Ardess-Walmsley Local Structure Plan

Prepared by Edge Planning & Property for Ardess 1607 Pty Ltd and Ten Year Developments Pty Ltd

www.edgeplanning.com.au

November 2020

City of Albany Local Structure Plan No. 10

ENDORSEMENT PAGE

This Structure Plan is prepared under the provisions of the *City of Albany Local Planning Scheme No. 1.*

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

Date 30-Nov-2020

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 30-Nov-2020

Date of Expiry 30-Nov-2025

TABLE OF AMENDMENTS TO LOCAL STRUCTURE PLAN			
Amendment No.	Summary of the Amendment	Amendment type	Date Approved by WAPC
1	Schedule of Modifications	Amendments to Part One, Part Two and Local Structure Plan	29 September 2020

PRE-LODGEMENT CONSULTATION		
Agency	Consultation	Method of consultation
City of Albany	March - December 2017	Meetings, emails and phone calls
Main Roads Western Australia	June, September and November 2017	Meetings, emails and phone calls
Department of Education	June and November 2017	Emails and phone calls
Department of Water and Environmental Regulation	June and November 2017	Emails and phone calls
Department of Planning, Lands and Heritage	June, July and December 2017	Meetings, emails and phone calls

EXECUTIVE SUMMARY

The *Ardess-Walmsley Local Structure Plan* has been prepared to facilitate new urban development, to guide subdivision and development within the Structure Plan area (to be called the 'site'), to coordinate with surrounding development and to support an amendment to the *City of Albany Local Planning Scheme No. 1.* The amendment proposes in part to facilitate the permissibility of the warehouse storage and commercial vehicle parking use in the Ardess Industrial Estate (Industrial Area IA1).

The site consists of the established Ardess Industrial Estate (Lot 10 Chester Pass Road, Walmsley) and Lot 521 Mercer Road, Walmsley. The site is strategically significant to Albany given its location, size, identification in the *City of Albany Local Planning Strategy* as Industry and Urban Growth, opportunities to create jobs, provide housing and connect roads and infrastructure to other development areas.

The Structure Plan proposes:

- significant residential development, an expanded light industrial area (employment land), a primary school and public open space (POS);
- substantial new residential lots, a range of densities, lot sizes and housing;
- retaining valuable native vegetation in the east-west bush corridor as POS (passive recreation) along with a large area of active recreation;
- improved vehicle, pedestrian and cycling connections and permeability through extending the surrounding road and pathway network including the extension of Range Road;
- safe and convenient access for pedestrians, cyclists and motorists; and
- coordinating with existing and proposed development.

The Structure Plan recognises the importance of the key environmental and landscape attributes of the area, and incorporates these in an urban form that will create environmentally responsive urban development.

Structure Plan summary table

Item	Data	Structure Plan reference (section number)
Total area covered by the Structure Plan	178.3348 hectares	Part Two, section 1.2.2
Area of each land use:[1]		
Residential	105 hectares	Part Two, section 3.3
Light Industry	58.5 hectares	Part Two, section 3.7
Public open space – Parks & Recreation (active)	3.46 hectares	Part Two, section 3.2
Public open space – Parks & Recreation (passive)	7 hectares	
Primary school	4 hectares	Part Two, section 3.6
Other (community purpose site)	0.3748 hectares	
Estimated lot yield		
Residential	1470 lots	Part Two, section 3.3
Light Industry	30 lots	Part Two, section 3.7
Total	1500 lots	
Estimated number of dwellings	1470 dwellings	Part Two, section 3.3
Estimated residential density	14 dwellings per hectare	Part Two, section 3.3
Estimated population[2]	3675	Part Two, section 3.3
Number of primary schools	1	Part Two, section 3.6
Number of high schools	0	Part Two, section 3.6

Notes: (1) Roads not included in above area calculations. (2) Assumes 2.5 persons per dwelling.

This Structure Plan comprises two parts. Part One is the implementation section, while Part Two is the explanatory section with associated technical appendices.

CONTENTS

ARDESS-WALMSLEY LOCAL STRUCTURE PLAN

PART ONE - IMPLEMENTATION

1. Structure Plan area

This Structure Plan shall apply to Lot 10 Chester Pass Road, Walmsley and Lot 521 Mercer Road, Walmsley being the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map (Plan 1).

2. Structure Plan content

This Structure Plan comprises:

a) Part 1 - Implementation section - This section contains the Structure Plan map and statutory planning provisions and requirements.
b) Part 2 – Non-statutory (explanatory) section - This section to be used as a reference guide to interpret and justify the implementation of Part One.
c) Appendices – Technical reports and supporting plans and maps.

3. Interpretation and Scheme relationship

Unless otherwise specified in this part, the words and expressions used in this Structure Plan shall have the respective meanings given to them in the *City of Albany Local Planning Scheme No. 1* (the Scheme) including any amendments gazetted thereto.

The Scheme prevails over the Structure Plan in the case of any inconsistency.

4. Operation

The date the Structure Plan comes into effect is the date the Structure Plan is approved by the Western Australia Planning Commission (WAPC).

5. Land use and subdivision requirements

The Structure Plan map (Plan 1) outlines land use, zones and reserves applicable within the Structure Plan area.

5.1 Land Use Permissibility

Land use permissibility within the Structure Plan area shall be in accordance with the corresponding zone or reserve under the Scheme.

The land uses, zones and reserves designated under the Structure Plan map (Plan 1) are to plan for the co-ordination of future subdivision and development of the Structure Plan area.

The Structure Plan shall be given due regard by the local government when assessing development applications. Once incorporated into the Scheme, the use and development controls of the Structure Plan will have force and effect.

The Structure Plan map (Plan 1) provides designations guiding the preferred locations for future land uses and future key infrastructure including roads. The designations are indicative and will be refined through detailed investigations and design at the time of rezoning, subdivision and/or development as appropriate.

Land within the Structure Plan area that is zoned 'General Agriculture' requires rezoning to 'Future Urban' via an amendment to the Scheme.

It is expected that the expanded light industrial area will be rezoned to 'Light Industry' while the land east of Range Road will be rezoned to 'Future Urban'.

All industrial areas and residential areas will be appropriately zoned prior to subdivision.

A local planning scheme amendment will need to be undertaken to introduce the land uses 'warehouse storage' and 'commercial vehicle parking'.

5.2 Residential

Plan 1 identifies residential density codes for the Structure Plan area.

Support residential development at minimum of R20.

A range of R-Codes will apply to residential areas shown on the Structure Plan. This will provide flexibility, allowing the final R Code to be applied closer to the time when the land will be subdivided.

On average, the Structure Plan area could accommodate approximately 14 dwellings per hectare. There are opportunities to create additional lots subject to market demand.

Support the residential precinct, including the future school site and public open space, being rezoned to 'Future Urban'.

Any subdivision or development application, proposing to clear or impact the linear native vegetation corridor on Lot 521 Mercer Road, is to be accompanied by a habitat assessment of native vegetation to determine impact on black cockatoo species and the western ringtail possum.

Landholders are to be advised (notification on title and notification on Development Application) that Chester Pass Road is a major heavy vehicle freight route and buildings within the vicinity may be affected by transport noise and vibration.

5.3 Light industry

The main access to the Ardess Industrial Estate is via a single entry road onto Chester Pass Road. Secondary access is permitted between the estate and Terry Road for as-of-right vehicles.

The first section of the private road, between Chester Pass Road and the first bend (left) is to be ceded at no cost to be listed as a public road. The required land area (width) to accommodate the road reserve is to be determined with the City.

The existing zoned industrial area may remain unsewered and confined to dry industries if all lots are above 1 hectare. On-site sewerage disposal shall utilise alternative treatment sewerage disposal systems unless the applicant can provide advice to the local government that soil conditions are conducive to the operation of septic tanks and leach drains and will not result in unacceptable loss of nutrients to surrounding waterways, or create a risk to public health.

Maximum total of 30 industry lots/industrial land uses may be considered within the light industry precinct. This requirement applies due to limitations on adjoining transport infrastructure. A transport impact assessment has determined that the maximum number of restricted access vehicles that the current intersection design (Chester Pass Road) can handle is 180 restricted access vehicles per day.

5.4 Public open space

A minimum of 10 per cent public open space (POS) will be provided in residential areas in accordance with WAPC policy. POS is to be provided generally in accordance with Plan 1. The POS will provide a range of opportunities suitable for sporting activities, nature space, playgrounds and other facilities.

There may also be opportunities for joint community/school recreational use of the primary school oval.

5.5 Subdivision

Subdivision of the land shall generally be in accordance with the Structure Plan (Plan 1) approved by the WAPC with any minor variations approved by the WAPC.

Lot sizes are to address *DC4.1 Industrial Subdivision* for the area classified and then zoned as 'Light Industry'.

For land zoned 'General Agriculture', other than the creation of super lots, further subdivision will not be supported prior to rezoning to the 'Future Urban' zone.

5.6 Conditions of subdivision approval

At the time of subdivision, the following conditions may be recommended, as applicable, requiring the preparation and/or implementation of the following:

a) Urban Water Management Plan.
b) Bushfire Management Plan.

c) A Local Development Plan to address matters in section 6.4.
d) Revegetation/landscaping plan.
e) Preventing direct vehicular access between lots and Chester Pass Road, Range Road, Terry Road (section classified as an Integrator Arterial Road) and between residential lots and Mercer Road.
f) All residential lots being connected to the reticulated sewerage system.
g) Additional light industrial areas, currently zoned 'General Agriculture', to be connected to reticulated sewerage.
h) Notification of titles, for lots adjoining Chester Pass Road, advising that Chester Pass Road is a major heavy vehicle freight route and buildings in the vicinity may be affected by transport noise and vibration.
i) Traffic Impact Assessment, which includes intersection treatment locations and intersection and road upgrades/contributions.

6. Development requirements

6.1 General

Development will be controlled by the Scheme and will be guided by the Structure Plan (Plan 1), the *Residential Design Codes* (for residential development), any approved Local Development Plan and any relevant Local Planning Policies.

The proposed predominant land use within the Structure Plan area will be residential development. It is also proposed to further develop and expand the Ardess Industrial Estate as a key employment area.

6.2 Residential development

The orientation and design of buildings should be sympathetic to existing landform.

6.3 Light industrial development

Industrial uses and development are required to meet industrial buffer standards (including as relevant risk, noise odour, dust, emissions, visual amenity and other potential nuisances) and to not create detrimental impact on surrounding land uses including adjacent residential uses.

Development in the area classified as 'Light Industry' will be serviced with on-site wastewater disposal. Existing and proposed industries will be 'dry-type' light industrial uses. Development is required to have low wastewater generation and low volume of process water for disposal. Development shall comply with the *Government Sewerage Policy*.

On-site sewerage disposal shall utilise alternative treatment sewerage disposal systems unless the applicant can provide advice to the local government that soil conditions are conducive to the operation of septic tanks and leach drains and will not result in unacceptable loss of nutrients to surrounding waterways, or create a risk to public health.

The local government will require stormwater disposal measures to be implemented to ensure that maximum retention and infiltration occurs on site using individual soakwells, retention basins or other measures as deemed necessary. Oil and grease traps are to be provided within each building site to the satisfaction of the local government to ensure that nutrient export off the site is kept to a minimum.

Stormwater is not to be discharged from development into the Chester Pass Road drainage system.

The landowner shall retain and manage the landscaping strip adjoining the Chester Pass Road boundary of the site.

Development that incorporates restricted access vehicles will be advised that there is no guarantee that restricted access vehicles will be permitted to use Chester Pass Road between Menang Drive and the main roundabout (intersection with Albany Highway, North Road and Hanrahan Road) following the Albany Ring Road being completely constructed and operational to the Port of Albany. Associated development approvals may also contain

conditions or advice relating to future limitations of access for restricted access vehicles.

Trees on the inner radius of the bend in the Private Access Road to be removed to allow for appropriate sight lines for oncoming traffic. Provide additional shoulder width at the corner to allow for two opposing restricted access vehicles to pass each other simultaneously (as per the Transport Impact Assessment report 2019).

6.4 Local Development Plans

Local Development Plans will be required to support applications for subdivision and development relating to the following:

a) Industrial and residential development adjoining Range Road to address access, car parking, built form, possible mixed uses and landscaping.
b) Lots adjoining Terry Road (section classified as an Integrator Arterial Road), if there is no service road, to address access, built form, bushfire management and landscaping.
c) Lots adjoining Mercer Road, if there is no service road, to address access, built form and landscaping.
d) Where residential lot sizes are 260m^2 or less.

7. Other requirements

7.1 Developer contributions

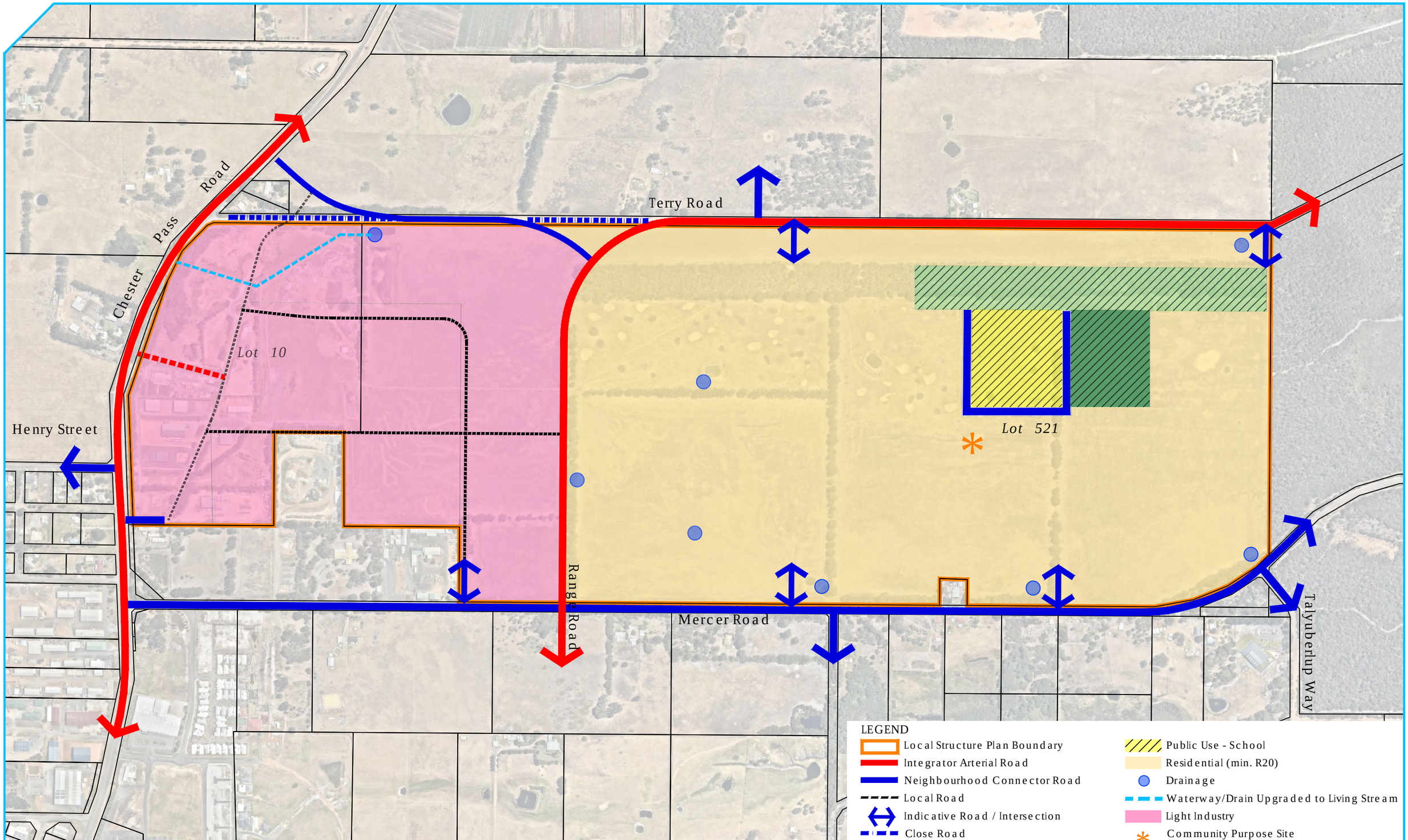
Developer contributions are to be made in accordance with the WAPC's State Planning Policy 3.6 and any Local Planning Policy adopted by the City of Albany.

