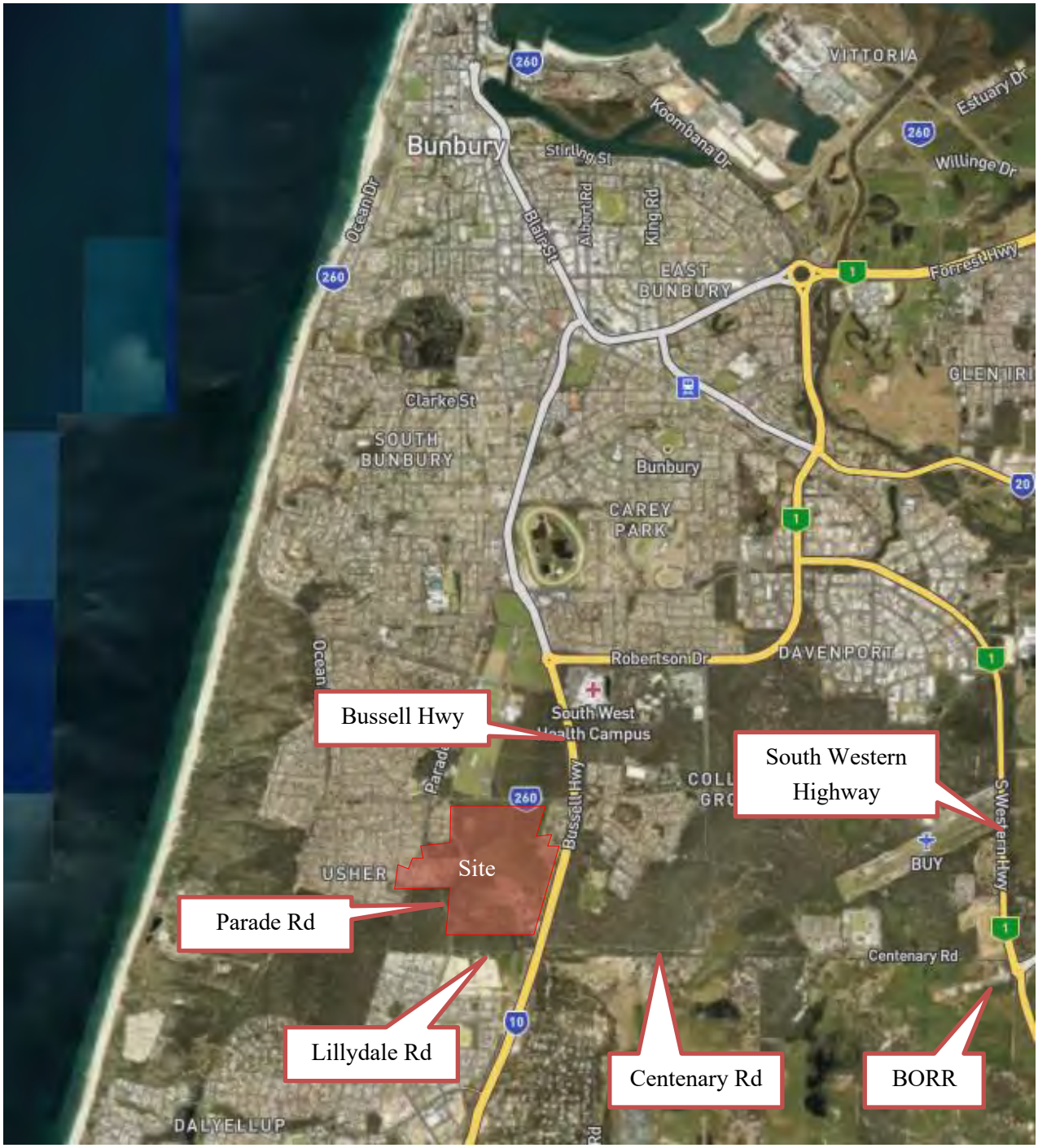

Figure 2.1: General Locality Plan ***(Source: MertroMap)***

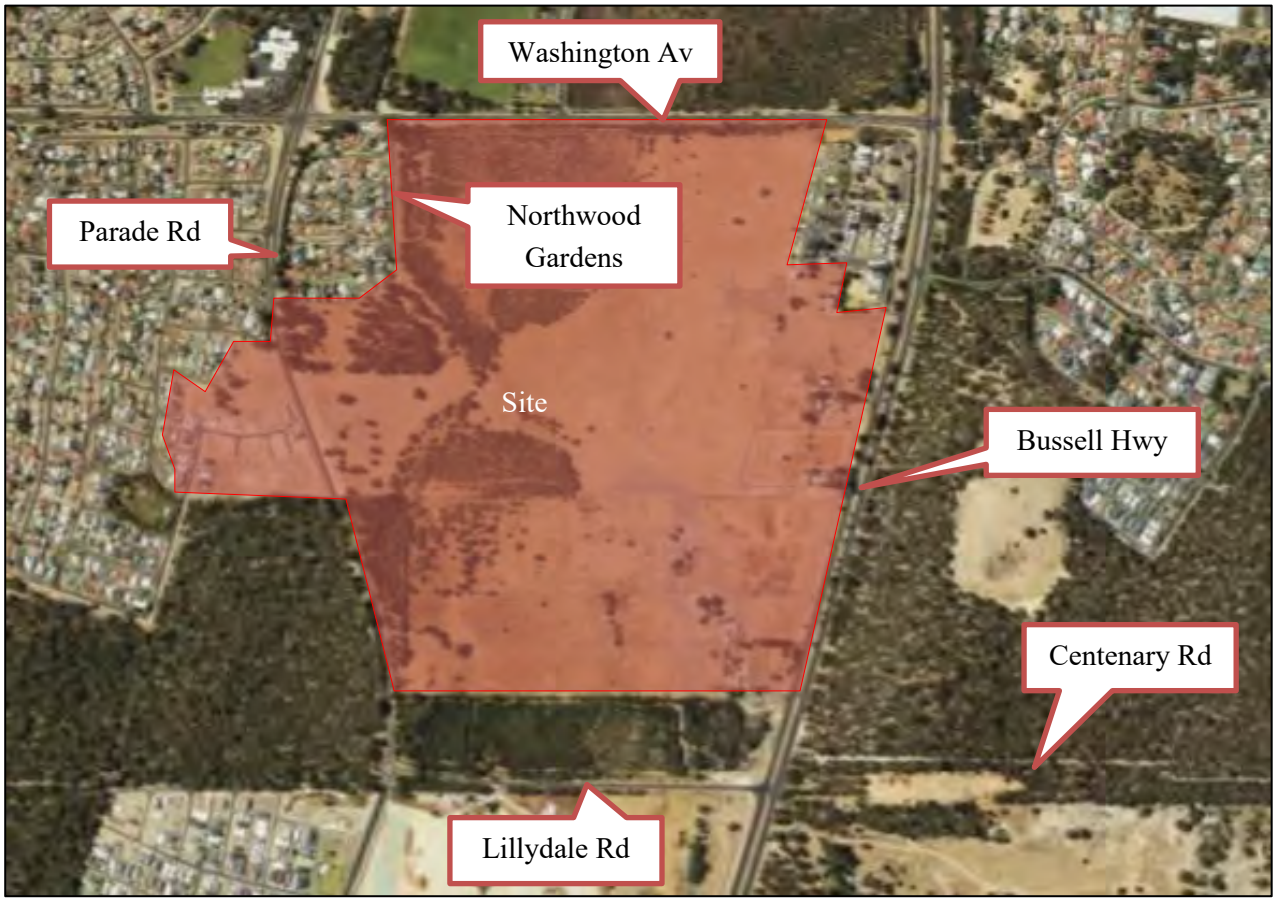

Figure 2.2: Site Location *Source: MetroMap*

2.2 CURRENT LAND USES

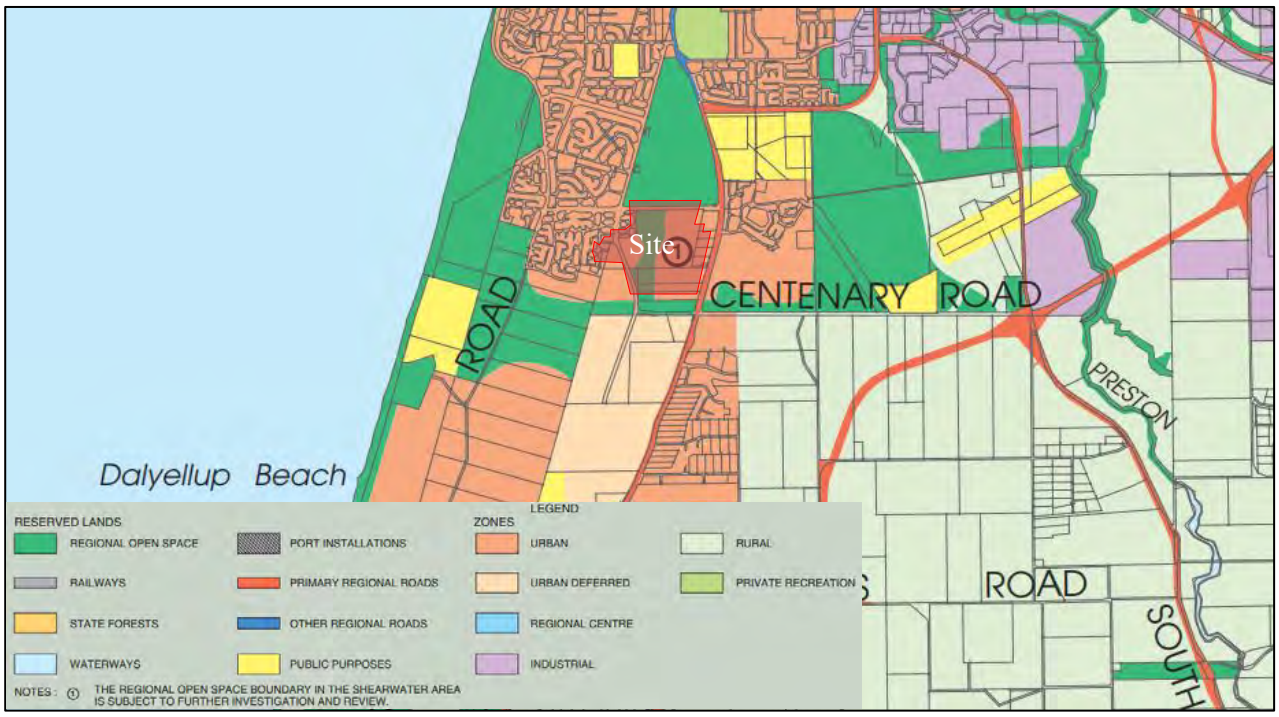

Figure 2.3: Greater Bunbury Region Scheme *(Source: WA Gov)*

The subject land is mostly undeveloped at present, with only around six properties located along the east side of the proposed Structure Plan area and a number of developed dwellings along the west side.

Photo 1: The site is currently undeveloped.

Other land uses in this area include residential dwellings and vacant land, whilst there are a number of sporting and educational facilities, mainly to the north of Washington Avenue.

Photo 2: There are sporting facilities located to the north of Washington Avenue.

2.3 ADJACENT ROAD NETWORK

The road network adjacent the site consists primarily of Washington Avenue to the north, Parade Road to the west and Bussell Highway to the east. Other prominent roads in the vicinity of the site include Lillydale Road, (formerly Centenary Road), just to the south.

2.3.1 Road Hierarchy

As shown in **Figure 2.4,** Bussell Highway is classified as a 'Primary Distributor' road under Main Roads WA's (MRWA) Functional Road Hierarchy. This classification is applied to roads which:

"...Provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes and all are State Roads. They are managed by Main Roads Western Australia." (MRWA).

Figure 2.4: Road Hierarchy Map ***(Source: MRWA)***

Washington Avenue and Parade Road are classified as 'Local Distributor' roads under MRWA's Functional Road Hierarchy. This classification is applied to roads which:

"...carry traffic within a cell and link District Distributors or Primary Distributors at the boundary, to access roads. The route of Local Distributors should discourage through traffic so that the cell formed by the grid of higher order distributor roads, only carries traffic belonging to, or serving the area. Local Distributors should accommodate buses, but discourage trucks" (MRWA).

These roads are managed by the local government authority.

Other roads within or abutting the site are classified as *Access Roads*. These include Lillydale Road; Northwood Garden; Crampton Avenue and Dudley Drive. This classification is applied to roads which:

"...provide access to abutting properties with safety aspects having priority over the vehicle movement function. In urban areas, these roads are bicycle and pedestrian friendly, with aesthetics and amenity also important" (MRWA).