7.2 Staging

The Ardess Industrial Estate is long established industrial estate. It is initially proposed to expand the industrial area eastwards to the extension of Range Road.

The Structure Plan proposes a substantial residential area east of Range Road. It is likely that the development will be staged over the next couple of decades. The staging will be flexible and should adapt to competing development fronts and the varying attractivity and cost of subdividing other development.

Lot 521 is zoned 'General Agriculture'. Accordingly, it will need to be rezoned prior to residential subdivision and development proceeding.



LEGEND

- Local Structure Plan Boundary
- Integrator Arterial Road
- Neighbourhood Connector Road
- Local Road
- Indicative Road / Intersection
- Close Road
- Parks and Recreation - Active
- Parks and Recreation - Passive
- Public Use - School
- Residential (min. R20)
- Drainage
- Waterway/Drain Upgraded to Living Stream
- Light Industry
- Community Purpose Site
- Emergency Access Way

LOCAL STRUCTURE PLAN

Lot 10 Chester Pass Road and Lot 521 Mercer Road

Walmsley

REV	DESCRIPTION	YYMMDD
J	MODS AS PER DPLH 10.11.2020	201113
I	MODS AS PER DPLH 04.09.2020	201022
H	REVISED VERSION	191028
G	BASINS, SCHOOL, POS	190519
F	VARIOUS MODIFICATIONS	190411
E	NOTES AND MODS	180515
D	ADD EMERGENCY A. WAY.	171118

NORTH

DRAWING NUMBER EP 170520 06 REV J SCALE 1:7500 SHEET A3

0 150 300m

Issued for design intent only.
All areas and dimensions are subject to detail design + survey.

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PART TWO - EXPLANATORY SECTION

1. PLANNING BACKGROUND

1.1 Introduction and purpose

The purpose of the Structure Plan is to:

- create new urban development which is characterised by its setting, range of views and conservation of environmental/landscape character;
- provide a statutory land use plan for the area;
- provide a comprehensive framework for land use to facilitate future subdivision and development;
- facilitate an urban form that provides for housing, light industry, other uses and infrastructure that is responsive to the character of the site and locality;
- provide additional industrial lots and employment opportunities;
- provide for fully serviced residential development, ranging from low to higher density development;
- provide a range of public parkland catering for recreation, and nature activities by the local community;
- provide an integrated water management system that minimises risk to public health and enhances the quality of water flowing to Oyster Harbour; and
- protect, enhance and manage the environmental values of the site including native vegetation and fauna.

To proceed to the subdivision and development of the land, it is necessary to prepare a Local Structure Plan in accordance with the *Planning and Development (Local Planning Schemes) Regulations 2015.*

The Structure Plan, provided in Plan 1, shows how the site can be broadly subdivided and developed. The Structure Plan seeks to provide for the orderly and proper planning of the site in terms of land use, servicing and design.

The Structure Plan allocates land uses which are complementary to the surrounding area and within the site. More detailed planning and investigations will occur at the scheme amendment, subdivision and development application stages.

The Structure Plan proposes an extension of the established Ardess Industrial Estate, a significant residential development with a range of residential densities (minimum of R20), a primary school and district POS.

The proposed expanded light industrial area will require connection to reticulated sewerage, while the residential area will be developed once reticulated sewerage has been established in the area.

The site is strategically significant to Albany given:

- the *City of Albany Local Planning Strategy* identifies Lot 10 and a portion of Lot 521 as 'Industry' with the balance of Lot 521 shown as 'Urban Growth';
- it is located 5km from the Albany central area, near an activity centre, employment areas and other facilities;
- it is surrounded by existing or planned urban development;
- it is critically important in providing connections to planned urban development and the extension of Range Road;
- it is a large land parcel unlike most land in the adjacent *Yakamia-Lange Structure Plan* area;
- it is an ideal site for residential and employment uses; and
- it is well connected to the State, regional and district road network.

1.2 Land description

1.2.1 Location

The Structure Plan area is located approximately 5 kilometres north of the Albany central area in the locality of Walmsley (see Appendix 1). The site is generally bordered by Chester Pass Road, Terry Road, Reserve 27179 and Mercer Road (Appendix 2). It is well located with

respect to the State and regional road network, providing easy and convenient vehicular access between the site and Albany and other parts of the Great Southern.

The site adjoins and is near various uses as outlined on the Context Plan including warehouse storage and commercial vehicle parking, City depot and dog pound, industry, commercial, rural and other urban uses (Appendix 3). To the east of Lot 521 is Reserve 27179 which contains remnant vegetation.

From a spatial and geographical perspective, the site provides a logical location for urban development including residential and employment uses.

1.2.2 Area and land use

The site is 178.3348 hectares in area. Lot 10 Chester Pass Road is 25.7335 hectares in area and Lot 521 is 152.6013 hectares in area. This compares with the smaller and more fragmented land ownership to the south of Mercer Road and within the *Yakamia-Lange Structure Plan* area.

The site consists of multiple land uses. Lot 10 Chester Pass Road comprises the Ardess Industrial Estate and cleared land used to keep current and old farm machinery and sand/gravel piles. The industrial area comprises of sheds, office buildings, car parks, an internal road network and cleared areas for future development. Businesses within the industrial area include Albany Freight Lines, Designer Dirt (landscaping supplies) and Ardess Nursery.

The Ardess Industrial Estate is subject to various leases.

Lot 521 Mercer Road encompasses the majority of the site and comprises predominantly cleared rural land used for grazing cattle. There are no dwellings on Lot 521 Mercer Road. There are two small to medium sized sheds (one used to store hay and farm machinery and the other an old shearing shed), a set of cattle yards and a strip of remnant vegetation in the northern part of Lot 521.

A variety of land uses surround the Structure Plan area (refer to Appendix 3).

1.2.3 Legal description and ownership

Copies of the Certificate of Titles are provided in Appendix 4. The Structure Plan consists of two lots which are summarised in Table 1:

Table 1 – Legal Description

Lot	Deposited Plan	Volume	Folio	Area	Ownership
Lot 10 Chester Pass Road, Walmsley	99325	2192	1	25.7335ha	Ardess 1607 Pty Ltd
Lot 521 Mercer Road, Walmsley	76829	2822	563	152.6013ha	Ten Year Developments Pty Ltd

1.3 Planning framework

1.3.1 Zoning and reservations

The *City of Albany Local Planning Scheme No. 1* (LPS1) zones Lot 10 Mercer Road as 'Light Industry' with the land identified as Industrial Area 'IA1'. Site specific controls are set out in Schedule 11 – Industry Area for Area No. IA1. Lot 521 Mercer Road is zoned 'General Agriculture'. The current zoning is shown in Appendix 5, while provisions relating to the Ardess Industrial Estate are outlined in Appendix 6.

1.3.2 Regional and sub-regional structure plan

There are no regional or sub-regional structure plans that apply to the Local Structure Plan area.

1.3.3 Planning strategies

Strategic planning for the area identifies the site in providing housing, employment and facilities to support the district and support employment growth.

The *City of Albany Local Planning Strategy* (LPS) sets the vision and long term land use planning direction for the City of Albany. Figure 2: Urban, shown in Appendix 7, classifies the site as 'Industry' and 'Urban Growth'.

The LPS sets a number of strategic objectives, principles and actions which include:

- To provide for a range of easily accessible community services and facilities.
- Facilitate a diversity of housing to align with the future population and social needs.
- Facilitate opportunities for local employment and economic growth by providing appropriate locations for establishing and growing business.
- To maintain an adequate supply and range of serviced industrial land in appropriate locations.
- To maintain the sustainable use of existing industrial sites.
- To integrate transport and land use planning in the City.

The Structure Plan is consistent with the strategic direction set by the LPS.

Industrial land demand and supply have been addressed through the *Albany Local Planning Strategy (2019)*.

1.3.4 State and regional strategies and policies

The Structure Plan is consistent with the State and regional planning framework including:

- *State Planning Strategy 2050* – this has a vision of sustained growth and prosperity. Page 20 states 'The vision of sustained growth and prosperity envisages a future where Western Australians enjoy high standards of living, improved public health and an excellent quality of life for present and future generations';
- *State Planning Policy 1 State Planning Framework Policy (Variation No. 2);*
- *State Planning Policy 2 Environment and Natural Resources Policy*;
- *State Planning Policy No. 2.9 Water Resources*;
- *State Planning Policy 3.7 Planning in Bushfire Prone Areas*;
- *State Planning Policy No. 3 Urban Growth and Settlement* – promotes a sustainable settlement pattern, job creation, building on and within existing communities and the cost-effective use of infrastructure;
- *State Planning Policy 4.1 State Industrial Buffer Policy*;
- *State Planning Policy 5.4 Road and Rail Noise;*
- *Liveable Neighbourhoods* – promotes connected communities and a walkable community (further outlined below);
- *Development Control Policy 2.2 Residential Subdivision* – lots are required to be both suitable and capable of residential development;
- *Development Control Policy 4.1 Industrial Subdivision* – the location and configuration of the site and the

development are consistent with DC4.1 including lot design, servicing and the efficient movement of traffic;
- *Guidelines for Planning in Bushfire Prone Areas;*
- *Visual Landscape Planning in Western Australia Manual;*
- *EPA Guidance Statement No 3 Separation Distances Between Industrial and Sensitive Land Uses*;
- *Guidelines for Separation of Agriculture and Residential Land Uses*;
- *Environmental Protection Bulletin 13 Guidance for the use of the Albany Regional Vegetation Survey in Environmental Impact Assessment*;
- *Great Southern Regional Planning and Infrastructure Framework* - identifies Albany as a regional centre. An initiative to support economic development is to 'Make land available to facilitate the establishment of new industries in designated estates or precincts in Albany' (page 9); and
- *Lower Great Southern Strategy 2016*.

Liveable Neighbourhoods is the State Government's key policy for the design and assessment of Structure Plans for new urban development. The Policy sets out a wide number of objectives and planning requirements relating to neighbourhood structure, roads and access, POS, commercial and shopping areas, schools and management of stormwater.

The Structure Plan is consistent with the aims of *Liveable Neighbourhoods* including it:

- facilitates ease of access in particular walking and cycling, through a network of connected streets that are safe, efficient and pleasant;
- fosters a sense of community, place and local identity through the creation of an urban village in a bush setting, bordered by open spaces (bush corridor on Lot 521 and Reserve 27179;
- supports public transport system, when feasible in Albany, through anticipated higher residential densities near Range Road and adjoining employment uses;
- provides a variety of lot sizes and housing types to cater for diverse housing needs at housing densities that support provision of local services;
- conserves and incorporates key environmental areas into designs including native vegetation;
- integrates the design of POS and stormwater management systems; and
- maximises the use of land for housing relevant for the site's context and setting.

1.3.5 Local planning policies

The Council has endorsed a number of Local Planning Policies and various policies are of relevance to future development on the site.

1.3.6 Other approvals and decisions

The existing *Ardess Service Industry Estate Development Plan* is provided in Appendix 8. This plan has largely been implemented through the formation of civil works and associated development of the Ardess Industrial Estate. Following WAPC approval of the Structure Plan, the Development Plan will be rescinded.

The local government has issued various development and associated approvals in the Ardess Industrial Estate.

View from the Ardess Industrial Estate access way towards Chester Pass Road

2. SITE CONDITIONS AND CONSTRAINTS

2.1 Biodiversity and natural area assets

2.1.1 Overview

Bio Diverse Solutions (Environmental Consultants) prepared an *Environmental Assessment Report and Land Capability Assessment* to guide future environmental management and guide the formation of the Structure Plan (see Appendix 9). The assessments identify the measures proposed to mitigate and manage the environmental features of the site and focus on the natural areas to be retained within the site. The assessment concluded that the site has no significant environmental constraints to facilitate urban development.

The Structure Plan recognises the importance of the key environmental and landscape attributes of the area. It incorporates these in an urban form that creates an environmentally responsive urban development that meets the EPA, WAPC and local government environmental requirements. Consequently, the environmental outcomes of the Structure Plan are considerable. It is expected that future subdivision/development will have negligible environmental impacts given:

- the site is largely cleared;
- significant native vegetation will be conserved in POS;
- there are opportunities to undertake environmental repair through replanting;
- there are appropriate buffers to sensitive land uses;
- subdivision will be appropriately serviced including residential lots will be connected to reticulated sewerage;
- stormwater will be appropriately managed; and
- noise, dust and stormwater will be effectively managed.

2.1.2 Native vegetation

The majority of the site has been cleared. The main area containing native vegetation is in the north of Lot 521 where it is proposed to retain a significant component of the vegetation as POS.

There are no Ramsar listed sites, Wetlands of National Importance or Declared Rare or Priority species of vegetation. Nevertheless, the remaining native vegetation has value and it is proposed to retain a significant component.

There are two areas of remnant vegetation within the site. A broad scale vegetation survey of these two areas was conducted by Bio Diverse Solutions on 29 August 2017. The strip of vegetation running parallel with the northern boundary of the site (approximately 13 hectares in size) comprises Low Open Jarrah/Marri/Sheoak Forest in good condition. The small area of remnant vegetation in the south-east corner comprises mixed Eucalypt Forest in a degraded condition.

A search of publicly available databases through WA Atlas, Nature Map, and EPBC Protected Matter Search Tool indicates that no threatened, priority or declared rare flora is present on the site, or within the surrounding Nature Reserves and remnant vegetation.

A key element in preserving biodiversity is connectivity, largely based on connecting natural areas through retaining and/or enhancing native vegetation. Environmental corridors can be for ecological, recreational or utilitarian purposes or for multiple purposes (City of Albany: 2002).

Considerable work has been undertaken to identify and manage environmental corridors. This includes *Albany Greenways* (2002). Appendix 10 shows greenways in and around Albany including the bush corridor on Lot 521 Mercer Road. There are opportunities to connect the bush corridor on Lot 521 Mercer Road to the north and west. This includes planting native vegetation on the western section of Terry

Road adjoining the site and opportunities through the *Warrenup-Walmsley Local Structure Plan* to provide revegetation in drainage lines, as part of POS and within relevant road reserves.

Bio Diverse Solutions advise 'all efforts should be made to conserve existing native vegetation. There is support however to clear, as required, replanted vegetation which is Blue gums given they are generally unsuitable in an urban area.'

The following management measures are proposed to reduce the likelihood of impacts to vegetation and flora and to retain the key existing biological values of the site:

- considerable components of the remnant vegetation will be retained within the vegetation strip in the north-east of the site and in the south-east corner of the site. Inclusion of the native vegetation within POS will provide the most effective way of managing the conservation values of the native vegetation;
- access crossings within the vegetation strip will be limited to facilitate retention and natural regeneration of vegetation and to prevent adverse impacts particularly for transient fauna;
- there will be revegetation using native species, where currently there is very little native species and diversity, in POS and other areas to promote fauna habitat, flora diversity and biodiversity;
- rehabilitating waterways/drainage lines to create a 'living stream' through revegetation and as required fencing; and
- develop a greening strategy to increase green canopy and green spaces.

2.1.3 Fauna

The majority of the site has been cleared. As a result, fauna habitat has largely been removed. The only potentially significant fauna habitat on site is within the two areas of remnant vegetation.

Within the bush corridor, in the northern section of Lot 521, there is the potential for black cockatoo foraging, roosting and breeding habitat, and any impacts on these habitats should be minimised. Biodiverse Solutions supports this area being conserved as POS.

The Department of Biodiversity Conservation and Attractions in 2017 advised that vegetation in this bush corridor will support roosting Black Cockatoos species that are listed as threatened under the *State Wildlife Conservation Act 1950* and the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999*. Additionally, significant areas of native vegetation are in Crown reserves to the east of the site that provide habitat for cockatoo and other threatened and non-threatened species along with landscape connectivity. The Department of Biodiversity Conservation and Attractions encourage the retention of as much of the strip of vegetation as possible on Lot 521 to support roosting habitat and landscape connectivity in the form of 'stepping stones'.

To reduce likely impacts to native fauna, considerable components of the bush corridor will be retained through maintaining the strip of remnant vegetation in the north of the site as POS. Additionally, native vegetation species will be used in areas of POS to promote habitat for native fauna species.

2.2 Landform and soils

2.2.1 Landform

Overall, the site has a gentle to moderate gradient. Topography over the site is undulating ranging from a high point of 51m AHD in the central northern portion of the site to a low point of 22m AHD in the southern central portion of the site. There is a ridge that runs from the central northern portion of the site to the south-west corner.

2.2.2 Geology and soils

Regolith of WA (Department of Mining, 2009) mapping indicates that soils across

the site are classified as sandplain, mainly Aeolian and include some residual deposits.

A Geotechnical Investigation was conducted on the 29 August 2017 by Great Southern Geotechnics under later winter conditions. The Geotechnical Investigation is included in Appendix 9. The investigation included both soil analysis and measuring of water table. The soil testing was conducted to assess the suitability of the site for the proposed residential and light industrial development including onsite sewerage disposal for the extension of the industrial area.

Soil testing showed that soils across the site comprised predominately of a silty sand topsoil, over sandy gravel (with a layer depth varying from 200 - 700mm), over sandy clay to the depth of the hole.

Permeability testing was conducted by Liquid Labs WA as part of the Geotechnical Investigation. Permeability at both borehole site TP3 and TP10 is extremely low which is consistent with the soil type (sandy clay) encountered at these locations.

Phosphorous Retention Index (PRI) results across the site varied consistent with soil type. The sandy clays found across most of the site were found to have a very high PRI and therefore a very high ability to fix nutrients and heavy metals. The sandy gravel found at TP1 also had an extremely high PRI, particularly for a sand, whereas the light grey sand found at TP6 had a low PRI and therefore a low ability of fixing nutrients and heavy metals.

Ten boreholes were constructed within the site to a depth of 2.3 metres and left open for a minimum of 1 hour to identify water table present. No groundwater was encountered.

2.2.3 Land capability

As set out in Appendix 9, a Land Capability Assessment of the site was conducted by Bio Diverse Solutions. The overall capability of the site supporting the Urban Development land use was rated as highly capable for Mapping Unit 1 and very highly capable for Mapping Unit 2. The overall capability of the site supporting the Light Rural Industrial is rated as highly capable for Mapping Unit 1. Mapping Unit 2 was not encountered at the location of the proposed Light Rural Industrial land use. The degree of limitations for both Urban Development and Light Rural Industry for Mapping Unit 1 and Mapping Unit 2 is low to very low.

Accordingly, the site is capable of supporting urban development and has similar soil types and hydrology to the surrounding urban areas. The soils have good foundation stability and any inconsistencies (e.g. lateritic cap rock) can be managed via design and normal construction techniques.

2.2.4 Acid Sulphate Soils

Acid Sulphate Soil (ASS) mapping indicates the site is not situated on any known ASS. There is however a section of high to moderate risk of ASS occurring within 3m of natural soil surface to the south of the site on Mercer Road.

The final fill levels and excavation requirements of the future subdivision will determine if an ASS and Dewatering Management Plan is required to be prepared prior to subdivision. If required, the management plan will be prepared to satisfy the Department of Water and Environmental Regulation and will outline the soil management measures, the groundwater and dewatering monitoring measures and the contingency management measures required to minimise any environmental impacts.

2.2.5 Landscape impact

The western boundary of the site adjoins Chester Pass Road which is a tourist route connecting Albany to attractions including the Stirling Ranges and the Porongurup's. The site also forms part of the 'gateway' into Albany.

The site has mature planting adjoining the Chester Pass Road boundary which is

managed by the landowner. The mature planting, combined with the flat topography and the existing development adjoining Chester Pass Road, will ensure there will be manageable landscape impacts of new development when viewed from Chester Pass Road.

At the residential subdivision stage, a revegetation/landscape strategy will be formulated to provide a framework for the development of POS and the landscape within the public realm. The strategy will address matters including the landscape and design context, protection of remnant vegetation, rejuvenation of habitat and ecological linkages and water sensitive urban design (WSUD).

2.3 Groundwater and surface water

2.3.1 Overview

There are no significant waterways, wetlands or groundwater resources within the site or within the vicinity of the site. Accordingly, surface water or groundwater are not considered constraints to future urban development.

2.3.2 Surface water hydrology

There are no major naturally existing drainage networks or water bodies within the site. There is one minor waterway situated in the north-western section of Lot 10. This area will need to be managed sensitively in relation to stormwater planning within the site.

Hydrographic Sub-catchments (DoW, 2008) show the site to be within two surface water sub-catchments; with the northern and western portion of the site discharging to Willyung Creek to the north of the site and the central and southern portion of the site discharging to Yakamia Creek to the south of the site. Both the Willyung Creek and Yakamia Creek sub-catchments form part of the Oyster Harbour/Kalgan/King Catchment ultimately discharging to Oyster Harbour.

There are several man-made dams across the site, which are surface water fed and used for livestock drinking water.

2.3.3 Groundwater hydrology and hydrogeology

Australian Geoscience Mapping and Department of Water 250K Hydrogeological mapping places the site within the; 'Tertiary - Cainozoic - Phanerozoic (TPw) period: Plantagenet Group - siltstone, spongolite; minor sandstone, peat, and conglomerate.' The aquifer is a 'sedimentary aquifer with intergranular porosity – extensive aquifers, major groundwater resources.' (DoW, 2015).

As set out in section 2.2.2, a Geotechnical Investigation was conducted on the 29 August 2017 by Great Southern Geotechnics under late winter conditions. The investigation included measuring of water table. Ten boreholes were constructed within the site to a depth of 2.3 metres. Groundwater was not observed in any of the boreholes indicating there is no likely groundwater present beneath the site to a depth of 2.3 metres. The geotechnical investigation was undertaken in accordance with Australian Standards.

The site is not located within a Public Drinking Water Source Protection Area.

2.4 Bushfire hazard

The publicly released Bushfire Prone Area Mapping (DFES, 2017) shows that the majority of the site is located within a Bushfire Prone Area (situated within 100m of >1 ha of bushfire prone vegetation).

Bio Diverse Solutions have assessed bushfire risks and have prepared a BAL Contour Plan for the site (Appendix 9). The plan addresses *State Planning Policy 3.7 Planning in Bushfire Prone Areas* and the *Guidelines for Planning in Bushfire Prone Areas*. The plan has informed the Structure Plan and its design.

Based on the Bio Diverse Solutions assessment, the Structure Plan meets the

'Acceptable Solutions' of each Element of the bushfire mitigation measures as per the *Guidelines for Planning in Bushfire Prone Areas* (WAPC, 2017). Table 2 summarises the Bio Diverse Solutions assessment of the site and the Structure Plan against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4.

Table 2 – Assessment against Acceptable Solutions

Element	Acceptable Solution	Applicable or not Yes/No	Meets Acceptable Solution
Element 1: Location	A1.1 Development Location	Yes	Compliant - BAL 29 or less applied to lots
Element 2: Siting and Design	A2.1 Asset Protection Zone	Yes	Compliant, APZ in BAL 29 or less
Element 3: Vehicular Access	A3.1 Two Access Routes	Yes	Compliant two access to 2 destinations - Compliant
	A3.2 Public Road	Yes	Compliant with EAW
	A3.3 Cul-de-sacs	Yes	Compliant
	A3.4 Battle axes	N/A	Compliant
	A3.5 Private driveways	Yes	N/A
	A3.6 Emergency Access Ways	Yes	Compliant on parent lot
	A3.7 Fire Service Access Ways	N/A	N/A
	A3.8 Firebreaks	Yes	Complaint
Element 4: Water	A4.1 Reticulated areas	Yes	Compliant
	A4.2 Non-reticulated areas	N/A	N/A
	A4.3 Individual lots in non-reticulated areas	N/A	N/A

Based on Appendix 9, the site and the proposed subdivision/development will have acceptable bush fire risks. Future development can be designed to achieve a maximum BAL rating of BAL-29, appropriate access and egress will be provided, new lots and development will be connected to reticulated water and hydrants will be installed.

Future dwellings within the Bushfire Prone Area will be constructed to the required standard that correspond to their assessed BAL, as set out in *AS 3959-2009 Construction of Buildings in Bushfire-Prone Areas*.

A detailed Bushfire Management Plan will be required if any industry is defined as 'High Risk'. A Bushfire Management Plan and a Bushfire Emergency Evacuation Plan are required to support a future Development Application for the primary school.

Additionally, a detailed Bushfire Management Plan may be required to support the staged development of the subdivision.

2.5 Heritage

There is no registered Aboriginal heritage site within the Structure Plan area as set out on the Department of Planning, Lands and Heritage inquiry system. Proponents are however required to address the Department of Planning, Lands and Heritage's *Cultural Heritage Due Diligence Guidelines* and meet the provisions of the *Aboriginal Heritage Act 1972*.

The site does not contain any structure or place of heritage significance on the *City of Albany Municipal Heritage Inventory*.

2.6 Servicing

2.6.1 Overview

The Ardess Industrial Estate is provided with standard 'hard' infrastructure with the exception of reticulated sewerage. An internal access road, which is privately owned, provides vehicular access between the estate and Chester Pass Road. A sealed emergency access way, with an associated approved crossover, connects the internal access road with Terry Road. Additionally, an existing emergency fire access connects the Ardess Industrial Estate to Chester Pass Road.

2.6.2 Wastewater

There is currently no reticulated sewerage provided to the site. The existing zoned industrial area may remain unsewered and confined to dry industries if all lots are above 1 hectare. On-site wastewater disposal shall utilise alternative treatment sewerage disposal systems unless the applicant can provide advice to the local government that soil conditions are conducive to the operation of septic tanks and leach drains and will not result in unacceptable loss of nutrients to surrounding waterways, or create a risk to public health.

Additional light industrial areas, currently zoned 'General Agriculture', to be connected to reticulated sewerage.

All residential lots will be connected to the reticulated sewerage system.

2.6.3 Water

Future lots will be serviced with reticulated water. There are also opportunities for development to capture rainfall into water tanks for reuse within both industrial/commercial operations and on residential lots.

2.6.4 Stormwater

The western and northern portions of the site drain towards the north, while the central and eastern sections drain to the south. Stormwater drainage will be managed through on-site reuse, detention and connection. Further details are outlined in section 3.5, Appendix 11 and Appendix 12.

2.6.5 Telecommunications and electricity

Future lots will be serviced with underground power.

2.6.6 Vehicular access

The site has good access to the State and regional road network. Restricted Access Vehicles (RAVs) are permitted on Chester Pass Road and to enter/leave the Ardess Industrial Estate via the private road.

It is noted, the northern road connection to Chester Pass Road will be for as-of-right vehicles only and not for RAV7 vehicles (heavy haulage vehicles).

To address traffic safety and create effective transport operating environments, direct vehicular access between lots and Chester Pass Road, Range Road, Terry Road (section classified as an Integrator Arterial Road) and between residential lots and Mercer Road is not supported.

There is a requirement that buildings are orientated toward major arterial roads to address visual amenity. In particular, lots adjoining Terry Road (section classified as an Integrator Arterial Road) and Mercer Road, if there is no service road, to address access, built form and landscaping.

2.7 Context and other land use constraints and opportunities

2.7.1 Context

The site is located approximately 5 kilometres north of the Albany central area.

The site is surrounded by a wide range of land uses including those outlined on Appendix 3. The site is surrounded by rural properties to the north, west and south and remnant vegetation (Reserve 27179) to the

east. The land to the north and west is zoned 'Future Urban'. To the south-west of the site along Chester Pass Road is Albany's main light industrial area which includes a range of businesses. To the south of Mercer Road is a shopping centre and a lifestyle village.

The Ardess Industrial Estate is a well-established industrial area which contains a number of sheds used for industrial, commercial and warehouse purposes along with uses such as transportation/logistics.

An internal access road, which is privately owned, provides access to the estate. A well-established landscape buffer is provided on the estate's western boundary adjoining Chester Pass Road.

The site is bordered by significant areas of remnant vegetation on its eastern boundary (Reserve 27179) which is reserved as 'Parks and Recreation' within LPS1. The vegetated reserve contributes significantly to the character and amenity of the area.

2.7.2 Rational for Structure Plan design

Major influences of the Structure Plan design include:

- designation of the site in the LPS as 'Urban Growth' and 'Industry' and including support to expand the Ardess Industrial Estate;
- design principles in *Liveable Neighbourhoods*;
- investigations and recommendations from Biodiverse Solutions;
- advice from the local government and State Government agencies;
- retaining a significant component of native vegetation including in the bush corridor;
- creating an urban village in a bush setting;
- promoting employment opportunities including facilitating warehouse storage, commercial vehicle parking and logistic operations;
- the *Ardess Service Industry Estate Development Plan,* existing development in the Ardess Industrial Estate and likely future development;
- extending Range Road; and
- *Warrenup-Walmsley Local Structure Plan*.