These roads are owned and operated by the City of Bunbury.

2.3.2 Speed zoning

The posted speed limit on Bussell Highway changes from 70 km/h to 80 km/h just south of the Somerville Drive intersection, as shown in **Figure 2.5**.

Figure 2.5: Speed Limit Map ***(Source: MRWA)***

Washington Avenue has a posted speed limit of 80 km/h from its intersection with Bussell Highway to mid way between Rotary Avenue and Northwood Gardens, where it reduces to 60 km/h.

The speed limit along Parade Road varies between 60 and 70 km/h, with the slower zones at either end, both south of Washington Avenue and north of the Lillydale Road roundabout.

2.3.3 Road construction

Bussell Highway is constructed as an unkerbed, divided carriageway road. It has two lanes in each direction with lane markings and sealed shoulders. The approximate pavement width is 9.2m in each direction, including the sealed shoulders. There is a recently constructed shared path along the western verge. The speed limit is 80 km/h. The road is orientated in a north-south direction connecting to Lillydale Road to the south and Washington Avenue to the north.

Photo 3: Bussell Highway northbound carriageway, looking north from a property access. Note PSP on left.

The intersection of Bussell Highway with Somerville Drive is located some 250m south of Washington Avenue, and provides access to the College Grove development to the northeast of the subject site. The intersection is unsignalized, and provides full movements. There are three private accesses onto Bussell Highway from existing properties on the eastern side of the subject site between the intersections with Centenary Road and Somerville Drive.

Washington Avenue is constructed as an unkerbed, two lane undivided single carriageway road with cycle lanes in each direction. See **Photo 4**.

Photo 4: Washington Avenue, looking east.

The overall carriageway width is around 10.4m, including two 1.8m cycle lanes. The speed limit is 80 km/h decreasing to 60 km/h just east of the intersection with Northwood Gardens. The road is orientated in a west-east direction connecting to Parade Road (to the west) and Bussell Highway (to the east).

There is a school zone on Washington Avenue, to the west of its intersection with Parade Road. This has an associated speed limit of 40 km/h from 7:30 am to 9:00 am and 2:30 pm to 4:00 pm on school days.

Northwood Gardens is constructed as a kerbed, two lane undivided single carriageway with no lane markings.

Photo 5: Intersection of Washington Avenue with Northwood Gardens. Note cycle lanes and bus stop.

The pavement width is approximately 7.2m with a 2.0m wide footpath on the eastern side. The built up area speed limit of 50 km/h applies. The road is orientated in a north-south direction connecting to Washington Parade (to the north) and ending with a turning head (to the south). This road serves as access from the existing residential development and will be connected into the proposed road network within the subject site. See **Photo 5**.

The section of Parade Road adjacent to the site is an unkerbed, two lane undivided single carriageway road. The approximate pavement width is 7.2m. There is a footpath along Parade Road from Washington Avenue to Crampton Avenue, which is approximately 2.0m wide. South of this, a new PSP has been constructed, again on the western side of Parade Road, which continues as far as the roundabout at Lillydale Road (previously known as Centenary Road). See **Photos 6 & 7**.

The speed limit on Parade Road is 70 km/h south of Washington Avenue, reducing to 60 km/h just north of Lillydale Road and just south of Washington Avenue. The road is orientated in a north-south direction, with connections to Washington Avenue, Crampton Avenue and Lillydale Road.

Photo 6: Parade Road, looking south. Note PSP on western side.

Photo 7: New roundabout at the intersection of Parade with Lillydale.

2.4 EXISTING TRAFFIC VOLUMES

The latest available traffic counts on Bussell Highway were sourced from the MRWA Traffic Map. This showed that in 2021/22 AADT adjacent the site was just under 31,000 vehicles per day (vpd), of which 8.0% were heavy vehicles. See **Figure 2.6**.

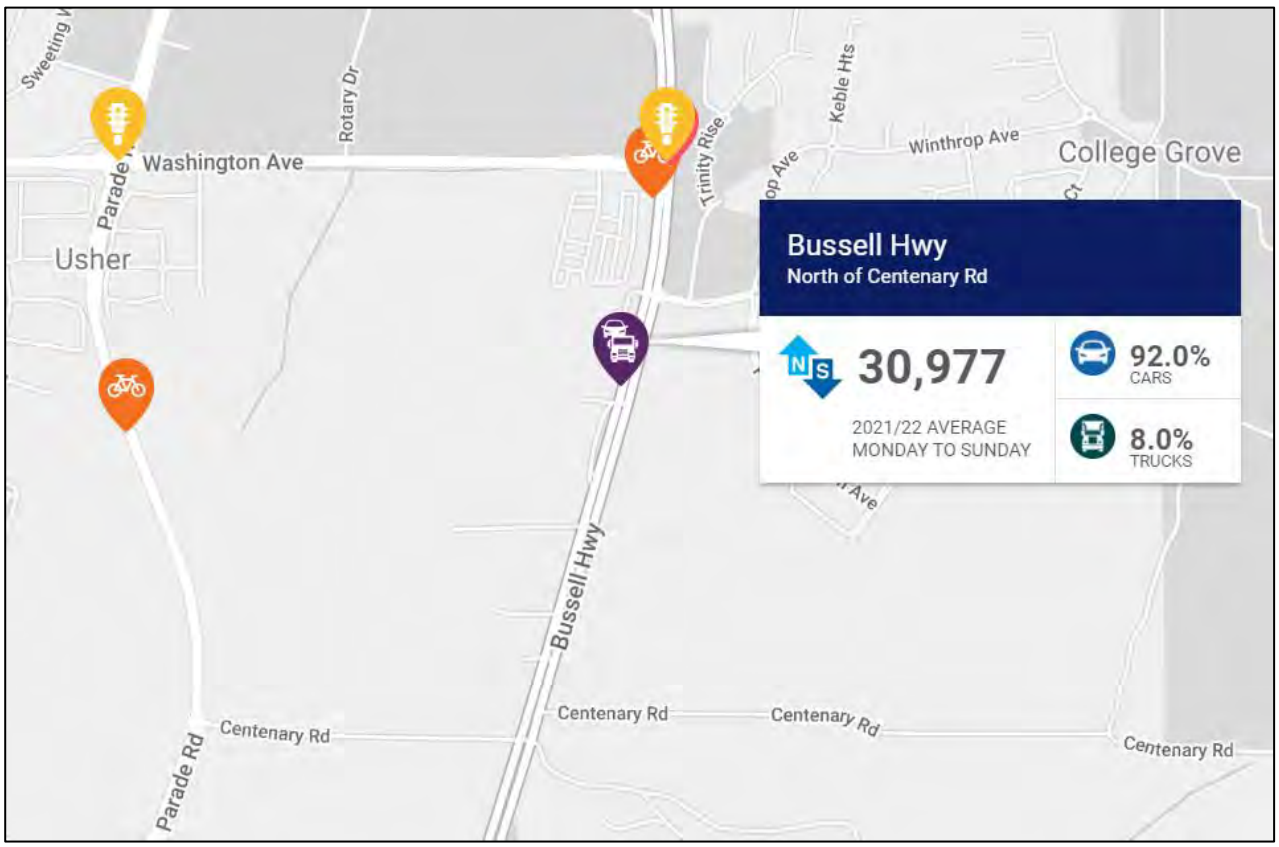

Figure 2.6: Traffic Counts

SCATS data was also available for the signalised intersections of Washington Avenue with Bussell Highway and with Parade Road.

This showed that Washington Avenue carried around 4,800 vpd, at its Bussell Highway end, and around 4,200 vpd near the Parade Road intersection. Parade Road, south of Washington Avenue, carried around 10,600 vpd.

2.5 CRASH HISTORY

Crash data was sourced from the MRWA Crash Map and shown graphically in **Figure 2.7**.

As can be seen, the vast majority of the crashes recorded along Bussell Highway near the site, and at its various intersections, are rear enders.

The intersection of most concern in terms of the recorded crashes would be that of Washington Avenue with Parade Road. Of the six crashes recorded at this signalised intersection, three were right angle crashes, with another being thru and right. Two of the crashes resulted in a hospital visit.

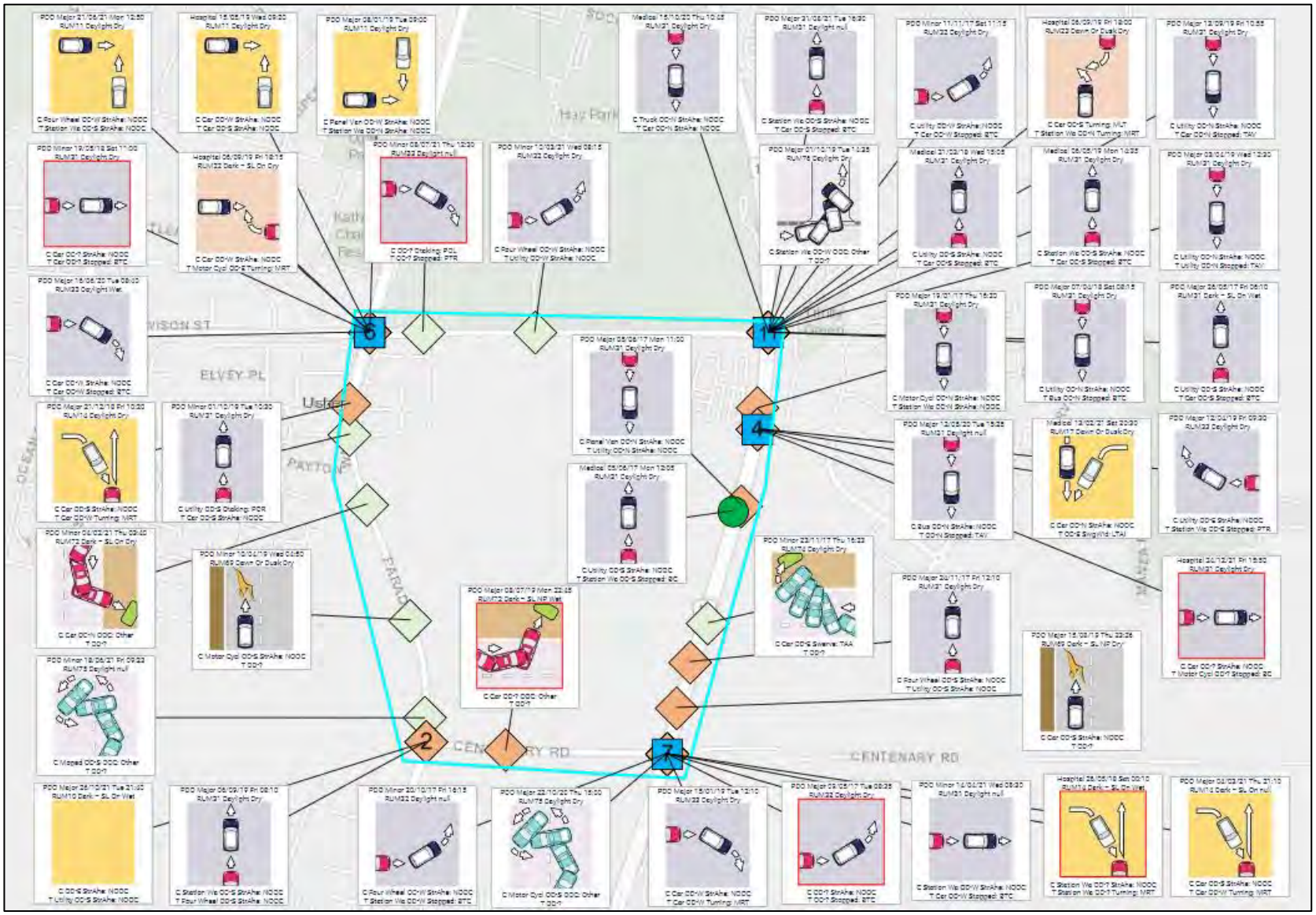

Figure 2.7: Crash History ***(Source: Crash Map MRWA)***

3. STRUCTURE PLAN PROPOSALS

3.1 STRUCTURE PLAN AREA

The structure plan area and the latest indicative internal layout are shown in **Figure 3.1**.

Figure 3.1: The Structure Plan area.

3.2 PROPOSED SITE ACCESSES

The proposed access points to the site will be via a new left in left out (LILO) intersection with Bussell Highway, a new intersection with Washington Avenue, a new roundabout on Parade Road, and via links to the existing road network in the Northwood Gardens area. There will be no direct access to Lillydale Road.