The Structure Plan responds to the site's context, opportunities, constraints and the planning framework. The rationale behind the Structure Plan (Plan 1) includes to:

- address land use compatibility with adjoining/nearby uses and coordinate with surrounding development;
- provide light industrial development and employment in the western section and residential development in the central and eastern sections;
- provide a range of residential lot densities, sizes and housing which contribute to a greater choice of housing and at densities that are marketable and make efficient use of land and infrastructure;
- comply with *Guidelines for Planning in Bushfire Prone Areas*;
- have regard to topographic and other natural features along with required servicing;
- foster a sense of identity that reflects the natural character of the area and creates a sense of community;
- create an urban village in a bush setting, bordered by open spaces (bush corridor on Lot 521 and Reserve 27179);
- minimise the impact of development on sensitive environmental values;
- facilitate the safe and efficient movement of traffic and promote a connective and permeable walking and cycling network;
- provide a large district park;
- provide POS that conserves native vegetation, treats stormwater along with providing opportunities for a range of recreation;
- enhance the area through the provision of a primary school and a community purpose site;
- recognise there is increasingly a move away from manufacturing operations towards transportation logistics and storage, warehousing and distribution centres. The Ardess Industrial Estate is well suited to assisting with

transportation logistics with its excellent road access and as demonstrated by current development in the estate;
- provide an opportunity to create a high quality extension of Albany's urban area which maximises the views to surrounding features including Willyung Hill, Porongurup, Stirling Ranges, Mount Manypeaks, Mount Clarence, Mount Melville and the coast; and
- provide additional retail catchment to the existing Chester Pass Mall activity centre.

2.7.3 Structure Plan key proposals

The Structure Plan has been developed to guide the subdivision and development of the site. The Structure Plan proposes:

- light industrial development including expanding the Ardess Industrial Estate eastwards towards Range Road;
- residential development with densities being a minimum of R20;
- active and passive POS in the north-east section of the site including a large district park;
- a primary school site;
- community purpose site;
- drainage basins; and
- new roads, indicative intersections and opportunities for walking and cycling.

3. LAND USE AND SUBDIVISION REQUIREMENTS

3.1 Land use

3.1.1 Overview

The Structure Plan (Plan 1) provides guidance for future subdivision and development. The Structure Plan proposes additional light industrial development, low and medium density housing development, POS, a primary school site and a community purpose site. The Structure Plan supports a range of residential densities (above R20) to promote a variety of densities, lot sizes and types of housing.

Associated roads are identified including part of Range Road which connects central Albany with Oyster Harbour/Lower King and road widening for Terry Road (eastern section).

The Structure Plan summary table, in the Executive Summary, outlines key statistics and planning outcomes.

3.1.2 Suitability of proposed land uses

The site is suitable and capable of accommodating light industrial and residential development.

The western portion of the site is suitable for light industrial development to complement the existing Ardess Industrial Estate. Expanding the Ardess Industrial Estate will create considerable employment and economic activity.

The central and eastern portions of the site are suitable for residential subdivision/development consistent with the LPS. *Liveable Neighbourhoods* promotes the concept of 'walkable catchments'. Based on detailed design at the subdivision stage, it is expected that the residential area will be generally within 400 metres (equivalent of 5 minutes walking time) to an area of POS.

3.1.3 Integration with surrounding land use

The Structure Plan is compatible and integrated with surrounding land uses. The Structure Plan has considered the site's context, including adjoining and nearby land uses, and considered the compatibility of future development. In summary, the proposed light industry and residential uses are compatible with adjoining and nearby land uses/development given:

- the long established Ardess Industrial Estate is well-buffered to sensitive uses given it adjoins industrial and rural land. Additionally, Chester Pass Road is wide adjoining the site. This combined with the established planting provides a buffer to uses on the western side of Chester Pass Road;
- it is likely that there are greater noise and associated impacts from Chester Pass Road than from the Ardess Industrial Estate;
- the Structure Plan proposes light industry rather than general industry. Effectively managed light industry can be located adjoining residential development;
- Range Road will have a 30 metre reserve width incorporating street trees and landscaping;
- development conditions can further assist to minimise off-site impacts; and
- a requirement for industrial operators to appropriately manage their operation and control their impacts on their own property in accordance with standard practice and legal principles.

3.2 Public open space

3.2.1 Overview

The design of the POS system responds to a wide number of opportunities presented by the site, namely:

- retaining key environmental features such as a significant component of remnant vegetation;
- integrating surface water management measures into POS;

- providing generous sized POS that provide a range of recreational opportunities; and
- fostering a sense of community, place and local identity through the creation of an urban village in a bush setting, bordered by open spaces (bush corridor on Lot 521 and Reserve 27179).

3.2.2 POS provision

The Structure Plan provides the following POS:

- retaining the eastern portion of the vegetated bush corridor in the north-east section. The bush corridor will be passive POS;
- a generous sized district park for active recreation of approximately 3.46 hectares; and
- a community centre site located near the proposed primary school.

A schedule of POS for the Structure Plan Area is shown in Table 3.

Table 3 – POS Schedule

Land use allocations	Hectares
Total Structure Plan area	178.3348
Less – Unrestricted POS not included in POS contribution	7ha
Total – Net site area	171.3348ha
Deductions	
Primary school	4ha
Light industry	58.5ha
Arterial roads:	
Range Road (30m reserve width)	2.67ha
Terry Road – eastern section (5m widening within Structure Plan area)	0.675ha
Gross subdivisible area	105.4898ha
Required POS @ 10 per cent	10.5489ha
POS contribution	
May comprise: minimum 80% unrestricted POS	8.439ha
May comprise: maximum 20% restricted POS – bush corridor total area 7ha	2.109ha
Unrestricted POS sites	
District park	3.46ha
Community purpose site	0.37ha
Restricted use POS	
Restricted use POS - bushland	2.109ha
POS provision	5.939ha

In addition to the above, there are opportunities for community use of the primary school oval under a shared access agreement with the Department of Education.

The amount of POS does not meet the minimum 10% requirement under *Liveable Neighbourhoods* and to provide for stormwater management systems. The current provision of POS has a shortfall of approximately 4.6 hectares.

The allocation of additional POS will be further refined during the subdivision stage as the detail of the stormwater management system is further determined through the Urban Water Management Plan. This will result in opportunities to improve dwelling yield and planning outcomes, while continuing to balance ecological and recreational needs that address *Liveable Neighbourhoods*.

The Structure Plan aims to provide wide ranging recreational opportunities while contributing to the unique identity of the locality. The Structure Plan recognises that well designed POS contributes to a community's better quality of life.

The provision of POS assists to create a distinctive sense of place, conserve important natural areas, provide active and passive recreational areas and provide convenient access to residential areas. Portions of the POS are also proposed to integrate with managing stormwater.

3.2.3 Nature space

While the majority of the site has been cleared, there are portions of remnant vegetation (the eastern section of the bush corridor) that will be retained within the POS. The retained bush corridor will be passive recreation. Retention of the native vegetation in public ownership will facilitate the effective management of the area for its conservation value.

The bush corridor contains native species or communities in a relatively natural state and hence contains biodiversity. The

Department of Biodiversity Conservation and Attractions have advised that the vegetation in this bush corridor will support roosting Black Cockatoos species that are listed as threatened under the *State Wildlife Conservation Act 1950* and the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999*. Significant areas of native vegetation are in Crown reserves to the east of the site that provide habitat for cockatoo and other threatened and non-threatened species and landscape connectivity. The Department of Biodiversity Conservation and Attractions encourage the retention of as much of the strip of vegetation as possible on Lot 521 to support roosting habitat and landscape connectivity in the form of 'stepping stones'.

The role of the bush corridor is significant in enhancing the area's natural assets to the benefit of the community. The bush corridor is expected to be of high value to residents. The POS will be bordered by public roads to assist with management of the POS.

Passive, conservation style POS is consistent with the desired character and lifestyle of the area. There will be opportunities for low-key recreation within the bush corridor, with details to be addressed at the subdivision stage.

3.2.4 District park

A large district park of approximately 3.46 hectares is proposed on Lot 521 in the north-east section.

There is an opportunity to provide attractively designed areas of POS which will be overlooked by the surrounding residential areas. The POS should be maintained to a high standard to be appealing to the community.

It is expected that the district park will be used for active recreation, passive recreation, and unstructured active play. It could be developed for active recreational use such as playgrounds, exercise facilities, half-court basketball courts along with passive facilities such as picnic/barbecue areas and seating.

3.2.5 Community purpose site

A community purpose site is proposed near the primary school. While details will be addressed at the subdivision stage, including its ownership or vesting, it is envisaged the site will be around 4000m^2 in area. The community purpose site will be an asset to the area and will complement the primary school.

3.3 Residential

The Structure Plan will provide a minimum of R20. The site is expected to facilitate a mix of densities, lot sizes and housing types. Increasing population in Albany, a designated regional centre, adds to its overall viability, vitality and prosperity and the range of services that can be sustained.

Future subdivision will meet the minimum lot size and will comply with the average lot size requirements of the *Residential Design Codes* for the specified density coding.

Approximately 105 ha has been identified as gross residential development land.

The LPS recommends that urban residential densities of at least R20 are to be achieved in 'Urban Growth' areas. The R20 density code is the equivalent to an urban density of approximately 14 dwellings per hectare of gross urban land. It is estimated approximately 1470 residential lots will be created, based on 14 dwellings per hectare of gross urban land. Final yields will be determined at the subdivision design stage. Over the life of the project, there is an opportunity to achieve an increased overall density, subject to market demand.

As previously outlined, it is intended to foster a sense of community, place and local identity through the creation of an urban village in a bush setting, bordered by open spaces (bush corridor on Lot 521 and Reserve 27179). Based on land use allocation, street block pattern and associated lot orientation, the Structure Plan seeks to promote views and outlooks.

Residential development should respond to the unique character of the area and be sympathetic to existing landform. Consideration should be made to formulating Building and Landscaping Guidelines supported by restrictive covenants.

The expected higher density near Range Road will maximise opportunities for future access to public transport.

3.4 Movement networks

3.4.1 Current situation

The site has excellent access to the National and State highway network and the regional road network. Additionally, the site is highly accessible by road with convenient access to the Albany central area and the Albany urban area. This will ensure convenient vehicular access that meets safety and amenity objectives.

Vehicular access between the site and Chester Pass Road is via an existing sealed access way (private road). There are appropriate sight distances in both directions where the access way intersects with Chester Pass Road (which is four lane dual carriageway adjoining the site) which facilitates safety for road users.

It is proposed that the first section of the private road, between Chester Pass Road and the first bend (left), is to be ceded at no cost to be listed as a public road. The required land area (width) to accommodate the road reserve is to be determined with the City.

The City has previously approved a crossover from the site onto Terry Road. In comparison to the main and direct access between the Ardess Industrial Estate and Chester Pass Road, the crossover to Terry Road is used only occasionally. Terry Road is not a classified Restricted Access Vehicles (RAV) route, so all RAVs are required to enter and leave the Ardess Industrial Estate via the main Ardess Industrial Estate access way. No RAV's are permitted to access or leave the Ardess Industrial Estate via Terry Road. 'As of right' vehicles are however able to use Terry Road.

Chester Pass Road is an approved road train route and it has a speed zoning of 60kph where the Ardess Industrial Estate access road intersects with Chester Pass Road. MRWA are supportive of RAVs to RAV Category 7 entering and leaving the site from the Ardess Industrial Estate access road. RAV Category 7 relates to vehicles (prime mover towing a semi-trailer and B Double or a B Double towing a dog trailer) that have a maximum length of 36.5 metres and a maximum mass of 107.5 tonnes.

Given the site adjoins Chester Pass Road, the impact of RAVs on general traffic on the Structure Plan area is minimised. RAVs will enter and leave the site in a forward gear.

Chester Pass Road looking towards Chester Pass Mall with Ardess Industrial Estate on the left

3.4.2 Proposed movement system

Various traffic impact studies have been prepared for the locality. In summary, these studies conclude that the road network and intersections have sufficient capacity to address traffic generation from the development. The Structure Plan has been complemented with the Traffic Impact Assessment prepared by Wood & Grieve (Appendix 13).

The Structure Plan proposes:

- a movement network that maximises permeability and legibility. New connections provide access to surrounding areas;
- key roads on a north-south and east-west grid to promote permeability including connecting the Ardess Industrial Estate with Range Road;
- an extension of Range Road will provide an alternative north-south route to Chester Pass Road and Lower King Road/Ulster Road;
- road reserve widths of 30 metres on Range Road/Terry Road to cater for eventual four lanes, stormwater management, services and street trees;
- roads within the industrial area will be designed and developed to accommodate heavy vehicles;
- no direct vehicular access between lots and Terry Road/Range Road. There will be limited or no access between lots and Mercer Road with this matter to be addressed at the subdivision stage;
- no additional access to Chester Pass Road is permitted;
- no cul-de-sacs in the light industry estate and no or limited cul-de-sacs in the residential area;
- trees on the inner radius of the bend in the Private Access Road to be removed to allow for appropriate sight lines for oncoming traffic. Provide additional shoulder width at the corner to allow for two opposing RAV's to pass each other simultaneously (as per the Transport Impact Assessment report 2019); and
- maximum total of 30 industry lots/industrial land uses may be considered within the industrial areas. This condition applies because of limitations on adjoining transport infrastructure. A transport impact assessment has determined that the maximum number of restricted access vehicles that the current intersection design (Chester Pass Road) can handle is 180 restricted access vehicles (RAV) per day.

The Structure Plan will ensure convenient vehicular access that meets safety and amenity objectives. The Structure Plan is guided by the appropriate road types from *Liveable Neighbourhood.* Neighbourhood connector roads are proposed as the key access and egress connectors for the Structure Plan area.

The final design will be subject to detailed civil engineering design at the subdivision stage. Roads in the industrial area will be designed and constructed to accommodate heavy vehicles in accordance with local government requirements. Roads in the residential area will be developed to an urban standard to the satisfaction of the City.

3.4.3 Key issues

In time, it is expected that the western section of Terry Road will be realigned. The existing intersection of Terry Road/Chester Pass Road is expected to be closed and the intersection relocated northwards to provide appropriate vehicular sight distances in both directions. This is separately addressed in the *Warrenup-Walmsley Local Structure Plan.*

MRWA is seeking changes to the realignment of Terry Road including connecting it with Harvey Road to create a 4-leg roundabout. MRWA advise the advantage to the design is safety. A 4-way roundabout is more effective than a 3 leg, the land to build the roundabout already resides in the Harvey Road truncations and it reduces the number of conflict points.

Chester Pass Road will continue to act as part of the Restricted Access Vehicle (RAV) Class 7 Network until the Albany Ring Road is finalised.

Development in the light industrial area that incorporates RAVs will be advised that there is no guarantee that RAVs will be permitted to use Chester Pass Road between Menang Drive and the main roundabout (intersection with Albany Highway, North Road and Hanrahan Road) following the Albany Ring Road being completely constructed and operational to the Port of Albany. Associated development approvals may also contain conditions or advice relating to future limitations of access for RAVs.

Given there is existing light industrial development adjoining Chester Pass Road, there are no traffic noise implications from Chester Pass Road on future development on the site.

In the future, the owners of Lot 10 Chester Pass Road and the City will review whether the private road becomes vested with the City as a public road.

3.4.4 Vehicle manoeuvring and parking

Vehicle parking and manoeuvring areas for industrial/commercial development will be contained on site and all vehicles will be able to enter and leave the site in a forward gear. Vehicular access, parking and manoeuvring areas will be constructed, drained and where necessary sealed to the satisfaction of the local government.

3.4.5 Pedestrian and cyclist movements

The site's location and the Structure Plan design provide considerable opportunities for walking and cycling. A strong pedestrian network is promoted in the Structure Plan to enable connectivity, access and recreational opportunities.

There are various opportunities to promote walking and cycling to/from the site which will be considered in more detail in future planning and design stages. Dual use paths and footpaths will be provided in the residential area in accordance with *Liveable Neighbourhoods.*

3.4.6 Public transport

The site is not currently serviced by public transport. It is expected that Range Road/Terry Road and Chester Pass Road will be identified as future public transport routes connecting the Albany central area with localities including Oyster Harbour, Lower King, Warrenup and Pendeen.