Although the previously approved application included a full movement intersection onto Bussell Highway, this option has now been replaced with a simpler left in left out arrangement. The impact of this change is not expected to be significant, as the number of vehicles forecast to turn right in and out of the site was relatively low, and alternative options are readily available.

The proposed layouts for the new access points can be seen in the SIDRA analyses in section 4.10.

3.3 INTERNAL ROAD NETWORK

3.3.1 Layout

As the proposed roads are yet to be named, the internal roads have been given identifiers for use in this assessment. Thus, the main west-east connector will be referred to as Road 1, whilst the north south connector will be referred to as Road 2.

3.3.2 Road reservation widths

The indicative road reserve widths of the new proposed internal road network will lie generally in the range from 20m for the major connectors to 15m for the minor access streets. These widths are reasonably consistent with the range of 14.2m to 24m suggested in Liveable Neighbourhoods (WAPC 2009) as indicative reserve widths for access streets (those that accommodate shared pedestrian, bike and vehicle movements).

The lower reserve width is generally for shorter, low volume and low parking demand streets. The higher reserve width allows for a median and/or additional road features such as paths to be incorporated. Roads abutting POS may also have their reserve widths reduced.

At this stage, with the exact lot layouts still to be determined, these widths remain flexible. Issues such as the need for localised widening near certain intersections, and the potential for on road facilities such as cycle lanes and parking bays may affect the final widths and cross sections in those areas.

Whilst both Road 1 and Road 2 are expected to be designated as Neighbourhood Connector B roads, with a road reserve width of 18m to 20m, other factors, as identified in section 3.3.3, may affect this. See **Figure 3.2**.

Figure 3.2: Indicative road reserve widths

3.3.3 Road cross sections and speed limits

As stated above, at this stage, the cross sections for the internal road network remain flexible. **Figures 3.4 to 3.7** show sample cross sections for various categories of access roads as outlined in *Liveable Neighbourhoods* (WAPC 2009). These offer a basis for the final layouts, the detail of which will be determined at a later design stage.

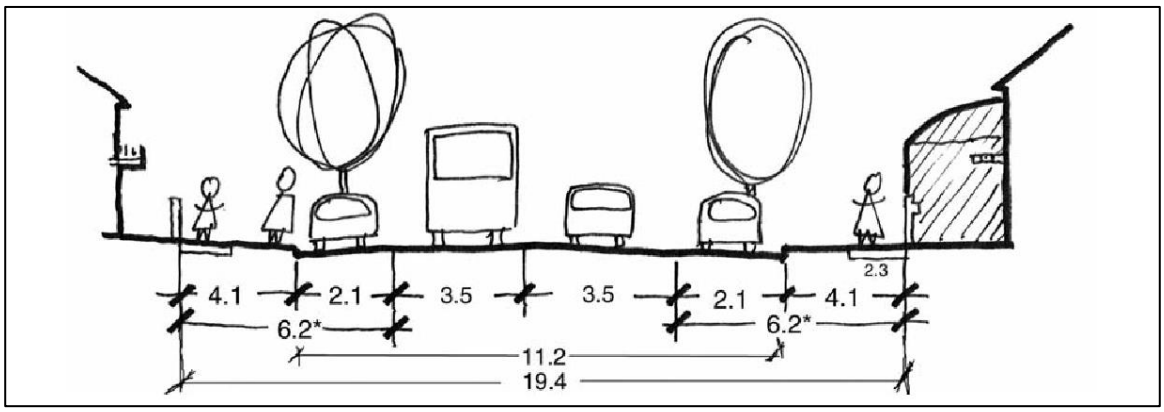

Figure 3.3: Sample Road Cross Section, Neighbourhood Connector B, 50 km/h (<3000 vpd)
Source: Liveable Neighbourhoods WAPC (2009)

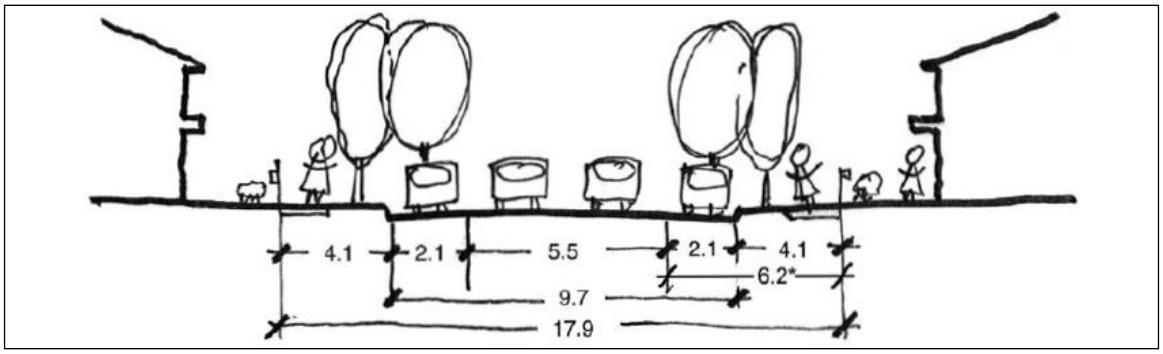

Figure 3.4: Sample Road Cross Section, Access Street B, 40 km/h <3000 vpd
Source: Liveable Neighbourhoods WAPC (2009)

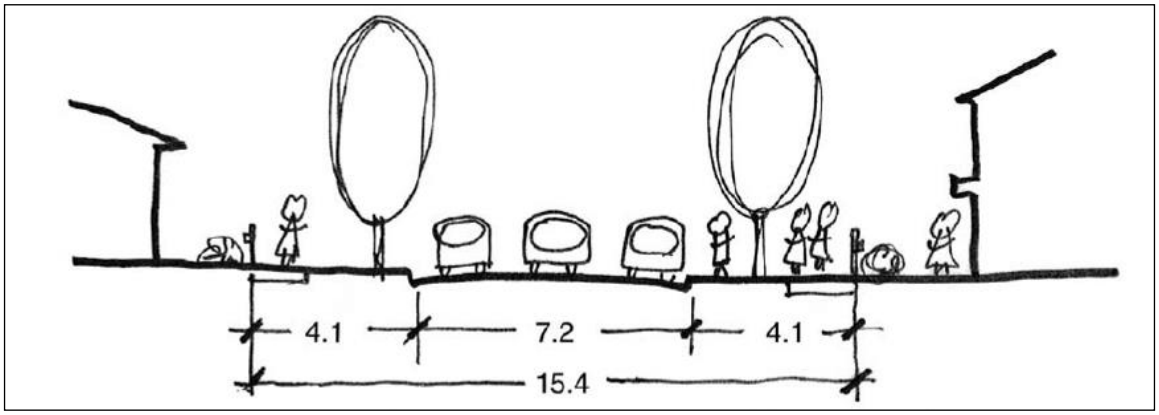

Figure 3.5: Sample Road Cross Section, Access Street C - Yield Access Street, 40 km/h, <3000 vpd
Source: Liveable Neighbourhoods WAPC (2009)

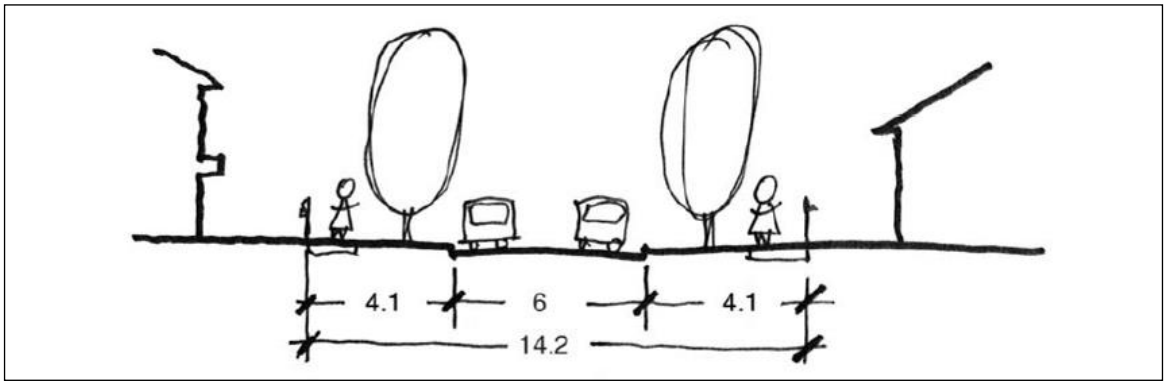

Figure 3.6: Sample Road Cross Section, Access Street D - Narrow Yield Access Street, 40 km/h, <1000 vpd
Source: Liveable Neighbourhoods WAPC (2009)

The existing section of Northwood Gardens has a 7.2m pavement with a 2.0m wide path on the eastern side, similar to an Access Street C. However, its intended function is that of a local distributor road, and as such, would be classified as a Neighbourhood Connector B.

The major internal roads within the structure plan are likely to carry between 1,000 and 3,000 vpd, hence it would be considered appropriate to adopt designs similar to those for Neighbourhood Connector B and Access Street B. However, despite the lower projected traffic flows, consideration should be given to classifying Road 1 as a Neighbourhood Connector A, due to the presence of the primary school and the possibility of it being both a public transport route and a shared path route. Other larger roads may also be upgraded to Neighbourhood Connector B to reflect the potential for them to feature on-road bicycle lanes.

The designation of roads as Neighbourhood Connectors A or B has implications for the number and location of crossovers to fronting properties. This and other factors, such as the need for on street parking and the resultant overall road reserve requirements, will need to be addressed when the lot layouts are finalised during later design stages.

Access Street C should be considered for the streets that are fronting higher residential densities. Note that the width of the verge can be reduced for sections fronting public space. The proposed speed limit is 50 km/h, as per the requirement for built up areas. It should be noted however that the target speed as defined by Liveable Neighbourhoods with respect to the cross sections is 40 km/h.

3.3.4 Intersection controls

All of the intersections within the proposed internal road network are indicated on the structure plan drawings as being T-intersections. The only current exception is the intersection of Road 1 with Parade Road, which is shown as a roundabout.

Intersection separation may need to be checked for compliance during the detailed design process.

3.4 EXTERNAL ROAD NETWORK

3.4.1 Changes proposed as part of the structure plan

There are a number of minor residential roads to the northwest of the structure plan area that currently end at the site boundary. These links will be extended into the site to join up with the internal road network. As

part of this, Liam Street will be extended to form the western end of Road 1, which will then intersect with Parade Road. This will result in increased traffic along the existing section of Liam Street, which may need to be monitored.

The proposed internal road network will also result in the creation of four new intersections with the external road network. The intersection of Road 1 with Parade Road will form a roundabout, whilst the other three will be T-intersections.

3.4.2 Other Planned Changes to the road network

The construction and opening of the Bunbury Outer Ring Road (BORR) may have a significant effect on the amount of traffic using Bussell Highway over the coming years.

Future year traffic modelling was therefore requested from MRWA in order to quantify this forecast reduction, and the effect on the accessibility of the site direct from Bussell Highway. The modelling received from MRWA was from the Bunbury Transport Model (BTM), and consisted of a 2021 validation plot, and 2021 and 2041 forecast link volume plots. No scenario plots for 2031 were available.

The modelling was supplied with a list of provisos, including the following:-

The ratio/split of traffic using the BORR-Bussell route vs the BORR-Centenary-Bussell route (the southern end of BORR) is highly sensitive as these two routes have very similar travel times in the model. Where figures are referenced in this area (on either route), further consultation with Main Roads is required. Depending on the area of interest and what the data is being used for there may be a need to undertake further reviews of the model outputs, sensitivity analysis or other checks. Once there is clarity of the type of information being sought from the BTM, decisions can be made with Main Roads on what, if any adjustments/further analysis is required to provide realistic volumes around Bussell Hwy/BORR South and associated areas.

The width of the Parade Road road reserve, south of Crampton Avenue, appears to have been designed with the intention for the road to be dualled at some point in the future.

It is noted that the MRWA website, showing the planned alignment for the Bunbury Outer Ring Road, indicates that there will be a link between the BORR and the Bussell Highway / Lilydale Road intersection.

This link is included in the modelled future year networks provided by MRWA. The indicated traffic flows can therefore be taken to reflect any potential increase in the volumes of traffic on Parade Road as a result of the link. As part of this work, the Bussell Highway / Lilydale Road intersection will be upgraded to a roundabout.

See **Figure 3.8**.

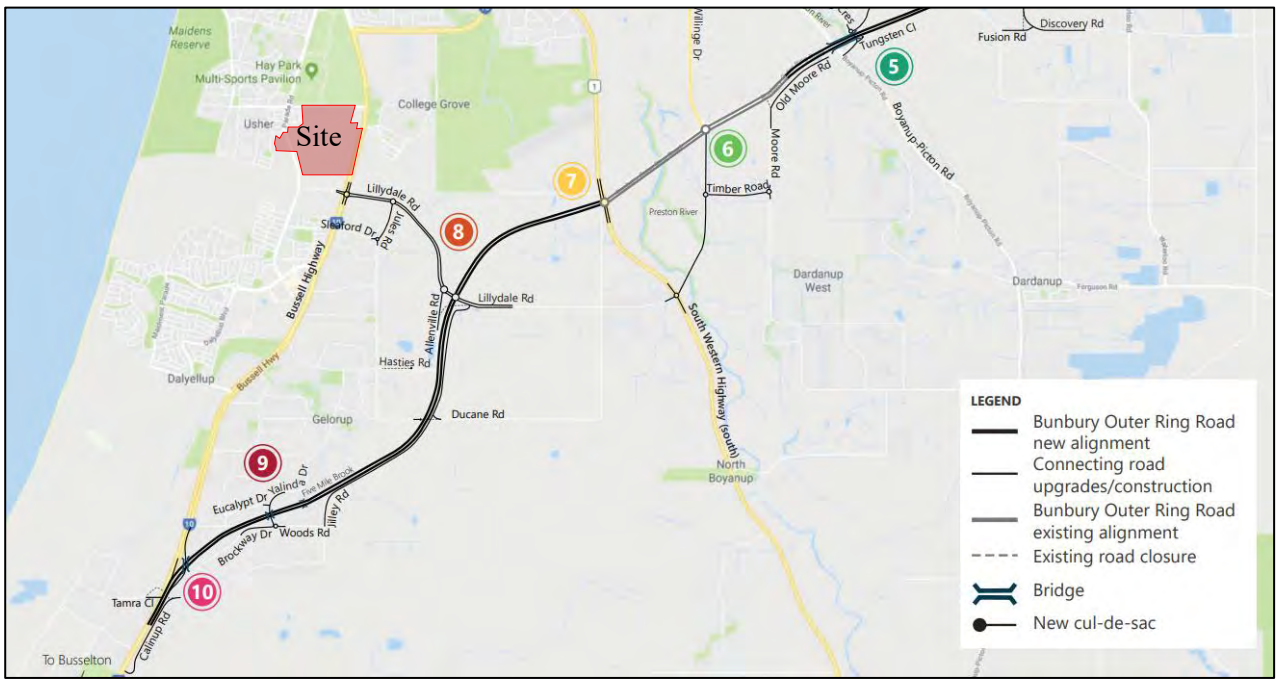

Figure 3.7: Bunbury Outer Ring Road

4. ANALYSIS OF TRANSPORT NETWORKS

4.1 ASSESSMENT PARAMETERS

This transport assessment has been undertaken assuming full development of the structure plan, which includes the further subdivision of numerous existing residential lots together with a proposed primary school and a local centre.

4.2 STRUCTURE PLAN GENERATED TRAFFIC

For the purposes of the transport assessment, the Structure Plan area has been divided into 7 traffic zones as shown in **Figure 4.1**.

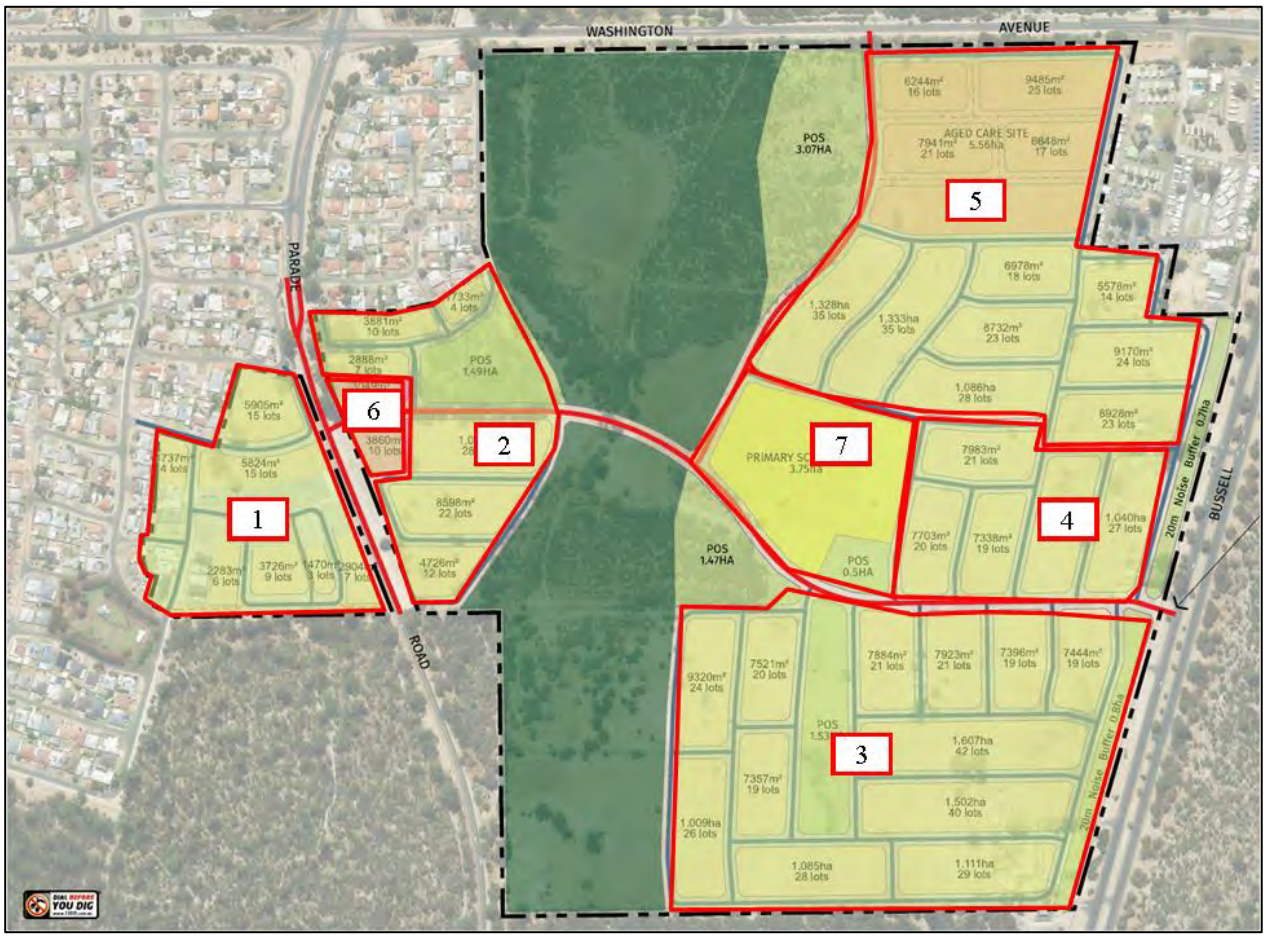

Figure 4.1: Trip Generation Zones.

Zones 1 to 4 are residential, Zone 5 includes residential and aged care, with the commercial area being Zone 6 and the Primary School Zone 7. Advice provided by Kingslane Group is that the Gross Floor Area (GFA) of the proposed commercial land uses will be around 1,200m^2, whilst the primary school is expected to cater for around 450 pupils.

In order to determine the traffic generation for the proposed development, trip generation rates were sourced from the WAPC Guidelines, the ITE's "Trip Generation Manual" and the RTA's "Guide to Trip Generating

Developments, Road Traffic Authority (NSW) (2002)". **Table 4.1** shows these rates and the breakdown of inbound and outbound trips for the peak hours estimated traffic generation based on them.

Table 4.1: Land Use Trip Rates

			AM Peak Hour trip rate			PM Peak Hour trip rate			Daily Trip Rate		
Source	**Land Use**	**Unit**	**In**	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
RTA	**Residential**	Dwellings	0.21	0.64	0.85	0.53	0.32	0.85	4.5	4.5	9
RTA	**Residential (R30)**	Dwellings	0.21	0.64	0.85	0.53	0.32	0.85	4.5	4.5	9
RTA	**Residential (R40)**	Dwellings	0.15	0.45	0.60	0.38	0.23	0.60	3	3	6
RTA	**Residential (R60)**	Dwellings	0.11	0.40	0.50	0.33	0.18	0.50	2.5	2.5	5
RTA	**Housing for aged**	Dwellings	0.07	0.13	0.2	0.12	0.08	0.2	1	1	2
ITE	**School**	Pupils	0.49	0.32	0.81	0.08	0.09	0.17	1.24	1.24	2.48
WAPC 02	**Commercial**	100m2 GFA	1.6	0.4	2	0.4	1.6	2	5	5	10

The proposed development is estimated to generate 8,930 vehicle trips per day (vpd), including up to 1,177 and 889 am and pm peak hour trips, respectively. The forecast peak hour and daily trips are shown in **Table 4.2**.

Table 4.2: Forecast Daily and Peak Hour trips

Zone	**Land Use**	**Quantity**	**AM Peak Hour Trip**			**PM Peak Hour Trip**			**Daily Trip**		
			In	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
1	Residential	59	13	38	50	31	19	50	266	266	531
2	Residential	83	18	53	71	44	26	71	374	374	747
3	Residential	308	65	196	262	164	98	262	1,386	1,386	2,772
4	Residential	115	24	73	98	61	37	98	518	518	1,035
5	Residential	200	43	128	170	106	64	170	900	900	1,800
	Housing for aged	119	8	15	24	14	10	24	119	119	238
	Subtotal	319	51	143	194	121	73	194	1,019	1,019	2,038
6	Commercial	6,909	111	28	138	28	111	138	345	345	691
7	School	450	222	142	365	37	39	77	558	558	1,116
	Total		504	673	1,177	486	403	889	4,465	4,465	8,930

4.3 PEAK PERIOD FLOWS

Peak hour flow conversion factors were obtained through current volumes recorded on MRWA's Traffic Map. These show that the traffic volumes on Bussell Highway amount to 7.4% of all day in the AM peak hour, and 8.3% in the PM peak hour. It can also be determined from this source that the AM peak flows are split 64% northbound and 36% southbound. The PM peak is split 42% northbound, with 58% travelling south.

In the absence of other data, and with nothing to indicate that the completion of the BORR would change these splits significantly, we have employed these same ratios in determining Peak Hour forecast flows for Bussell Highway in the future year scenarios.

It is noted that the PM peak of the adjacent road network around the site currently appears to be driven by school based trips, rather than commuter trips that may occur slightly later. On the other hand, the AM peak period of the local road network will coincide with both the commuter peak and the AM school drop off.

However, many of the trips generated by these two land uses may well be shared, as parents drop off their children on the way to work etc. It is also considered likely that both the origin and destination of a significant proportion of the trips generated by the school will be within the structure plan area. i.e. residents of the structure plan area taking their children to and from the local school.

These trips will be 'internal' and will not need to be distributed out onto the wider road network beyond the boundaries of the Structure Plan area.

4.4 TRIP DISTRIBUTION

Of the 8,930 daily generated traffic trips, half are assumed to be inbound and half outbound. The proposed trip distribution patterns are as follows:

- 60% north along Road 1, Parade Road and Bussell Highway towards Bunbury Airport, Edith Cowan University, South West Health Campus and the Bunbury town centre;
- 20% south along Bussell Highway and Parade Road towards Dalyellup (including the proposed Dalyellup District Centre) and Busselton; and
- 20% west along Washington Avenue connecting onto Ocean Drive and accessing the coast.

The daily, am and pm peak hour traffic generation was then calculated for each of the 7 zones based on yield estimates provided by the client.

4.5 TRIP ASSIGNMENT

The main links within and external to the structure plan area have been identified and numbered in order to more readily assign the trips to appropriate routes. The link numbers are shown in **Figure 4.2**.