3.5 Water management

A Local Water Management Strategy (LWMS) has been prepared in support of the Structure Plan as required by *State Planning Policy 2.9 Water Resources* and Better Urban Water Management (WAPC 2008). Refer to Appendix 11. This is complemented with the Stormwater Management Plan prepared by Wood & Grieve set out in Appendix 12.

The LWMS outlines there are opportunities to enhance water quality and quantity onsite before being discharged offsite. Accordingly, stormwater management from the site is required be effectively designed, constructed and managed to the satisfaction of the local government and Department of Water and Environmental Regulation to meet publications such as *State Planning Policy 2.9 Water Resources*, *Better Urban Water Management, Stormwater Management Manual for Western Australia*.

The LWMS details the integrated water management strategies to facilitate future urban water management planning. The LWMS will achieve integrated water management.

The LWMS sets out a number of management/design measures to be implemented to reduce the impact of the proposed development on surface water and groundwater flows, levels and quality, the function and environmental values of the site, or its interconnected areas.

Stormwater management is required to ensure there are limited off-site impacts through adopting WSUD. This recognises that water is a valuable resource. WSUD aims to reduce stormwater runoff, remove nutrients and contaminants, protect receiving environments, minimise water use, maximise water conservation, promote fit-for-purpose use and promote re-use.

In particular, the subdivision/development is required to ensure that stormwater is designed to ensure that post development run-off rates are no greater than pre-development run-off rates.

The LWMS confirms that there are no significant constraints or sensitive features which would preclude implementation of WSUD.

Based on geotechnical investigations, the land capability assessment and the proposed management measures, it is not expected that any changes to groundwater flows, levels or quality will have an adverse impact on the function and environmental values of the site.

There are limited water management risks associated with development of the site. Based on the geotechnical investigations (see section 2.2.3), there is no requirement to undertake pre-development groundwater monitoring. Overall, the soil types enable stormwater infiltration at source.

Based on geotechnical investigations (Appendix 9), it is expected that lots can support on-site reuse and/or detention.

The Stormwater Management Plan (Appendix 12) shows catchments (including areas), major flow paths for land affected by flooding (1% Annual Exceedance Probability), existing and proposed basins, proposed living stream, design data and typical treatment/storage basin.

The Stormwater Management Plan includes indicative locations of stormwater basins higher up in the sub-catchments along with basins at each low point within the catchments. These basins will be designed and landscaped to become a significant feature of the development.

The Stormwater Management Plan also highlights where particular mitigation measures are required such as addressing erosion in steep areas.

The LWMS in association with the Stormwater Management Plan set out that infiltration on each lot and for roads/other impervious areas will be through at-source control. This will be achieved through bio-retention, swales, floodways, treatment trains, public open space and basins.

As set out in Appendix 9, a Land Capability Assessment of the site was conducted by Bio Diverse Solutions. A small portion of land, identified as Mapping Unit 2, had a low capability. This land is located near Mercer Road in the residential area. The main identified limitations for Mapping Unit 2 were that soils have a low Phosphorus Retention Index (PRI) and very low soil absorption.

There are various measures that can overcome the land capability issues for Mapping Unit 2. It is expected that suitable clean fill will be required which is complemented with enhanced stormwater management. Gardens and open space can incorporate soils that have a higher PRI which can be promoted using suitable native species.

The waterway in the north-west section of the site is to be landscaped/revegetated to become a 'living stream'.

Stormwater is not to be discharged from development into the Chester Pass Road drainage system.

As outlined in the LWMS, an Urban Water Management Plan is required to be undertaken at the subdivision stage to support residential subdivision to provide detailed design in accordance with Department of Water and Environmental Regulation and local government requirements. This will address, in detail, the approach to matters such as managing erosion in steep areas.

3.6 Education facilities

The estimated lot yield of 1470 residential lots and a population of approximately 3675 people will generate demand for one primary school.

Liaison with the Department of Education confirms that one primary school will be required within the Structure Plan area to service the site and a catchment extending outside of the Structure Plan area. Provision for a high school is not required.

A four hectare primary school site is set aside for education facilities in the north-east section of the Structure Plan area. The school is conveniently located to the

residential area on Lot 521 and to the future school catchment north of Terry Road.

The school site is bordered on three sides by roads to assist with access and parking. There will be effective circulation for traffic around the school site which will assist to reduce traffic congestion and illegal parking issues at peak school periods. This in turn will assist to reduce congestion in the local streets as traffic moves to and from the school site.

The site has minimal physical constraints, is gently sloping, is well drained and is capable of supporting school buildings.

There are opportunities for community use of the school oval under a shared access agreement with the Department of Education. If agreed, it will satisfy the requirement for an active sporting area in the northern portion of the site and provide another public recreational asset.

3.7 Activity centres and employment

The City and the WAPC (via documents such as *Liveable Neighbourhoods*) promote employment and economic growth which will be assisted by the proposed expansion of the Ardess Industrial Estate to Range Road.

The Structure Plan will have various economic benefits including supporting local employment, supporting local services and strengthening the local economy which is consistent with the planning framework. For instance, implementation of the Structure Plan will:

- provide a range of opportunities and choices for businesses, most which are expected to be small to medium sized operations;
- assist in the economic sustainability and strength of Albany and contributes to the local and regional economy. Development of the site will contribute to job creation (direct and indirect jobs) and it will assist in the growth and diversify of the City's economic base and add to the overall vitality and prosperity of Albany;
- support a growing and more diverse industrial and logistics sector which will provide an important foundation for the future economic growth of Albany;
- create employment close to where people live; and
- assist with employment self-sufficiency in the district.

Other employment generators within the Structure Plan area include the primary school and home businesses.

3.8 Infrastructure coordination, servicing and staging

3.8.1 Overview

Background servicing information is set out in section 2.6. Future subdivision and development will be appropriately serviced in accordance with local government and WAPC requirements.

The subdivision/development of the site, as advocated by the Structure Plan, will require the extension and upgrading of essential civil infrastructure. There will be a need for more detailed investigations and design to ensure there is capacity of these services for the subdivision. The capacity of existing infrastructure to service future subdivision will need to be determined prior to the issue of titles.

3.8.2 Sewerage disposal

Biodiverse Solutions assessed the proposed expanded light industrial area being serviced with on-site sewerage disposal against the *Government Sewerage Policy*. The assessment found that the proposed light industrial area is appropriate for on-site sewage disposal. In addition, the low permeability and high PRI of the soils in the location of the proposed industrial area will allow for slow draining assisting the process of being fixed by soil microbes.

While noting the above, the servicing approach required by the WAPC is:

- existing zoned industrial area may remain unsewered and confined to dry industries if all lots are above 1 hectare.

On-site wastewater disposal shall utilise alternative treatment sewerage disposal systems unless the applicant can provide advice to the local government that soil conditions are conducive to the operation of septic tanks and leach drains and will not result in unacceptable loss of nutrients to surrounding waterways, or create a risk to public health;

- additional industrial areas, currently zoned 'General Agriculture', to be connected to reticulated sewerage; and
- all residential areas are connected to reticulated sewerage.

As the current light industrial area is in a sewerage sensitive area, a secondary sewerage treatment system with nutrient removal should generally be used. The provision of on-site sewage disposal systems including calculation of land application area will be in accordance with minimum site requirements contained in Schedule 3 of the *Government Sewerage Policy* and must be approved for use in Western Australia by the Department of Health. LPS1 requirements for the current Light Industrial area require 'dry industry' and 'alternative treatment sewerage disposal systems'.

As outlined above, all residential lots will be connected to the reticulated sewerage system. To service residential lots, waste water pumping stations (WWPS) will be required. It is expected that the northern portion of the site will be serviced with a WWPS located outside the site in the northeast corner of Lot 4925 Terry Road. South of the ridge line on Lot 521, the majority of the site is expected to the serviced with a WWPS located outside the site on Mason Road within the *Yakamia-Lange Structure Plan* area. Both WWPS's eventually discharge into the WWPS on the corner of Albany Highway and Le Grande Avenue.

While the permanent WWPS and their pressure mains are ultimately funded by the Water Corporation, pre-funding of those works by developers is likely to be required to enable subdivision to proceed. These costs can be shared between developers both within and outside of the Structure Plan area.

3.8.3 Reticulated water

Proposed lots will be connected to the reticulated (scheme) water system. This will require an extension and upgrading of the water main, plus advancing the programmed enlargement of a supply main to ensure proposed lots have sufficient pressure to meet Water Corporation's licence conditions and its Customer Charter. Hydrants will be installed based on Water Corporation guidelines.

The reticulated water supply should be complemented with rainwater capture and storage, with landowners/operators required to install rainwater tanks as a condition of development approval.

3.8.4 Power supply and telecommunications

All proposed lots will be serviced with underground power and required telecommunication infrastructure. Electrical trenching within the site will also be used for communications cabling as well.

Existing HV power supplies are available in adjacent commercial and industrial areas and can be extended in a staged program to service the site. While no significant offsite infrastructure upgrades are anticipated, this will need to be confirmed closer to the subdivision stage.

3.8.5 Gas

Albany has an LPG reticulated gas network operated by Atco Gas. While the current system is limited and there is no network in the Walmsley locality, upgrades currently being carried out may extend the system.

The options at present are an individual household/commercial premise bottled supply or the establishment of a centralised 'bullet' for reticulated gas to each household and commercial premise.

3.8.6 Staging

A staged development will occur, with the initial stages being the expansion of the Ardess Industrial Estate to the east. The formulation of future stages will consider the location of services, demand and feasibility considerations. Residential subdivision will only be feasible and environmentally sustainable once reticulated sewerage has been established in the area.

3.9 Developer contributions arrangements

Developer contributions are to be made in accordance with the WAPC's *State Planning Policy 3.6.* Contributions may be required for:

1. The ceding and development of land for a north/south link road, namely 'Range Road'; and
2. Road upgrading and/or intersection treatments as may be required at the subdivision stage, as recommended by a Traffic Analysis to the satisfaction of the City of Albany.

Note: The value of contribution for Range Road may consider:

1. Value of land ceded (30m W/L); +
2. Road construction costs; divided by:
3. Proportion of vehicles attributed to structure plan; divided by
4. Expected dwellings;
5. Cost per lot.

Note: Road upgrading and/or intersection treatments may be required for Terry Road, Mercer Road and the intersection between the Range Road and Mercer Road. Cost sharing mechanisms may apply.

3.10 Implementation

Implementation of the Structure Plan will be through application of the provisions of Part One - Implementation of the Structure Plan through scheme amendment, subdivision and/or development processes.

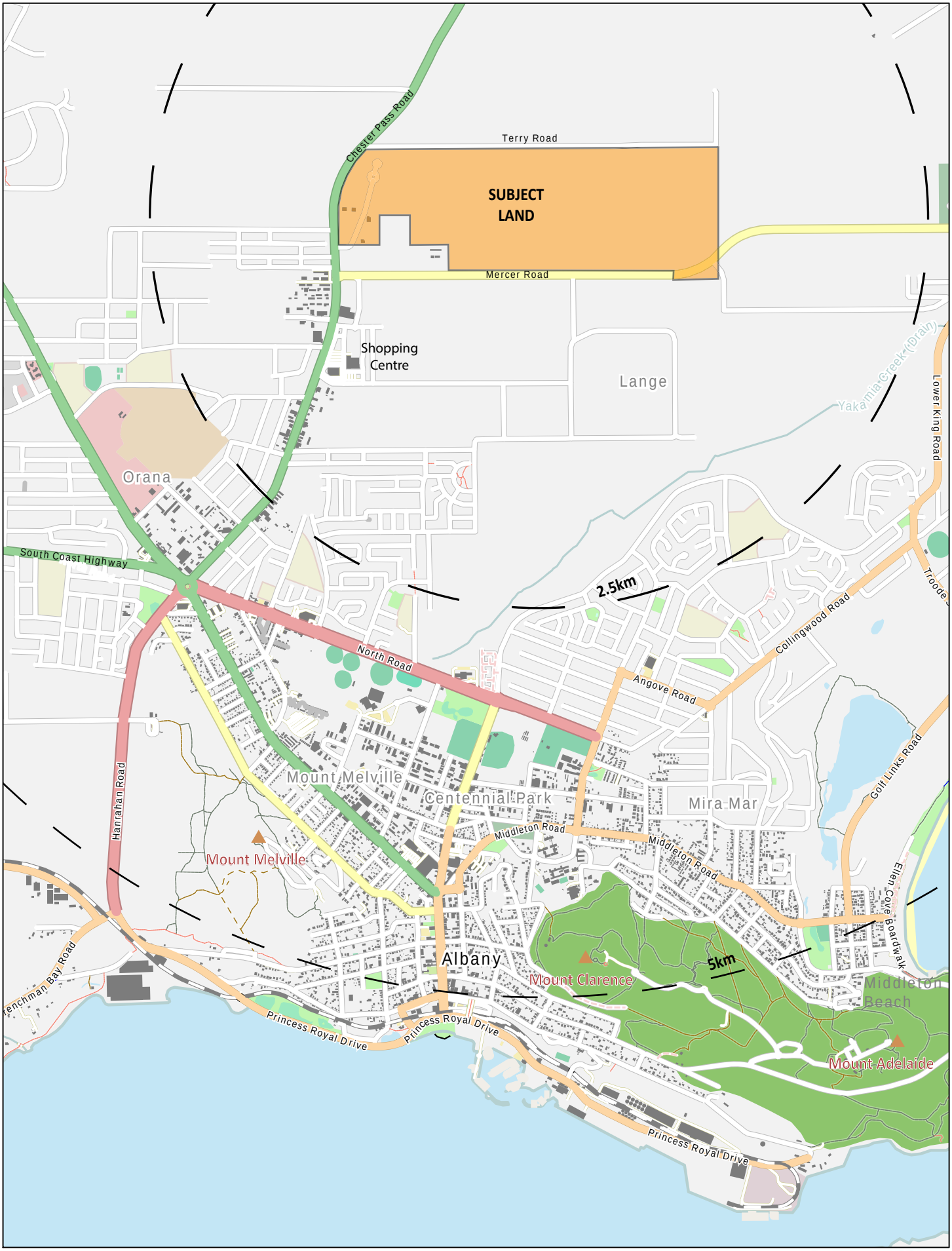
4.0 CONCLUSION

The *Ardess-Walmsley Local Structure Plan* coordinates and facilitates a strategically significant development area as identified in the City of Albany Local Planning Strategy. Its relative proximity to the Albany central area, retail, commercial and industrial activity provides an opportunity to consolidate development which maximises access to employment and services.

The Structure Plan recognises the importance of the key environmental and landscape attributes of the area, and incorporates these in an urban form, that creates an environmentally responsive urban development that meets the EPA, WAPC and City of Albany's environmental requirements.