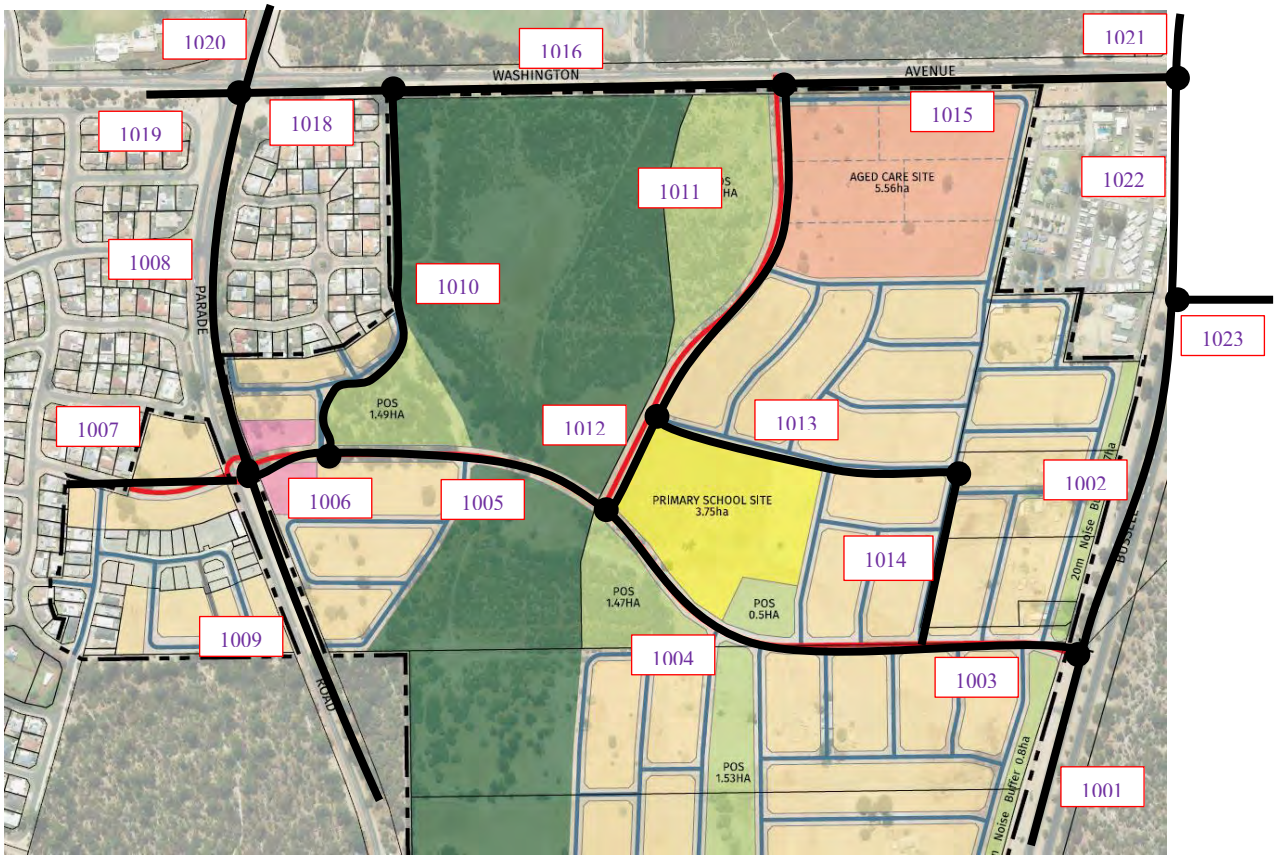

Figure 4.2: Internal and External Road Link Numbers

The daily volumes assigned to each link are shown in **Figure 4.3**.

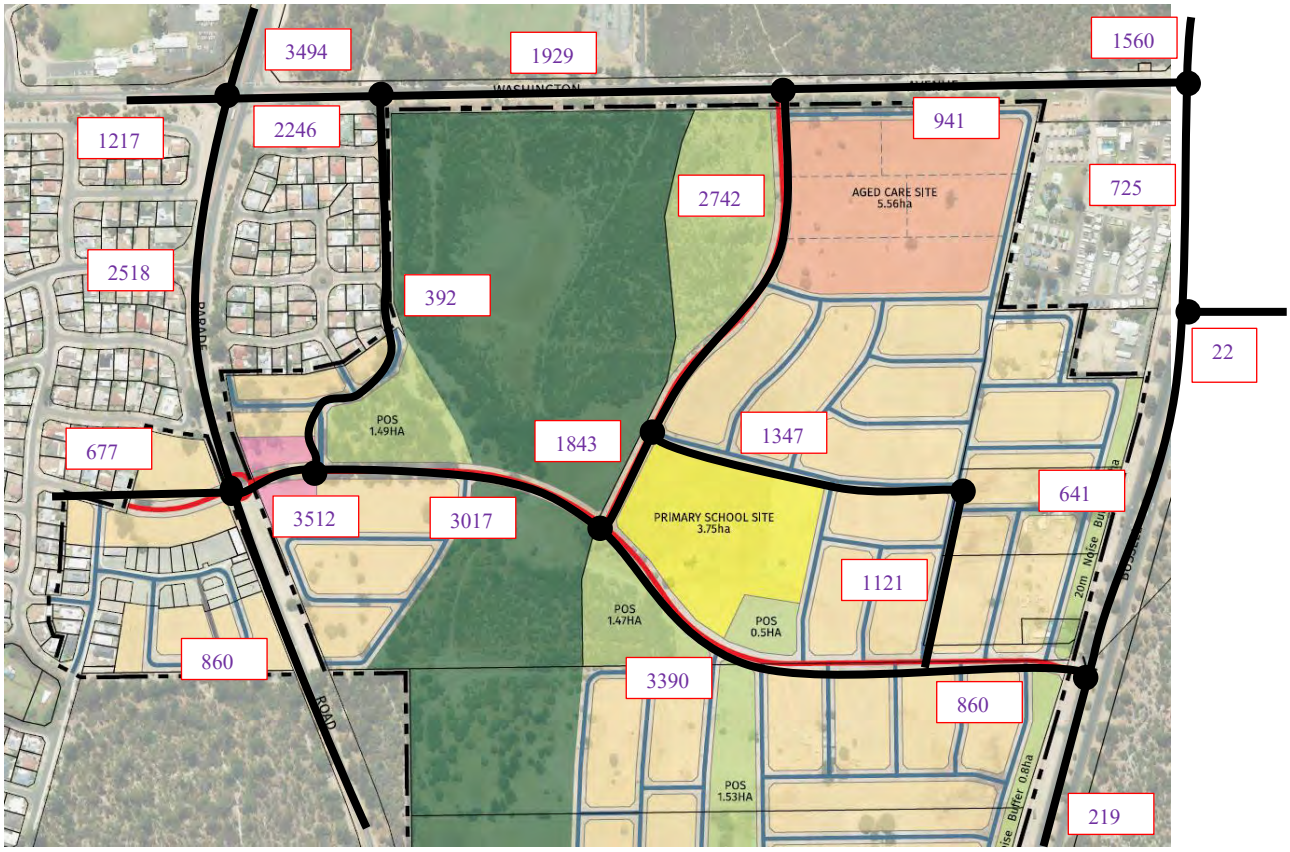

Figure 4.3: Assigned Daily Link Volumes as Generated by the Development

4.6 NON SUBDIVISION TRAFFIC

The level of non-subdivision traffic expected to pass through the structure plan area is minimal. The main road on which extraneous traffic could be expected is the section of Road 1 west of Parade Road, as this provides a potential shortcut from the existing residential units located west of Dudley Drive.

4.7 INTERNAL ROAD ASSESSMENT

The structure plan is expected to generate an average of approximately 8,930 vehicle trips per day.

According to Liveable Neighbourhoods, (WAPC 2009), the indicative maximum volume of traffic suitable for an access street varies from 3,000 vpd based on a pavement width of at least 7.2m and 1,000 vpd based on a pavement width of 5.5-6m. The design traffic flows suggest that the major internal roads will carry just under 3,000 vpd.

Based on the lot layout and connectivity of the surrounding road network it is expected that traffic access/egress will be reasonably well spread between the three main access points, onto Bussell Highway, Washington Avenue and Parade Road. Hence, all other streets within the structure plan are forecast to carry progressively less than 2,000 vpd.

The traffic assessment confirms that all roads are expected to carry traffic volumes appropriate for the road types as defined for neighbourhood and access roads in accordance with the guidelines provided by Liveable Neighbourhoods (WAPC 2009).

4.8 MRWA FORECAST MODELLING

Data from the Bunbury Transport Model (BTM) was provided by MRWA for the 2041 forecast year, in the form of daily link volume plots, together with 2021 validation plots. The 2041 forecast year is likely to represent a planning horizon at which the site will be fully developed, whilst the BORR will also be fully operational through this area.

Currently, the BORR does not have full connectivity, and its effect on the through traffic volumes on Bussell Highway and other associated roads has not been fully realised.

Thus, assuming that full development will have occurred at the latest by 2031, we have used 2041 as the '10 years after full development' planning horizon.

As it is expected that the BORR will be completed in the vicinity of the site well before 2031, it is considered that the 2041 analysis will provide the worst case scenario, with 2031 being less onerous.

As can be seen in **Figure 4.4** below, the 2041 modelling provided by MRWA shows a single zone connector from the Tuart Brook area, with a daily trip generation figure of 6,333 vpd entering the site and 6,333 leaving. All of these trips have been assumed to enter via the connector onto Washington Avenue.

This is standard practise and does not indicate that this is expected to be one of the, (or the only), access points into the site.

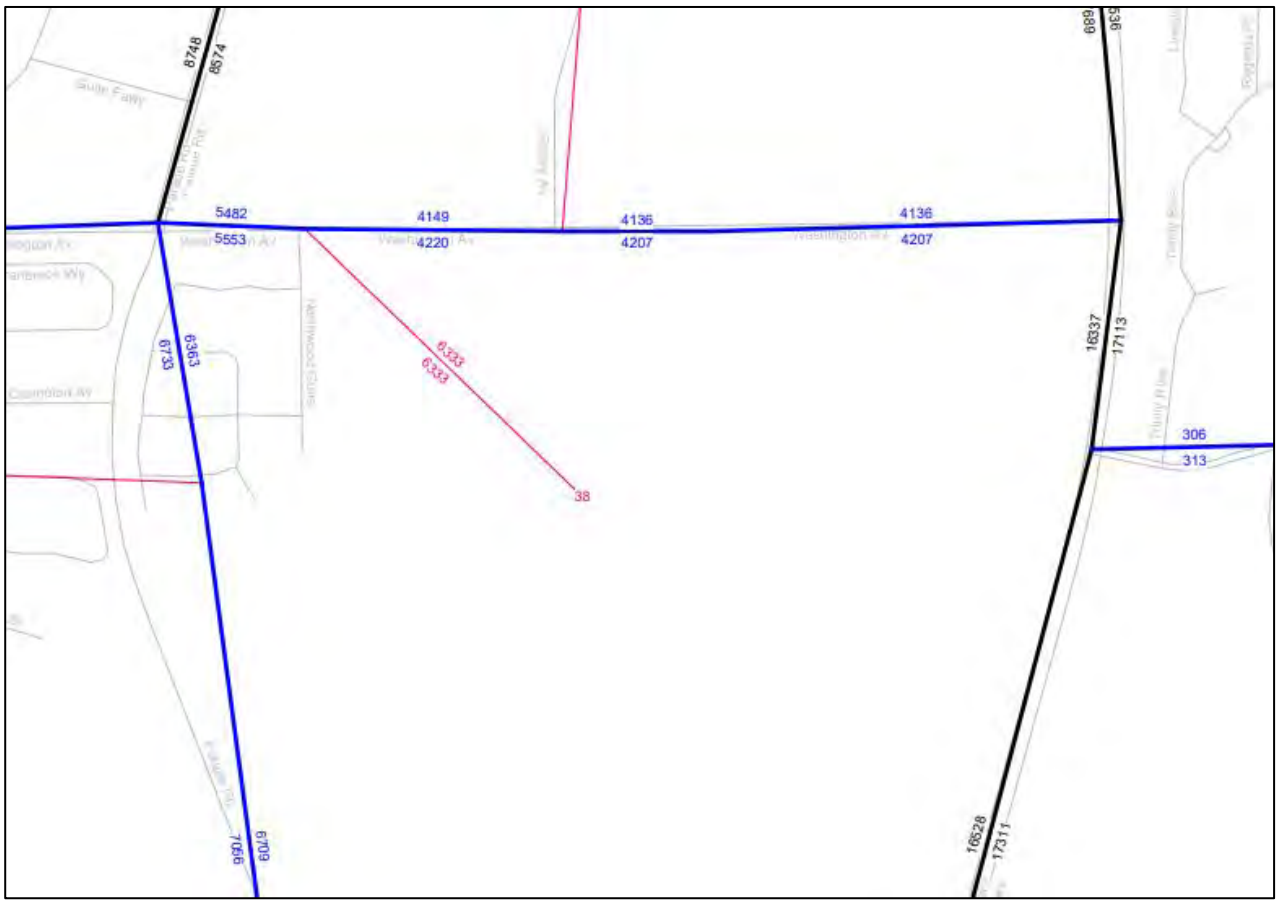

Figure 4.4: MRWA 2041 modelling showing a single Tuart brook zone connector onto Washington Avenue.