View of Ardess Industrial Estate and surrounding area

APPENDIX 1



LOCATION PLAN

Lot 10 Chester Pass Road
and Lot 521 Mercer Road
Walmsley, City of Albany

SUBJECT LAND

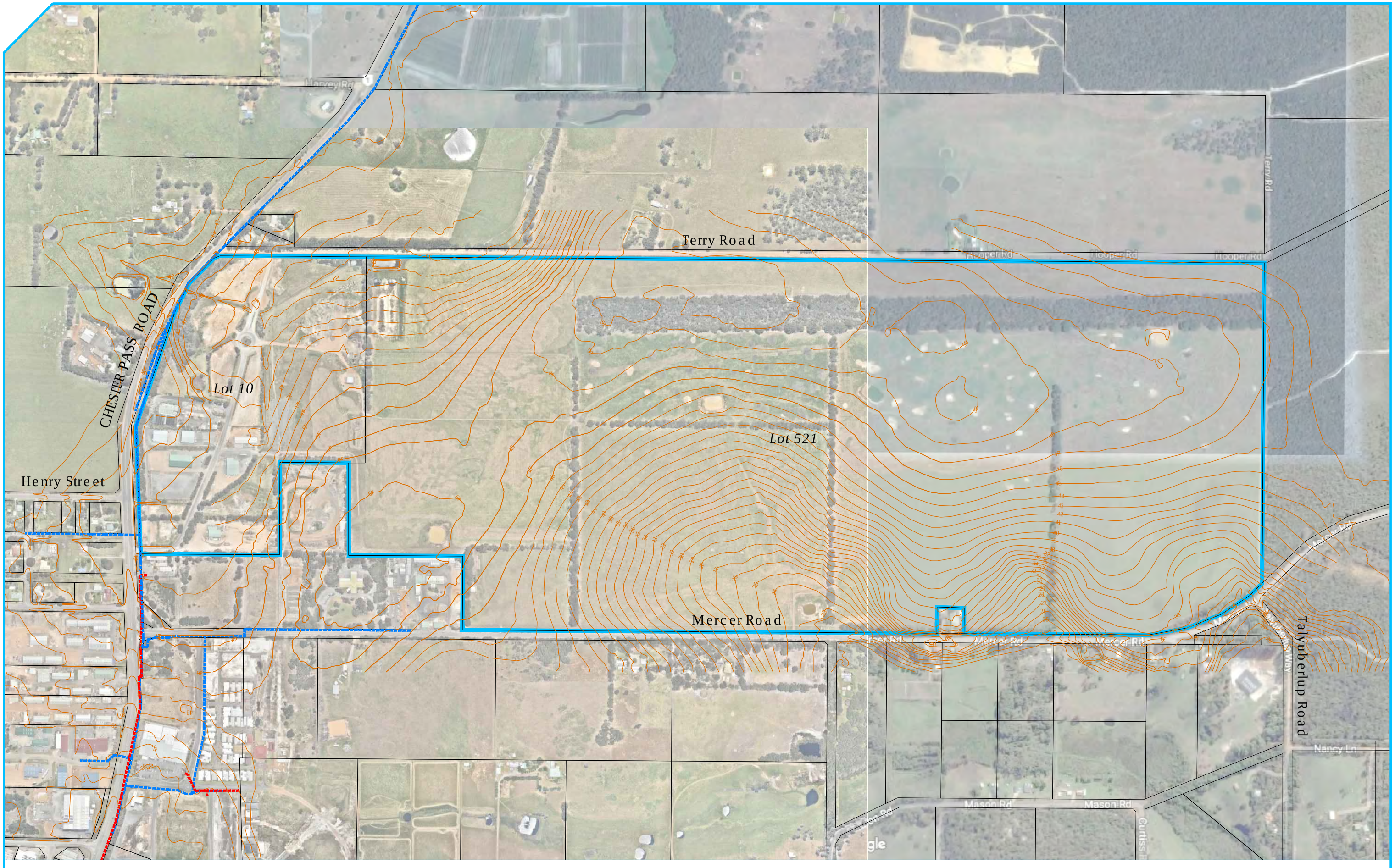
N

scale 1 : 30,000 @ A4

0 2km

Edge Planning & Property
134 Hare Street, Mount Clarence
ALBANY WA 6330
W www.edgeplanning.com.au
E steve@edgeplanning.com.au
M 0409 107 336

APPENDIX 2



SITE PLAN
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

Legend

- Structure Plan Boundary
- Existing Lot Boundary
- Contours
- Existing u/ground Water Pipe
- Existing u/ground Sewer Pipe

SCALE 1:7500
SHEET A3

NORTH

0 150 300m

REV	DESCRIPTION	YYMMDD	DRAWN	APPRVD
A	CONTEXT PLAN	170522	SJ	ST

DRAWING NUMBER EP 170520 01 REV A

Issued for design intent only. All areas and dimensions are subject to detail design + survey.

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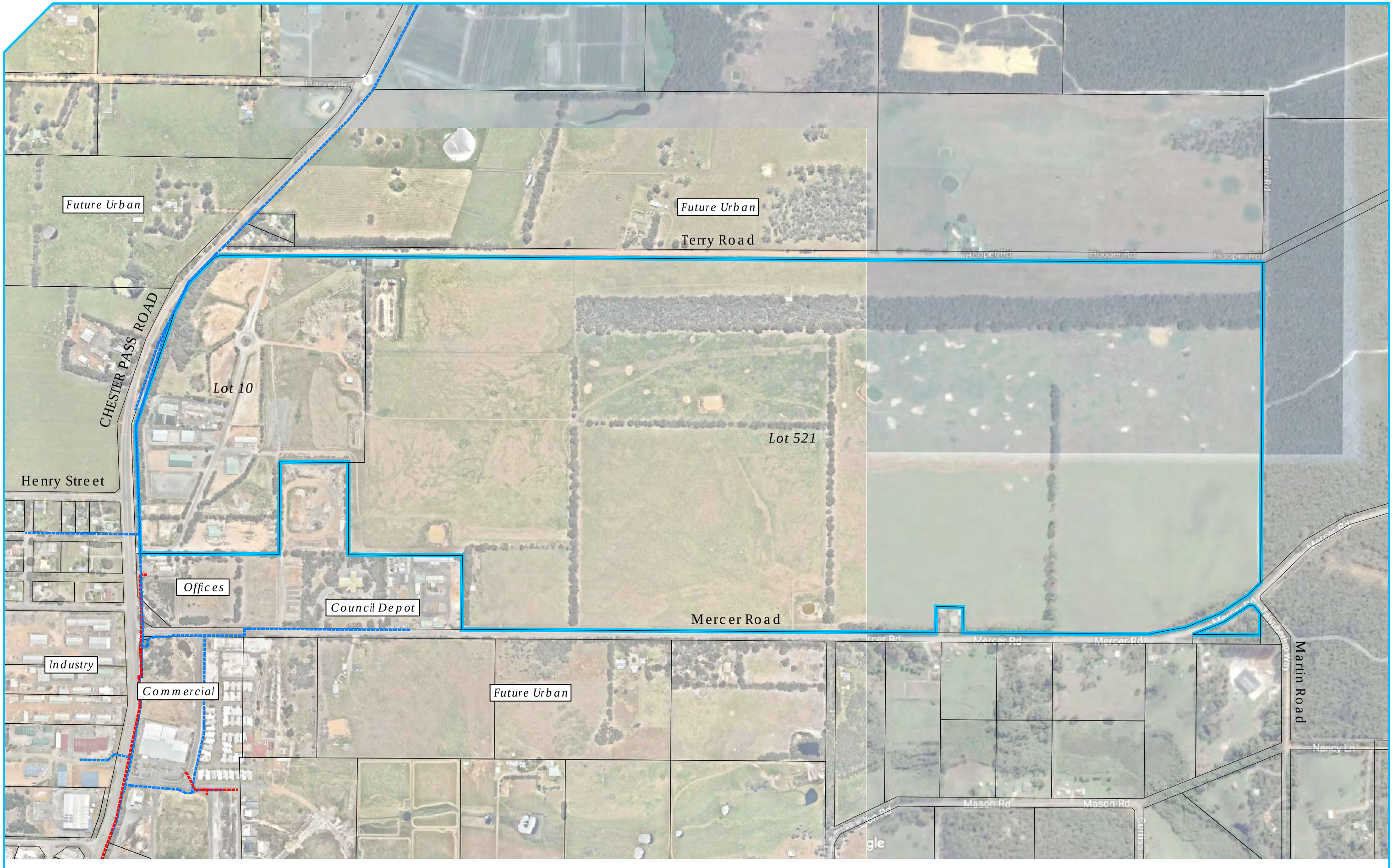
APPENDIX 3



CONTEXT PLAN
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

Legend

- Structure Plan Boundary
- Existing Lot Boundary
- Existing u/ground Water Pipe
- Existing u/ground Sewer Pipe

SCALE 1:7500
SHEET A3

0 150 300m

NORTH

REV	DESCRIPTION	YYMMDD	DRAWN	APPRVD
A	CONTEXT PLAN	170522	SJ	ST

DRAWING NUMBER EP 170520 03 REV A

Issued for design intent only. All areas and dimensions are subject to detail design + survey.

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APPENDIX 4

Application H436981

Volume 1575 Folio 458

WESTERN AUSTRALIA

VOLUME 2192 FOLIO 1

IN THE REGISTER

CERTIFICATE OF TITLE

UNDER THE " TRANSFER OF LAND ACT, 1893 " AS AMENDED

The person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements, encumbrances and notices shown in the Second Schedule hereto.

REGISTRAR OF TITLES

Dated 5th May, 2000

ESTATE AND LAND REFERRED TO

Estate in fee simple in portion of Plantagenet Location 392 and being Lot 10 on Diagram 99325, delineated on the map in the Third Schedule hereto.

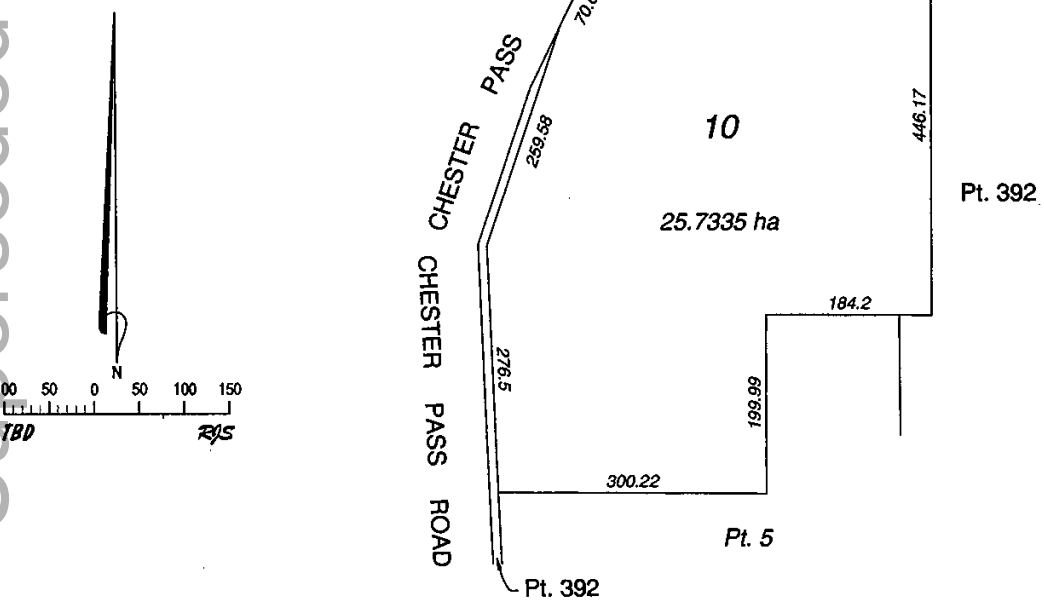
FIRST SCHEDULE (continued overleaf)

~~Ten Year Developments Pty Ltd of 51 Collie Street, Albany.~~

SECOND SCHEDULE (continued overleaf)

1. EASEMENT for Drainage purposes created on Diagram 99325 under Section 27A TP&D Act.
2. MORTGAGE H436984 to **Ten Year Developments Pty. Ltd.** of 51 Collie Street, Albany. Registered 5.5.00 at 11.19 hrs.

THIRD SCHEDULE



VOLUME 2192 FOLIO 1

IN THE REGISTER

FIRST SCHEDULE (continued) NOTE : ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS

PARTICULARS	INSTRUMENT NATURE	INSTRUMENT NUMBER	REGISTERED	TIME	SEAL & INITIAL
Ardess 1607 Pty. Ltd. of Lot 52 Lower Denmark Road, Albany.	Transfer	H436983	5.5.00	11.19	

SECOND SCHEDULE (continued)

REGISTERED or LODGED	TIME	SEAL & INITIAL	CANCELLATION NATURE	CANCELLATION NUMBER	REGISTERED or LODGED	SEAL & INITIAL

WESTERN AUSTRALIA

REGISTER NUMBER	
521/DP76829	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

VOLUME 2822 FOLIO 563

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 521 ON DEPOSITED PLAN 76829

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

TEN YEAR DEVELOPMENTS PTY LTD OF 51 COLLIE STREET, ALBANY

(AF M485739) REGISTERED 5/12/2013

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	DP76829
PREVIOUS TITLE:	2795-990
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF ALBANY

NOTE 1: M485739 THIS LOT/TITLE CREATED AFTER CROWN LAND INCLUDED INTO THE FREEHOLD ESTATE WITHOUT PRODUCTION OF THE DUPLICATE CERTIFICATE OF TITLE. CURRENT DUPLICATE FOR THE WITHIN LAND IS STILL VOLUME 2795 FOLIO 990 EDITION 1

WESTERN AUSTRALIA

REGISTER NUMBER	
10/D99325	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	21/7/2014

RECORD OF CERTIFICATE OF TITLE

VOLUME 2192 FOLIO 1

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 10 ON DIAGRAM 99325

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ARDESS 1607 PTY LTD OF LOT 52 LOWER DENMARK ROAD, ALBANY
(T H436983) REGISTERED 5 MAY 2000

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1.	*L643182	CAVEAT BY ANNE WALMSLEY AS TO PORTION ONLY LODGED 2.6.2011.
2.	*L643183	CAVEAT BY GORDON WALMSLEY AS TO PORTION ONLY LODGED 2.6.2011.
3.	*L643184	CAVEAT BY PETER WALMSLEY AS TO PORTION ONLY LODGED 2.6.2011.
4.	*L643185	CAVEAT BY RHODA WALMSLEY, GEORGE WALMSLEY AS TO PORTION ONLY LODGED 2.6.2011.
5.	M685117	EASEMENT TO CITY OF ALBANY FOR DRAINAGE PURPOSES - SEE DEPOSITED PLAN 76833 REGISTERED 26.6.2014.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