It should be noted that the modelling as supplied is strategic in nature, and intended purely to give an indication of the effects of the BORR on the major routes. It is not intended to provide detailed modelling of the local roads.

Nonetheless, as this modelling represents the only available future year forecast data available, and in order to better represent the structure plan layout for the area, DVC produced a revised scenario, based on this strategic modelling. This was achieved by removing the single zone connector and its indicated trips from the network, before adding back in the forecast trips as shown in section 4.2 of this report. These trips were distributed onto the network via the three main accesses, with a smaller number also added to the Northwood Gardens route.

This revised modelling plot was then used in the subsequent analysis.

4.9 MID-BLOCK CAPACITY ANALYSIS

This section reviews the roads external to and/or bounding the development site in terms of their existing cross sections and capacity, and their future forecast (2041) traffic flows.

4.9.1 Bussell Highway

Bussell Highway is a dual carriageway road with two lanes in each direction, which services a number of major trip generators in the Bunbury area. The MRWA traffic modelling indicates that Bussell Highway is forecast to carry in the order of 31,000 vpd by 2041. As this road is designed as a Primary distributor road with two lanes in each direction, its estimated capacity is around 35,000 vpd. It is noted that the modelling indicates that the flows on Bussell Highway adjacent the site are only forecast to grow by around 1,000 vpd between the 2021 and 2041 scenarios. However, it is likely that a slightly higher peak flow may be reached in the interim years, before being reduced by the completion of the BORR.

Calculations show that the Tuart Brook development will generate up to 725 additional daily trips to the section of Bussell Highway south of Washington Avenue. The resultant traffic volumes on Bussell Highway would therefore be around 31,750 vpd, which is in line with the road classification. It can be seen that Bussell Highway has sufficient spare capacity to cater for this additional traffic.

4.9.2 Parade Road

Parade Road runs north/south, just to the west of Bussell Highway, from its intersection with Bussell Highway and Brittain Road, just south of Carey Park, through to its intersection with Norton Promenade, to the south of the Tuart Brook site. North of Crampton Avenue, Parade Road is constructed as a dual carriageway. This section is classified within the MRWA functional hierarchy as a Local Distributor (See **Figure 2.4**).

The remaining section of Parade Road adjacent the Tuart Brook development site, from Crampton Avenue to Lillydale Road, is constructed as a 2-lane undivided carriageway, with a 7.2m pavement. However, this is also categorised as a Local Distributor. The recommended capacity for a road of this type would be ‘a desirable maximum of 6,000 vpd’.

However, the revised MRWA modelling indicates that without the Tuart Brook generated traffic, the section of Parade Road south of Crampton Avenue is expected to carry around 12,300 vpd.

The revised MRWA traffic modelling also indicates that, north of Washington Avenue, Parade Road will carry in the order of 17,300 vpd by 2041. It is estimated that the structure plan development will generate up to 3,500 additional daily trips along this section (refer to **Figure 4.3**). This would increase the total volume on this part of Parade Road to around 20,800 vpd.

Whilst these levels of daily traffic are in excess of the recommended capacity of the existing road configuration for both sections of Parade Road, it can be seen that this is expected to be the case, even without the Tuart Brook structure plan development.

South of the new Lillydale Road roundabout, Parade Road has been upgraded to a divided carriageway, with one lane in each direction.

4.9.3 Washington Avenue

Washington Avenue is constructed to a two lane undivided carriageway standard, with 3.3m traffic lanes and two 1.8m cycle lanes. According to the Main Roads functional hierarchy, the road is classified as a Local Distributor, which can carry up to 6,000 vehicles. In line with this classification, Washington Avenue is likely to be defined by Liveable Neighbourhoods as a Neighbourhood Connector B although existing traffic volumes indicate it carries volumes in line with a Neighbourhood Connector A.

Liveable Neighbourhoods (2009) suggests the indicative maximum volume for a Neighbourhood Connector A is 7,000 vpd. The 2041 volume forecast for Washington Parade, in the vicinity of Parade Road, is around 3,500 vpd, which is well below this level.

It is estimated that up to 2,246 additional daily trips generated by the structure plan will be distributed onto Washington Avenue east of Parade Road, increasing the total volume up to almost 5.750 vpd west of Northwood Gardens, and around 5,500 to the east. The road would still operate within capacity as it does not include any direct property accesses.

4.9.4 Lillydale Road

Lillydale Road is constructed to a two lane undivided carriageway standard with a 7.2m pavement and, according to the MRWA's functional hierarchy, is classified as an Access Road which can carry up to 3,000 vpd.

Despite there being no access to the Tuart Brook subdivision included in the Structure Plan layout, it does provide an additional link between Parade Road and Bussell Highway, giving some residents an alternative route in peak periods.

The accuracy of the 2041 forecast flows for Lillydale Road is unclear. The MRWA plot shows the road carrying 127 vpd eastbound, but 2,652 westbound. The email provided with the plots specifically stated:-

"Please also note Centenary Rd shows 0 volumes between Bussell Hwy and South Western Hwy in the 2021 scenario; this is due to the centroid connector configuration in the area".

4.10 INTERSECTION ANALYSIS

4.10.1 SIDRA

SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

Degree of Saturation: is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.

Level of Service (LOS): is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).

Average Delay: is the average of all travel time delays for vehicles passing through the intersection.

95% Queue: is the queue length below which 95% of all observed queue lengths fall.

A SIDRA analysis was undertaken for the following key new intersections connecting the Structure Plan area with the surrounding road network:-

- Proposed LILO access, Road 1 / Bussell Highway;
- Proposed access onto Washington Avenue; and
- Proposed new roundabout, Road 1 / Parade Road.

Full SIDRA results are included in **Appendix A**.

4.10.2 Proposed intersection of Road 1 with Bussell Highway

The proposed intersection of Road 1 with Bussell Highway was previously modelled as a full movement, unsignalized T-intersection. Whilst this arrangement was shown to work reasonably well, with drivers undertaking the right turn out as a two stage movement, the latest development layout plan now shows this intersection restricted to left in left out movements only, and the trip distribution and assignment has been reworked accordingly.

With a posted speed limit of 80km/h on Bussell Highway, and an estimated design speed of 50km/h for the entry curve, the deceleration lane will need to be, in accordance with Table 5.2 of Austroads Guide to Road design Part 4A (2021), around 85m in length. See **Figure 4.5** for the modelled layout.

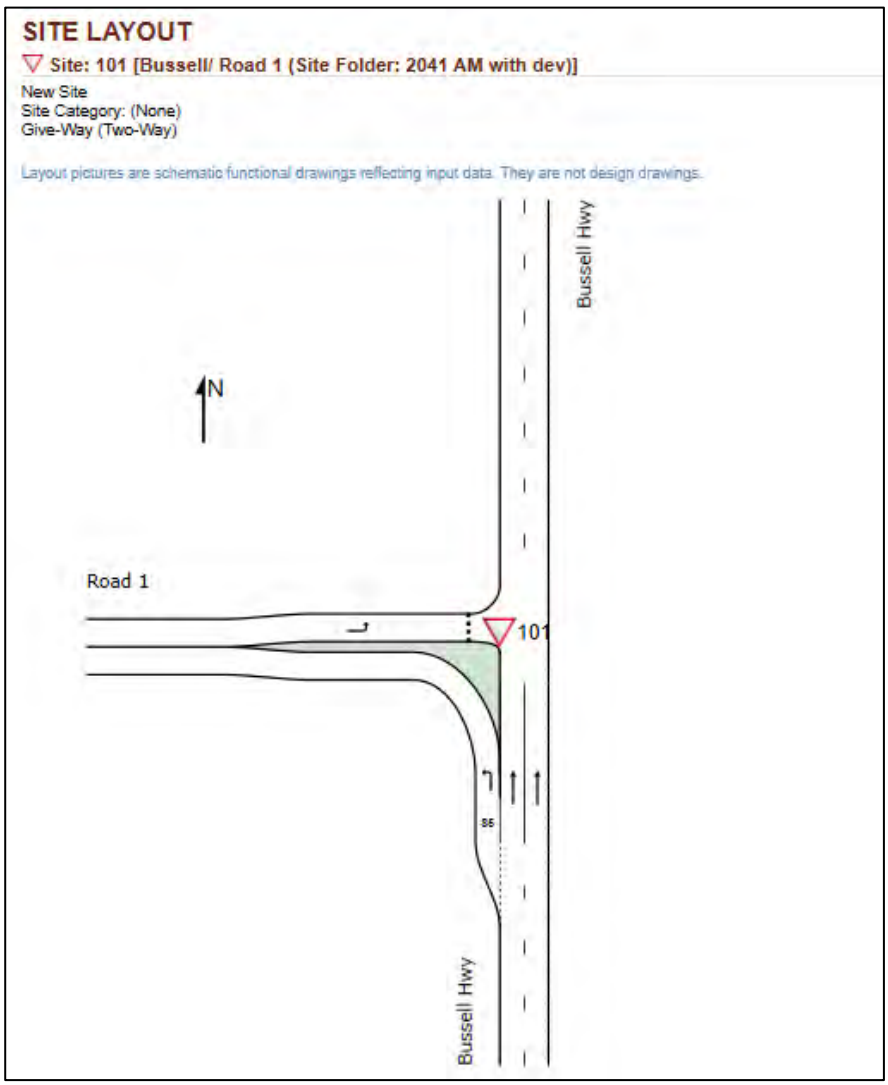

Figure 4.5: Modelled Layout

The AM and PM peak directional splits were based on existing SCATS data from the signalised intersection at Washington Parade. This shows that in the AM peak, 61% of traffic flows northbound, whereas in the PM peak, this reduces to 38%.

In the AM peak hour, the SIDRA analysis indicates that the intersection works well, with the left out movement operating at Level of Service A, with average delays of around 14 seconds, and minimal queuing.

In the PM peak hour, the SIDRA analysis again indicates that the left out movement will operate at Level of Service A, this time with average delays of around 8 seconds, and minimal queuing.

It can be seen that, with the reduced forecast flows on Bussell Highway resulting from the BORR, the intersection will perform adequately, well into the future.

4.10.3 Intersection of Road 1 with Parade Road

The proposed intersection of Road 1 with Parade Road has been modelled as a single lane roundabout. See **Figure 4.6** for the modelled layout.