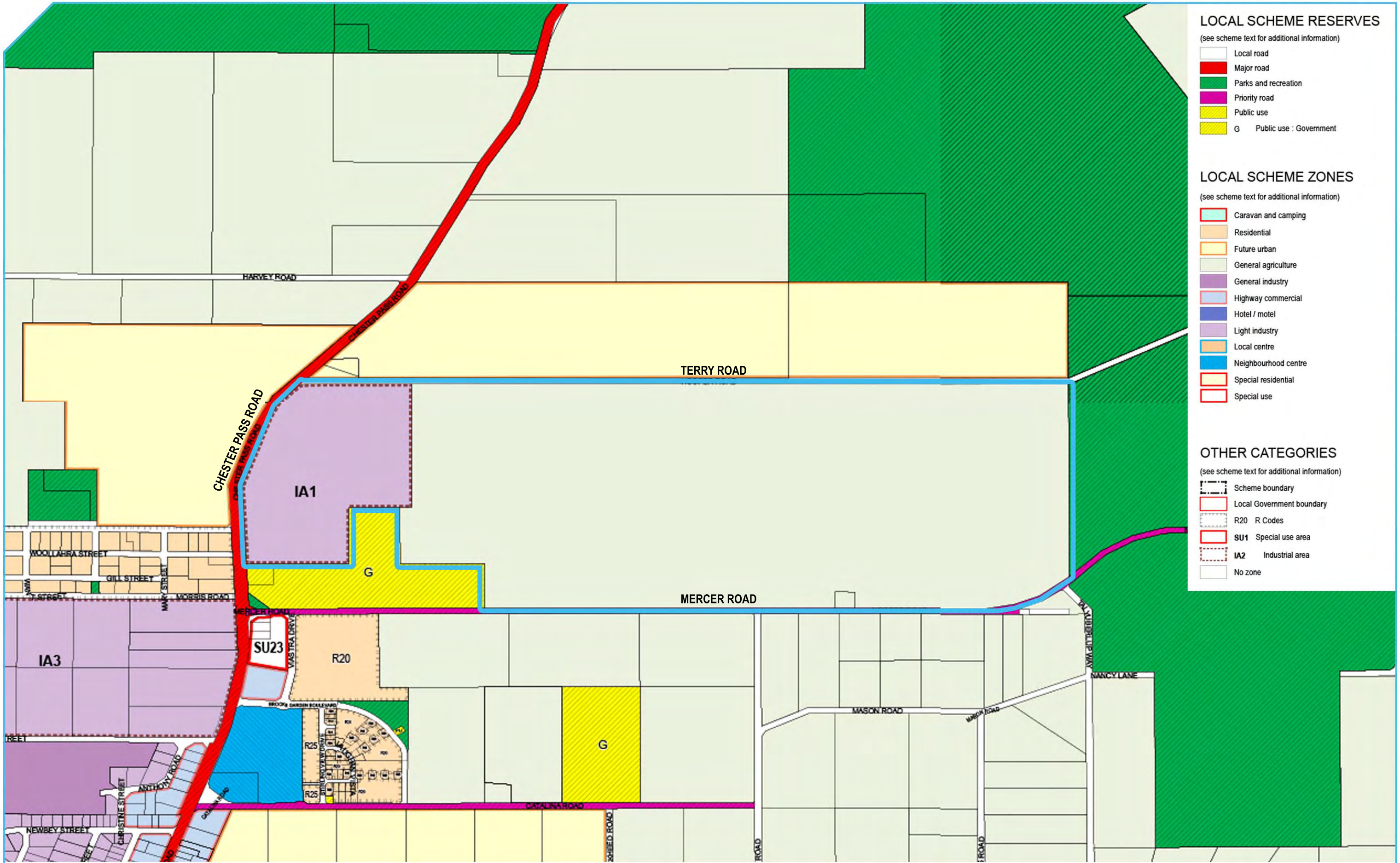
STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 2192-1 (10/D99325).
PREVIOUS TITLE: 1575-458.
PROPERTY STREET ADDRESS: 230 CHESTER PASS RD, WALMSLEY.
LOCAL GOVERNMENT AREA: CITY OF ALBANY.

NOTE 1: M498174 DEPOSITED PLAN (INTEREST ONLY) 76833 LODGED.

APPENDIX 5



EXISTING ZONING PLAN
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

Legend

Structure Plan Boundary

0 300 600 900 1,200

NORTH

REV	DESCRIPTION	YYMMDD	DRAWN	APPRVD
A	EXISTING ZONING	170522	SJ	ST

issued for design intent only. All areas and dimensions are subject to detail design + survey.

DRAWING NUMBER EP 170520 04 REV A

edge PLANNING & PROPERTY

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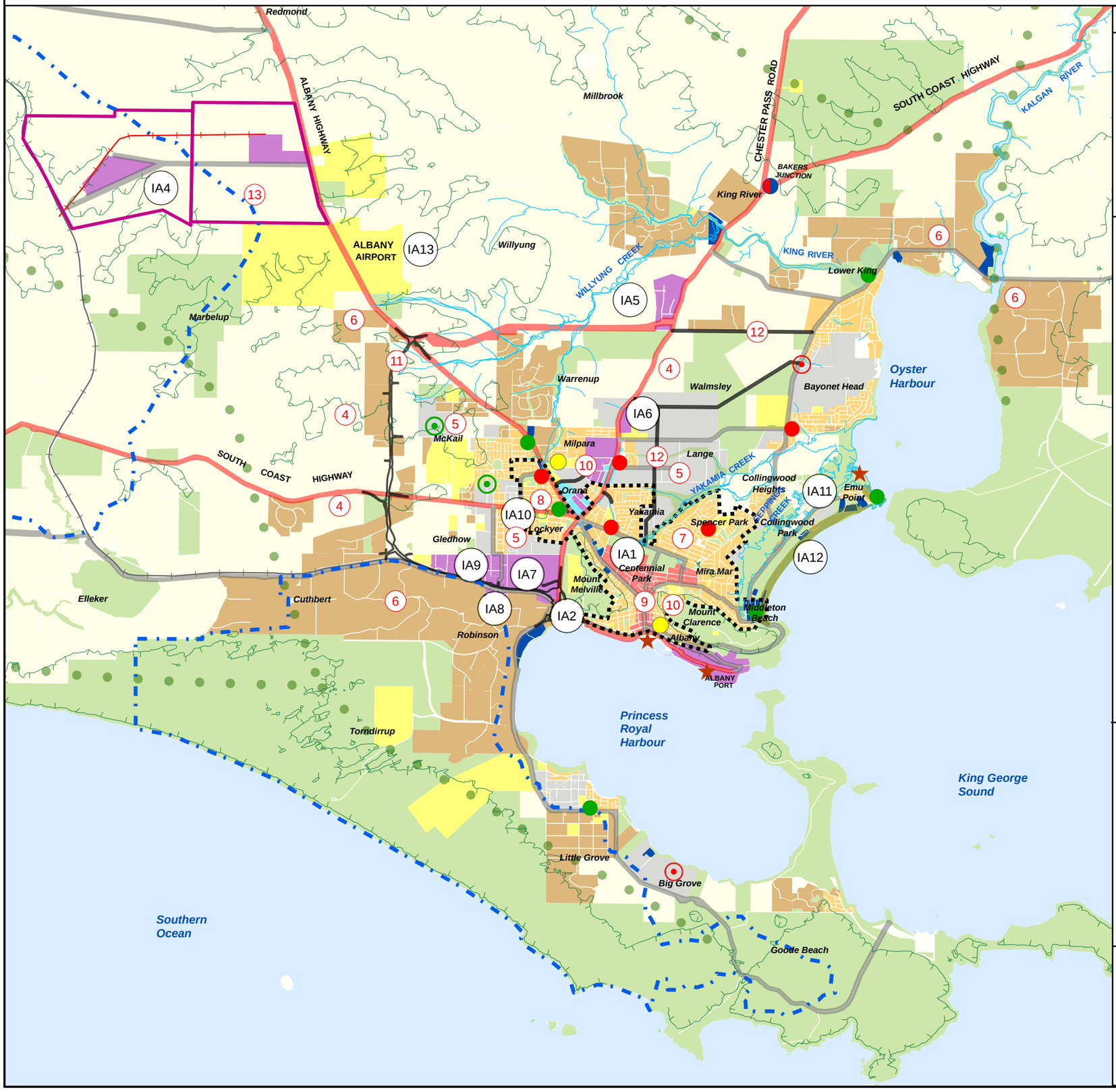
APPENDIX 6

No.	Industrial Area	Special Conditions Applying to Industrial Area
IA1	Ardess Light Industrial Estate, Chester Pass Road and Terry Road, Walmsley	1. Subdivision 1.1 Subdivision of the land shall generally be in accordance with Development Guide Plan *IA1* endorsed by the CEO, with any minor variations approved by the Western Australian Planning Commission. 2. Land Use 2.1 Notwithstanding any other requirements of the Zoning Table, the following land use restrictions shall apply - (i) All industrial uses within the zone shall comply with the definition of a 'Dry Industry' as follows: *Dry Industry means an industrial land use which can demonstrate to the satisfaction of the Local Government that the quality/quantity and volume of wastes produced from its operations can be successfully disposed of on- site without creating any adverse environmental or health effects.* 2.2 The Local Government may permit a maximum of 16 dry industries (industries which do not have significant effluent or waste disposal requirements) on the lot (average density = 1.62 hectares per industry). 3. Site and Building Requirements 3.1 All buildings and structures are to have minimum setback as follows: (i) Internal Road: 9 metres; and (ii) Revegetation Areas: 10 metres. 3.2 The setback from the internal road can be used for landscaping, car parking or trade display. 4. Access to Ardess Industrial Estate 4.1 Access to the estate will be via a single entry road onto Chester Pass Road. 4.2 All internal roads and crossovers will be required to be sealed to the satisfaction of the Local Government. The minimum road pavement width for the internal road(s) should be 10 metres with 2 metre shoulders to allow the passage of two passing vehicles past a further vehicle parked at the verge. Minor roads are to be constructed to at least 5 metres pavement width. 5. Stormwater Management 5.1 The Local Government will require stormwater disposal measures to be implemented to ensure that maximum retention and infiltration occurs on site through the use of individual soakwells, retention basins or other measures as deemed necessary. Oil and grease traps are to be provided within each building site to the satisfaction of the Local Government to ensure that nutrient export off the site is kept to a minimum. 6. Effluent Disposal 6.1 On-site effluent disposal shall utilise alternative treatment effluent disposal systems unless the applicant can provide advice to the Local Government that soil conditions are conducive to the operation of septic tanks and leach drains and will not result in unacceptable loss of nutrients to surrounding waterways, or create a risk to public health.

APPENDIX 7

Local Planning Strategy 2019

Figure 2: Urban



Legend

Designation

- Rural
- Parks and Recreation
- Rural Living
- Urban
- Existing Tourism Accommodation Sites
- Commercial
- Industry
- Public Use
- Regional Centre
- Urban Growth
- Neighbourhood Centre
- Future Neighbourhood Centre
- Local Centre
- Future Local Centre
- Rural Enterprise

Strategic Direction/Action

4	Protect agricultural land from urban sprawl and inappropriate development
5	Direct urban settlement growth of Albany to areas designated as 'urban growth'
6	Direct rural living settlement of Albany to areas designated as 'rural living'
7	Support the collaboration between the City and State government in the redevelopment of the Spencer Park Urban Renewal Area
8	Identify localities or precincts in the City suitable to increase residential densities (infill development) based on accessibility to services and facilities, utility infrastructure, heritage, character and amenity, and land capability
9	Continue to protect the primacy of the regional centre, identify its unique identity and build upon this, facilitate new mixed-use commercial development, increase the density and diversification of housing within and surrounding the regional centre, protect and enhance the heritage character, improve public realm with universal access, improve public transport, walkability and bikeability, diversify users - residents (age and cultural diversity), workers and visitors that engage with the regional centre and attract the location of regional facilities
10	Identify education precincts in conjunction with activity centres and support diversification of housing and land uses to cater for accommodation, entertainment and shopping needs of students
11	Advocate for the completion of the Ring Road
12	Facilitate the planning and construction of key link roads
13	Advocate for development of industry in Mirambeena

IA1	Investigation Area 1 - Centennial Park Urban Renewal Area
IA2	Investigation Area 2 - Wool Stores
IA3	Investigation Area 3 – Neighbourhood and Local Centres
IA4	Investigation Area 4 – Mirambeena Strategic Industrial Area
IA5	Investigation Area 5 – Pendeen Expansion Area
IA6	Investigation Area 6 – Proposed Ardess Estate Light Industrial Area
IA7	Investigation Area 7 – Lot 2 Hanrahan Road (CSBP Fertiliser Depot)
IA8	Investigation Area 8 – Robinson Industrial Area
IA9	Investigation Area 9 – Gledhow Industrial Area
IA10	Investigation Area 10 – Mueller Road
IA11	Investigation Area 11 - Protection of Yakamia Creek and Lake Seppings
IA12	Investigation Area 12 - Implementation of the Emu Point to Middleton Beach Coastal Hazard Risk Management Adaptation Plan
IA13	Investigation Area 13 - Potential Airport Business Area

Other

- Rail
- Indicative Rail Spur Extension
- Primary Road
- District Road
- Significant waterway
- Strategic Important Road Extensions
- Investigation Area 4 – Mirambeena Strategic Industrial Area
- Investigation Area 12 - Emu Point to Middleton Beach CHRMAP
- Macro-corridors
- Landscape Protection Areas
- SCA PDWSA
- Housing Strategy
- Education Precinct
- Strategic Infrastructure

1 0.5 0 Kilometers

1:100,000

SCALE @ A3

MXD: X:\Planning_&_Development\Planning_Services\Strategic_Planner\ALPS_Review\new ALPS\MXD's_&_shapefiles\Fig 2 Urban.aprx Date Printed: 19/11/2019

APPENDIX 8

ARDESS SERVICE INDUSTRY ESTATE - DEVELOPMENT PLAN

Legend

- Existing fences
- Proposed Main Roads, 10m 2 coat seal
- Proposed Access Roads, 5m 2 coat seal
- Constructed drainage lines, additonal retention basins in positions shown if needed
- Retention and swirl basins to ameliorate water flows across site.
- Strategic firebreaks / emergency access routes Gravel to 2WD all weather standard
- Revegetation Areas (further plantings around individual industries will be required)
- Potential industrial sites. Final siting to be determined by landowner and Council depending upon industry requirements. Hatch areas shown are approximately 2500m².
- Landsca Protection Zone (dimensions as shown)

Major contour interval 2.0m, minor contour interval 0.5m, heights approx. AHD., Map Datum Local - Albany Grid

0 50 100 250

TOWN PLANNING INFORMATION

To be read in conjunction with the City of Albany Town Planning Scheme No. 3

Service Industry Zone:

i) Council shall not permit an industrial use unless it can be demonstrated that by application of buffer standards in place at the time the industry can be accommodated without detrimental impact upon surrounding land uses and that the industry will perform as a "Dry Industry".

ii) The landowner will be required to demonstrate that prospective industries will be able to meet environmental guidelines in terms of risk, noise, dust, emissions or other potential nuisance and be able to be accommodated on the site without the need for a buffer distance of greater than 50m.

iii) The landowner shall be required to plant and maintain suitable revegetation areas to maintain visual amenity of the site and to assist in nutrient assimilation. Council may require additional plantings as a condition of Planning Scheme Consent or allow a variation to any revegetation plan if an area of the same or greater extent is planted elsewhere within the site to Councils satisfaction. The choice of species shall be the responsibility of the landowner but at least 50% of the trees must be capable of growing to a height of 3m within 5 years, with preference given to species endemic to the region.

iv) Applications for Planning Scheme Consent shall be required for all uses as listed in Table 1 for the Service Industry Zone and any change of use. The Application for Planning Scheme Consent shall require the submission of a completed "Application for Planning Scheme Consent", three copies of the plan showing the exact location of any buildings or displays proposed and three copies of scaled elevation plans for any buildings or displays showing colours and materials to be used.

v) Uses not specifically listed in Table 1 may be permitted if, in the opinion of Council, they will fulfil the objectives of the zone. Such uses will be regarded as "AA" uses for the purposes of public consultation and advertising. Any additional requirements for individual areas are to be listed in Schedule 6 - Service Industry zone.