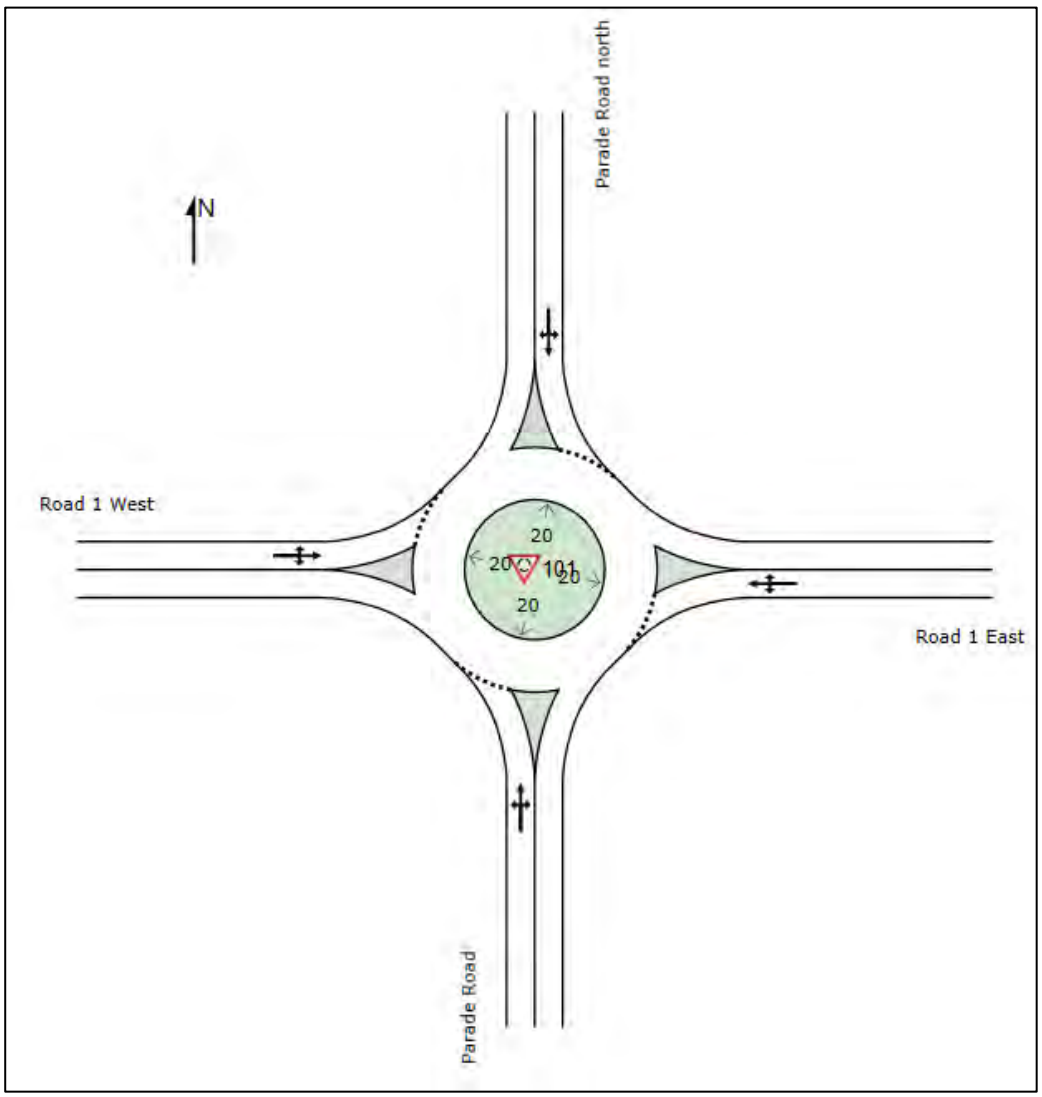

Figure 4.6: Modelled Layout

In the 2041 AM peak hour scenario, all movements at the roundabout performs at LoS A or LoS of B, with a maximum delay of 15 seconds for the right turn from the west approach. The maximum queue length of 47m occurs on the south Parade Road approach.

In the PM peak, both right turn manoeuvres from the side roads (Road 1) perform at LoS B, with delays of around 13 seconds. Maximum queuing occurs on the Parade Road approaches, with both directions under 40m.

4.10.4 Proposed intersection of Road 3 with Washington Avenue

The proposed intersection of Road 3 with Washington Avenue has been modelled as a full movement, unsignalized T-intersection.

See **Figure 4.7** for the modelled layout.

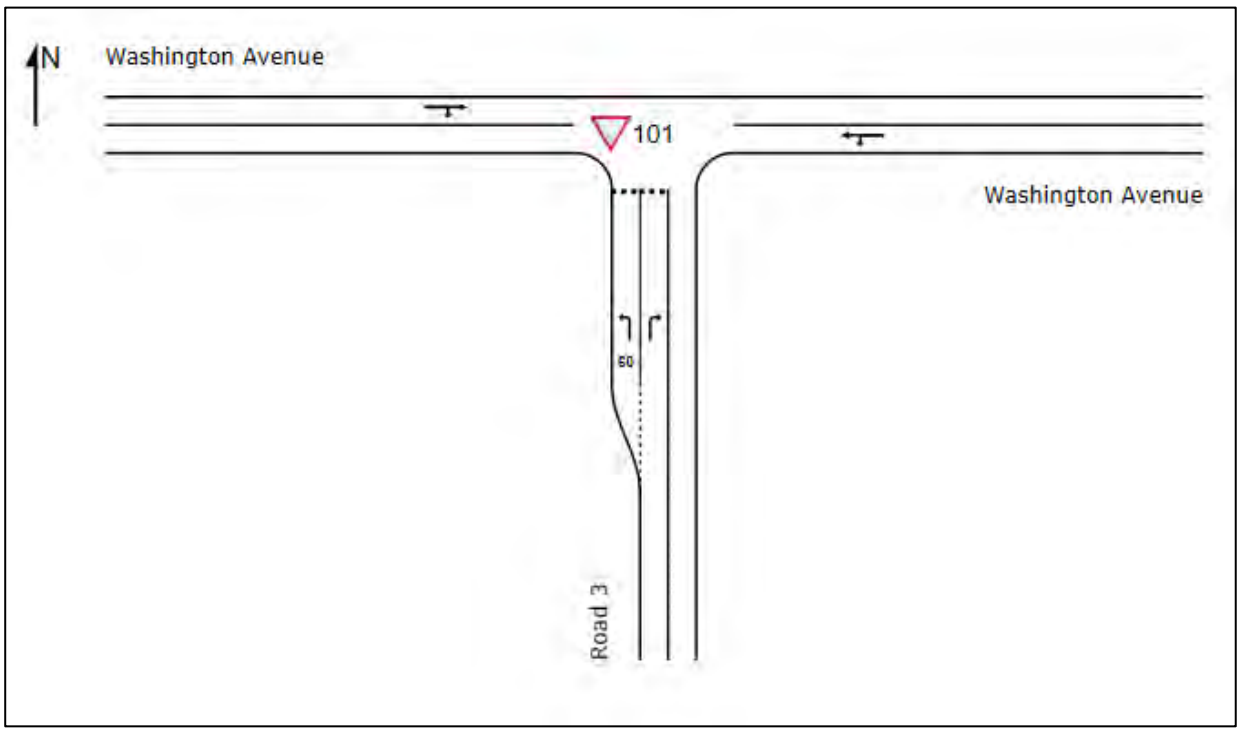

Figure 4.7: Modelled Layout

Running the SIDRA analyses for the 2041 forecast scenario shows that even with only a short (60m) left turn lane on the side road approach, and no auxiliary lanes on Washington Avenue, the intersection will operate at LoS A except for the right turn out movement in the AM peak period (LoS B, delay 10 seconds).

5. SUSTAINABLE TRANSPORT

5.1 PEDESTRIANS AND CYCLISTS

The proposed cycling network for 2050 in the vicinity of the Structure Plan area is shown in **Figure 5.1**.

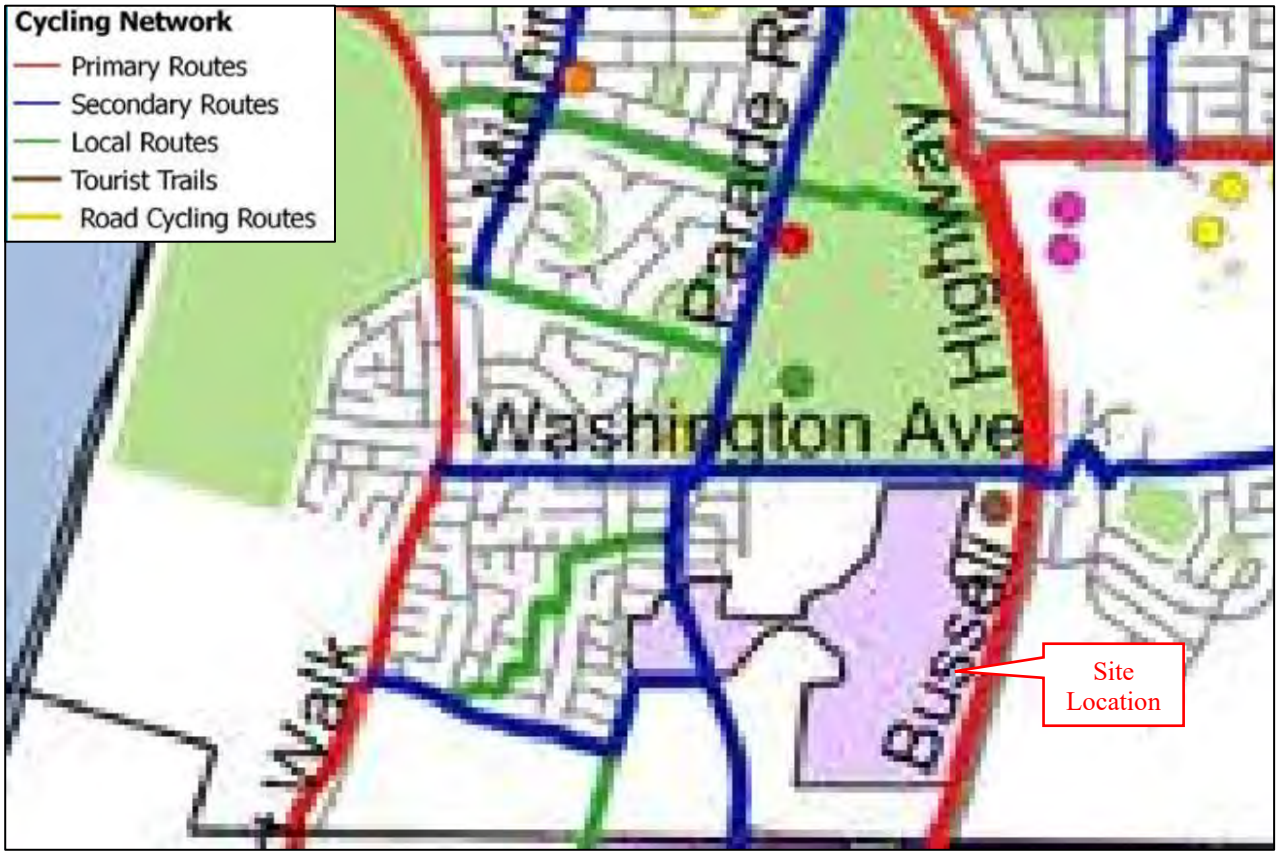

Figure 5.1: Pedestrian and Cyclist Network ***(Source: Transport WA website)***

Currently, as identified previously, there are Shared Paths constructed along both the eastern and western boundaries of the site, along Bussell Highway and along Parade Road. There are also cycle lanes along Washington Avenue.

Although speeds on the internal road network are expected to be low, it may nonetheless be advantageous to provide cycle lanes or shared paths along the main connector roads through the structure plan area, to provide connectivity to the external facilities.

5.2 PUBLIC TRANSPORT

There are a number of Public Transport services running along the periphery of the site. These include route numbers 832, 842 & 843, which have stops on Washington Avenue and/or Parade Road.

It may be advantageous to discuss potential revisions to these existing bus routes, in order to provide stops within the structure plan area. Any such revisions would need to be taken into account when carrying out more detailed design of the main connector roads through the site.

6. SUMMARY AND CONCLUSIONS

6.1 SUMMARY

Kingslane Group has commissioned Donald Veal Consultants to prepare this report as a review of the previous Transport Impact Assessment supporting the approved structure plan in 2013. The review has taken account of the changed circumstances, including the ongoing construction of the Bunbury Outer Ring Road, and incorporates the latest traffic modelling supplied by Main Roads WA.

The Structure Plan comprises residential lots with densities of R20, R30, R40 and R60; a local centre; an area of aged care housing; a primary school; and public open space. The subject land is mostly undeveloped at the present time.

The site lies within the City of Bunbury, in the suburb of Usher. It is located approximately 800m south of the South West Health Campus, and only 6.5km south of the City of Bunbury CBD. Major arterial roads within close proximity include Bussell Highway to the east.

The site is bounded by Washington Avenue, Bussell Highway and Parade Road, with Lillydale Road just to the south. Existing residential land uses lie to the northwest and west, with the South West Academy of Sport and Hay Park to the north of Washington Avenue. There is an access to the College Grove suburb on the eastern side of Bussell Highway, whilst mostly vacant lots lie to the south of Lillydale Road. To the southwest, along Parade Road, the area is predominantly open space.

The forecast volume of traffic expected to be generated by this development is 8,930 vpd with 1,177 and 889 am and pm peak hour trips respectively, to be distributed primarily over the three main access points. These volumes generally fall within the capacity of the roads and intersections. Attention is drawn to the following notes:-

- Modelling provided by MRWA has been used to determine the effects of the Bunbury Outer Ring Road (BORR) on future forecast flows for Bussell Highway in the vicinity of the site.
- The previously proposed all movement priority intersection of Bussell Highway with Road 1 has now been replaced with a left in / left out only arrangement.
- The analysis shows that the number of trips likely to be carried by Parade Road in 2041 may be in excess of the recommended capacity of the existing road configuration. However, it can be seen that this is expected to be the case, even without the Tuart Brook structure plan development.

Given that this analysis is being carried out at the structure planning stage, details such as the exact lot layouts and road cross sections are yet to be confirmed. Thus, the reserve widths shown are indicative only and remain flexible. In accordance with this, the following observations and recommendations are made:

- The road reserve widths of the proposed internal road network lie in the range from 20m for the major connectors to 15m for the minor access streets. These widths are reasonably consistent with the range of 14.2m to 24m suggested in *Liveable Neighbourhoods* (WAPC 2009). The lower reserve width is generally for short, low volume, and low parking demand streets. The higher reserve width allows for a median and/or additional road features such as paths to be incorporated. Issues such as

the need for localised widening near certain intersections, and the potential for on road facilities such as cycle lanes and parking bays may affect the final widths and cross sections in those areas.

- The major internal roads within the structure plan are likely to carry between 1,000 and 3,000 vpd. Hence it would be considered appropriate to adopt designs similar to those for Neighbourhood Connector B and Access Street B. However, despite the lower projected traffic flows, consideration should be given to classifying Road 1 as a Neighbourhood Connector A, due to the presence of the primary school and the likelihood of it being both a public transport route and a shared path route. Other larger roads may also be designated as Neighbourhood Connector B. It should be noted that the designation of roads as Neighbourhood Connectors A or B has implications for the number and location of crossovers to fronting properties, and this will need to be addressed when the lot layouts are finalised at a later design stage.

We recommend that the relevant public transport authority be approached regarding the potential for an additional service to be provided along Road 1, with associated stops near the major internal intersections. This will ensure all areas within the structure plan area fall within the walkable catchment of bus stops.

It is also recommended that consideration be given to the inclusion of on-road cycling lanes or separate shared paths on relevant sections of the key internal roads.

6.2 CONCLUSIONS

The ongoing construction of the Bunbury Outer Ring Road will be completed prior to the full development of the Tuart Brook Structure Plan area, and as such the development will benefit from the improved accessibility and reduced traffic flows resulting from this important piece of infrastructure.

The provision of a left in left out only access onto Bussell Highway, combined with those lower through traffic movements, will result in improved traffic turning movements in this location compared to the previously proposed full movement access, with numerous other routes available to accommodate the relatively low numbers of right turners.

All of the accesses to the site have been assessed, using the latest available MRWA modelled data and forecast turning movements, as functioning well in the 2041 the ‘development +10 year’ scenario.

The Structure Plan proposal is therefore supported by the findings of this Transport Impact Assessment and there are no identified traffic related issues to be addressed other than those stated above. We therefore recommend approval of the proposal from a traffic perspective.

APPENDIX A: SIDRA RESULTS

MOVEMENT SUMMARY

Site: 101 [Bussell/ Road 1 (Site Folder: 2041 AM with dev)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Bussell Hwy															
1	L2	All MCs	12	0.0	12	0.0	0.006	5.6	LOS A	0.0	0.0	0.00	0.53	0.00	53.5
2	T1	All MCs	2011	8.0	2011	8.0	0.537	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.5
Approach			2022	8.0	2022	8.0	0.537	0.3	NA	0.0	0.0	0.00	0.00	0.00	59.5
West: Road 1															
10	L2	All MCs	94	0.0	94	0.0	0.218	14.0	LOS B	0.8	5.5	0.78	0.92	0.84	47.1
Approach			94	0.0	94	0.0	0.218	14.0	LOS B	0.8	5.5	0.78	0.92	0.84	47.1
All Vehicles			2116	7.6	2116	7.6	0.537	0.9	NA	0.8	5.5	0.03	0.04	0.04	58.8

MOVEMENT SUMMARY

Site: 101 [Bussell/Road 1 (Site Folder: 2041 PM with dev)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Bussell Hwy															
1	L2	All MCs	27	0.0	27	0.0	0.015	5.6	LOS A	0.0	0.0	0.00	0.53	0.00	53.5
2	T1	All MCs	1253	8.0	1253	8.0	0.334	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach			1280	7.8	1280	7.8	0.334	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.6
West: New Road															
10	L2	All MCs	47	0.0	47	0.0	0.057	8.4	LOS A	0.2	1.5	0.54	0.73	0.54	50.8
Approach			47	0.0	47	0.0	0.057	8.4	LOS A	0.2	1.5	0.54	0.73	0.54	50.8
All Vehicles			1327	7.5	1327	7.5	0.334	0.5	NA	0.2	1.5	0.02	0.04	0.02	59.3

MOVEMENT SUMMARY

Site: 101 [Parade / Road 1 (Site Folder: 2041 AM with dev)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Intersection of Road 1 with Parade 2041 AM with full dev
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	HV] %	Arrival Flows [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh]	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Parade Road															
1	L2	All MCs	2	0.0	2	0.0	0.634	5.5	LOS A	6.3	47.0	0.68	0.54	0.68	51.8
2	T1	All MCs	719	8.0	719	8.0	0.634	5.9	LOS A	6.3	47.0	0.68	0.54	0.68	52.0
3	R2	All MCs	16	0.0	16	0.0	0.634	10.3	LOS B	6.3	47.0	0.68	0.54	0.68	51.3
Approach			737	7.8	737	7.8	0.634	6.0	LOS A	6.3	47.0	0.68	0.54	0.68	51.9
East: Road 1 East															
4	L2	All MCs	75	0.0	75	0.0	0.340	8.9	LOS A	2.2	15.7	0.79	0.75	0.79	49.1
5	T1	All MCs	17	0.0	17	0.0	0.340	9.1	LOS A	2.2	15.7	0.79	0.75	0.79	49.4
6	R2	All MCs	164	0.0	164	0.0	0.340	13.8	LOS B	2.2	15.7	0.79	0.75	0.79	48.7
Approach			256	0.0	256	0.0	0.340	12.1	LOS B	2.2	15.7	0.79	0.75	0.79	48.9
North: Parade Road north															
7	L2	All MCs	75	0.0	75	0.0	0.529	4.2	LOS A	5.1	37.8	0.31	0.40	0.31	53.4
8	T1	All MCs	682	8.0	682	8.0	0.529	4.5	LOS A	5.1	37.8	0.31	0.40	0.31	53.6
9	R2	All MCs	12	0.0	12	0.0	0.529	9.0	LOS A	5.1	37.8	0.31	0.40	0.31	52.9
Approach			768	7.1	768	7.1	0.529	4.5	LOS A	5.1	37.8	0.31	0.40	0.31	53.6
West: Road 1 West															
10	L2	All MCs	34	0.0	34	0.0	0.124	10.5	LOS B	0.8	5.9	0.85	0.75	0.85	49.7
11	T1	All MCs	29	0.0	29	0.0	0.124	10.7	LOS B	0.8	5.9	0.85	0.75	0.85	50.0
12	R2	All MCs	6	0.0	6	0.0	0.124	15.3	LOS B	0.8	5.9	0.85	0.75	0.85	49.3
Approach			69	0.0	69	0.0	0.124	11.0	LOS B	0.8	5.9	0.85	0.75	0.85	49.8
All Vehicles			1831	6.1	1831	6.1	0.634	6.4	LOS A	6.3	47.0	0.55	0.52	0.55	52.1

MOVEMENT SUMMARY

Site: 101 [Parade / Road 1 (Site Folder: 2041 PM with dev)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Intersection of Road 1 with Parade 2041 PM with full dev
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	HV] %	Arrival Flows [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh]	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Parade Road															
1	L2	All MCs	5	0.0	5	0.0	0.566	4.9	LOS A	5.2	38.8	0.53	0.48	0.53	52.4
2	T1	All MCs	671	8.0	671	8.0	0.566	5.3	LOS A	5.2	38.8	0.53	0.48	0.53	52.5
3	R2	All MCs	35	0.0	35	0.0	0.566	9.8	LOS A	5.2	38.8	0.53	0.48	0.53	51.9
Approach			711	7.5	711	7.5	0.566	5.5	LOS A	5.2	38.8	0.53	0.48	0.53	52.5
East: Road 1 East															
4	L2	All MCs	38	0.0	38	0.0	0.189	8.1	LOS A	1.1	8.0	0.71	0.73	0.71	49.6
5	T1	All MCs	9	0.0	9	0.0	0.189	8.3	LOS A	1.1	8.0	0.71	0.73	0.71	49.9
6	R2	All MCs	101	0.0	101	0.0	0.189	12.9	LOS B	1.1	8.0	0.71	0.73	0.71	49.1
Approach			148	0.0	148	0.0	0.189	11.4	LOS B	1.1	8.0	0.71	0.73	0.71	49.3
North: Parade Road north															
7	L2	All MCs	115	0.0	115	0.0	0.523	4.2	LOS A	4.8	35.5	0.27	0.41	0.27	53.6
8	T1	All MCs	635	8.0	635	8.0	0.523	4.4	LOS A	4.8	35.5	0.27	0.41	0.27	53.8
9	R2	All MCs	28	0.0	28	0.0	0.523	9.0	LOS A	4.8	35.5	0.27	0.41	0.27	53.1
Approach			778	6.5	778	6.5	0.523	4.6	LOS A	4.8	35.5	0.27	0.41	0.27	53.7
West: Road 1 West															
10	L2	All MCs	17	0.0	17	0.0	0.039	9.0	LOS A	0.2	1.7	0.77	0.70	0.77	50.6
11	T1	All MCs	5	0.0	5	0.0	0.039	9.1	LOS A	0.2	1.7	0.77	0.70	0.77	51.0
12	R2	All MCs	3	0.0	3	0.0	0.039	13.8	LOS B	0.2	1.7	0.77	0.70	0.77	50.2
Approach			25	0.0	25	0.0	0.039	9.6	LOS A	0.2	1.7	0.77	0.70	0.77	50.7
All Vehicles			1662	6.3	1662	6.3	0.566	5.7	LOS A	5.2	38.8	0.43	0.47	0.43	52.7

MOVEMENT SUMMARY

▽ Site: 101 [Washington / Road 3 (Site Folder: 2041 AM with dev)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Road 3															
1	L2	All MCs	133	0.0	133	0.0	0.112	6.8	LOS A	0.4	3.1	0.40	0.63	0.40	51.7
3	R2	All MCs	15	0.0	15	0.0	0.028	10.2	LOS B	0.1	0.6	0.60	0.80	0.60	49.3
Approach			147	0.0	147	0.0	0.112	7.1	LOS A	0.4	3.1	0.42	0.65	0.42	51.4
East: Washington Avenue															
4	L2	All MCs	43	0.0	43	0.0	0.202	5.6	LOS A	0.0	0.0	0.00	0.07	0.00	56.8
5	T1	All MCs	338	5.0	338	5.0	0.202	0.1	LOS A	0.0	0.0	0.00	0.07	0.00	59.3
Approach			381	4.4	381	4.4	0.202	0.7	NA	0.0	0.0	0.00	0.07	0.00	59.0
West: Washington Avenue															
11	T1	All MCs	422	5.0	422	5.0	0.273	0.0	LOS A	0.6	4.1	0.15	0.18	0.15	58.7
12	R2	All MCs	60	0.0	60	0.0	0.273	9.7	LOS A	0.6	4.1	0.15	0.18	0.15	56.1
Approach			482	4.4	482	4.4	0.273	1.2	NA	0.6	4.1	0.15	0.18	0.15	58.3
All Vehicles			1011	3.8	1011	3.8	0.273	1.9	NA	0.6	4.1	0.13	0.20	0.13	57.4

MOVEMENT SUMMARY

▽ Site: 101 [Washington / Road 3 (Site Folder: 2041 PM with dev)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

Washington Road 3 PM 2041
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Road 3															
1	L2	All MCs	66	0.0	66	0.0	0.045	5.9	LOS A	0.2	1.3	0.22	0.55	0.22	52.2
3	R2	All MCs	7	0.0	7	0.0	0.008	6.9	LOS A	0.0	0.2	0.38	0.61	0.38	51.5
Approach			74	0.0	74	0.0	0.045	6.0	LOS A	0.2	1.3	0.24	0.55	0.24	52.1
East: Washington Avenue															
4	L2	All MCs	96	0.0	96	0.0	0.118	5.6	LOS A	0.0	0.0	0.00	0.26	0.00	55.3
5	T1	All MCs	126	5.0	126	5.0	0.118	0.0	LOS A	0.0	0.0	0.00	0.26	0.00	57.6
Approach			222	2.8	222	2.8	0.118	2.4	NA	0.0	0.0	0.00	0.26	0.00	56.6
West: Washington Avenue															
11	T1	All MCs	99	5.0	99	5.0	0.138	0.0	LOS A	0.7	4.7	0.32	0.40	0.32	55.9
12	R2	All MCs	124	0.0	124	0.0	0.138	6.8	LOS A	0.7	4.7	0.32	0.40	0.32	53.6
Approach			223	2.2	223	2.2	0.138	3.8	NA	0.7	4.7	0.32	0.40	0.32	54.6
All Vehicles			519	2.2	519	2.2	0.138	3.5	NA	0.7	4.7	0.17	0.36	0.17	55.1