Extract from Schedule VI "Special provisions relating to the Ardess Service Industry Zone"

i) Council may permit a maximum of 16 dry industries on the lot (average density = 1.625ha per industry). The area allotted to each industry will be dependant upon individual industry requirements in terms of area, internal buffers and land capability. Any requests by the landowners to increase the maximum number of industries shall be made in the manner of Scheme Policy or Scheme Amendment to be decided upon by Council and dependant upon the scale and nature of the proposed changes.

ii) All buildings and structures shall be set back a minimum of 20 metres from the internal road and 10 metres from any revegetation area. The 20m setback from the internal road can be used for landscaping, carparking or trade display in a similar manner to the standards set by provisions 5.7 to 5.9 inclusive or any alterations to these provisions by way of a Town Planning Scheme Policy or Amendment.

iii) Council may vary the setback requirements for any setback if the landowner can demonstrate that it will not adversely impact upon adjoining industries, revegetation or access for firefighting purposes and may require further screening within the reduced setback area to compensate for any percieved or actual loss of amenity.

iv) All entrance to the estate will be via a single entry onto Chester Pass Road.

v) Advertising signs for individual businesses shall not be visible from Chester Pass Road although a sign stack approved by and to the specifications of the Main Roads Department may be erected upon Chester Pass Road at the entry statement.

vi) A single entry statement may be erected at the Chester Pass Road entrance subject to advice and approval from Council and the Main Roads Department.

vii) All internal roads and crossovers will be required to be sealed to the satisfaction of Council. The minimum standard proposed is for the main internal road to have a pavement width of 10m with 2m shoulders to allow the passage of tw ssing vehicl past a further vehicle parked on the verge. Minor roads are to be constructed to at least 5m pavement width.

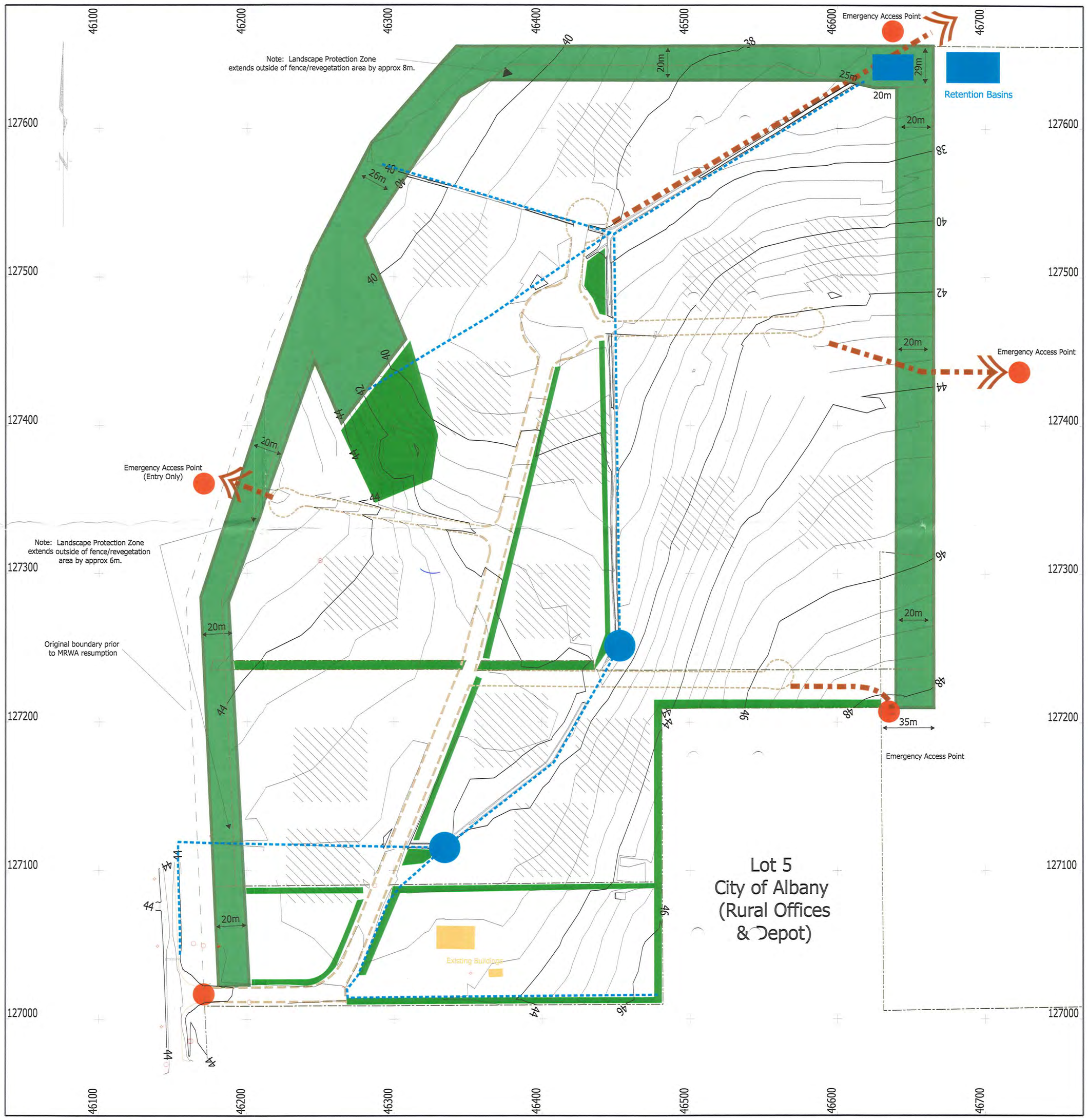
viii) Council will require stormwater disposal measures to be taken to ensure that maximum retention and infiltration occurs on site through the use of individual soakwells, retention basins or other measures as deemed necessary. Oil and grease traps are to be provided within each building site to the satisfaction of Council to ensure that nutrient export off the site is kept to a minimum.

ix) On site effluent disposal shall utilise amended soil systems unless the proponent can provide advice to Council that soil conditions are conducive to the operation of septic tanks and leach drains and will not result in unacceptable loss of nutrients to surrounding waterways, or risk to public health.

x) The landowner shall be directly responsible for the maintenance of amenity in those areas surrounding individual industries and shall take necessary means to rectify unsightly displays or unkempt land as directed by Council.

xi) Carparking bays shall be provided in accordance with relevant standards as directed by Council.

xii) The landowner shall provide a copy of these Special provisions to prospective tenants and provision shall be made to the satisfaction of Council to prove that this has occurred and that the prospective tenant has read and understood their content.



APPENDIX 9

Lot 10 Chester Pass Road &
Lot 521 Mercer Road,
Walmsley WA 6330

Environmental Assessment and Land Capability Assessment Report

BIO DIVERSE SOLUTIONS

21/11/2017
Kathryn Kinnear
Bio Diverse Solutions

DOCUMENT CONTROL

Title: Environmental Assessment Report – Lot 10 Chester Pass Road and Lot 521 Mercer Road, Walmsley WA

Author (s): Chiquita Burges

Reviewer(s): Kathryn Kinnear & Steve Thompson

Job Number: EPP 004

Client: Ardess 1607 Pty Ltd

REVISION RECORD

Revision	Summary	Revised By	Date
Draft Id 26/09/2017	Internal QA Review	Kathryn Kinnear	26/09/2017
Draft Id 29/09/2017	Issued to client for review	K. Kinnear	29/9/2017
Draft Id 26/10/2017	Updated as per client review	B. Theyer	26/10/2017
Draft Id 13/11/2017	Issued to Client	K. Kinnear	13/11/2017
Final Id 21/11/2017	Final updates and Issued to Client	K. Kinnear	21/11/2017

The recommendations and measures contained in this assessment report are based on the requirements of the Australian Standards 3959 – Building in Bushfire Prone Areas, WAPC SPP3.7, Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) and CSIRO's research into Bushfire behaviour. These are considered the minimum standards required to balance the protection of the proposed dwelling and occupants with the aesthetic and environmental conditions required by local, state and federal government authorities. They DO NOT guarantee that a building will not be destroyed or damaged by a bushfire. All surveys and forecasts, projections and recommendations made in this assessment report and associated with this proposed dwelling are made in good faith on the basis of the information available to the fire protection consultant at the time of assessment. The achievement of the level of implementation of fire precautions will depend amongst other things on actions of the landowner or occupiers of the land, over which the fire protection consultant has no control. Notwithstanding anything contained within, the fire consultant/s or local government authority will not, except as the law may require, be liable for any loss or other consequences (whether or not due to negligence of the fire consultant/s and the local government authority, their servants or agents) arising out of the services rendered by the fire consultant/s or local government authority.

BIO DIVERSE SOLUTIONS

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

Bio Diverse Solutions
29 Hercules Crescent
Albany WA 6330

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1. Executive Summary

Ardess 1607 Pty Ltd commissioned Bio Diverse Solutions (Environmental Consultants) to prepare an Environmental Assessment Report (EAR) and Land Capability Assessment (LCA) to guide all future environmental management for the proposed subdivision of Lot 10 Chester Pass Road and Lot 521 Mercer Road, Albany WA.

This EAR and LCA describes the relevant environmental characteristics of the site and presents management and mitigation strategies in response to potential environmental impacts. These management and mitigation strategies aim to minimise the potential impact on the environmental values within the site.

The Local Structure Plan (LSP) has been developed to guide the subdivision and development of the Subject Site (Appendix A). The LSP for the site proposes an extension of the adjacent light industrial area, a residential zone which includes are range of residential densities, a primary school and three POS areas. The proposed light industrial area will require on-site effluent disposal, where as the residential area will be developed once reticulated sewerage has been established in the area. This EAR and LCA identifies the measures proposed to mitigate and manage the environmental features of the site, and focuses on the natural areas to be retained within the LSP.

The Subject Site was found to have no significant environmental constraints. A geotechnical investigation conducted by Great Southern Geotechnics (2017) under late winter conditions did not encounter groundwater to depth of 2.3m across the site. Soil type across the majority of the site was found to be sandy gravel over sandy clay with low permeability and high PRI. A small area in the southern central portion of the site was found to have silty sand over gravelly sand with a low PRI. There is no significant waterways, wetlands or groundwater resources within the Subject Site or within the vicinity of the Subject Site.

The vegetation across the Subject Site and surrounding areas is consistent with rural farmland, with the majority of the site and surrounds comprising of heavily grazed pasture dominated by pasture grass species. There are two areas of remnant vegetation within the Subject Site. A broad scale vegetation survey of these two areas was conducted with the strip of vegetation running parallel with the northern boundary of the site (approximately 12 ha in size) found to comprise of Low Open Jarrah/Marri/Sheoak Forest in good condition and the small area of remnant vegetation in the south-east corner comprising of mixed Eucalypt Forest in a degraded condition.

A BAL Contour Plan was prepared by Bio Diverse Solutions to identify the bushfire risks associated with the site (Appendix D) and guide the Structure Plan development. The Subject Site was assessed as having internal areas of Grassland Type G consistent with rural farmland, low fuel/non- vegetated areas (associated with the industrial area, tracks/roads and buildings) and an area of Forest Type A (being the strip of remnant vegetation in the north). External bushfire risks are mostly associated with the Forest Type A (CoA Reserve) directly to the east and south-east of the Subject Site and Forest Type A and Woodland Type B along the Mercer Road Reserve. BAL contouring across the Subject Site has allocated BAL 29 or less shall apply to any buildings within the lots. All future buildings (through subdivision designs) can achieve an APZ area associated with a BAL allocation of BAL 29, BAL 19 or BAL 12.5. A detailed Bushfire Management Plan has not been prepared for the site. The publicly released Bushfire Prone Area Mapping (DFES, 2017) shows that the majority of the Subject Site is located within a Bushfire Prone Area (situated within 100m of >1 ha of bushfire prone vegetation). Where “High risk” or “Vulnerable land uses” (Primary school), as defined by SPP 3.7 are proposed, detailed Bushfire Management Plans are to be prepared.

A Land Capability Assessment (LCA) of the site was conducted in accordance with the State Planning Commission’s (1989) Land Capability Assessment for Local Rural Strategies (note these definitions are as per this policy for the purposes of this report and not any other planning instrument/policy). The overall capability of the Subject Site supporting the Urban Development land use was rated as highly capable for Mapping Unit 1 and very highly capable for Mapping Unit 2. The overall capability of the Subject Site supporting the Light

Rural Industrial (as per WAPC, 1989) land use is rated as highly capable for Mapping Unit 1. Mapping Unit 2 was not encountered at the location of the proposed Light Rural Industrial land use. The degree of limitations for both Urban Development and Light Rural Industry for Mapping Unit 1 and Mapping Unit 2 is low to very low.

This EAR and LCA report provides details of the ASS, Water, Waste Water, Flora, Fauna and Fire Management strategies proposed to be implemented across the site as it is developed to ensure adequate protection of environmental, life, property and biodiversity assets.

The proposed LSP recognises the importance of the key environmental and landscape attributes of the area, and incorporates these in an urban form, that creates an environmentally responsive urban development that meets the EPA and City of Albany's environmental requirements. Consequently, the environmental outcomes of the proposed LSP are considerable and include:

- Providing an improvement in groundwater and surface water quality through residential and industrial development and implementation of water sensitive urban design and best stormwater drainage management practices.
- Revegetation using native species (where currently there is very little native species and diversity) in areas of POS to promote fauna habitat and flora diversity. Landscaped urban areas to promote biodiversity using native plants.
- Maintaining areas of remnant vegetation and limiting access points through these areas to the subdivision to prevent adverse impacts particularly for transient fauna.
- The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017).
- As Light industrial land use is proposed in the west of the Structure Plan, a detailed Bushfire Management Plan will be required to guide developers if any industry is defined as "High Risk".
- A detailed Bushfire Management Plan jointly endorsed by DFES and CoA will be required for any Primary School proposed in the Structure Plan area, at the Development Application stage. A Bushfire Emergency Evacuation Plan (BEEP) will be required at Development Approval Stages.
- The proposed light industrial area is deemed appropriate for effluent disposal and meets the state's minimum requirements for on-site sewage disposal systems as outlined in the *Draft Government Sewerage Policy* (Department of Planning, 2016). Where on-site sewage disposal is to be provided by a secondary treatment system, the WAPC will require a notification on title pursuant Section 70A of the *Transfer of Land Act 1893* (as amended) advising that an on-site secondary treatment sewage disposal system and unencumbered area to which treated sewage is to be distributed are required.
- Provide vegetated buffer and / or other management techniques between industrial areas to sensitive land uses (such as residential) in accordance with the EPA's (2015) Draft Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses.*

2. Introduction

Ardess 1607 Pty Ltd commissioned Bio Diverse Solutions (Environmental Consultants) to prepare an Environmental Assessment Report (EAR) and Land Capability Assessment (LCA) to guide all future environmental management for the proposed subdivision of Lot 10 Chester Pass Road and Lot 521 Mercer Road, Walmsley WA.

This EAR and LCA describes the relevant environmental characteristics of the site and presents management and mitigation strategies in response to potential environmental impacts. These management and mitigation strategies aim to minimise the potential impact on the environmental values within the site.

2.1. Location

Lot 10 Chester Pass Road and Lot 521 Mercer Road, Walmsley WA (herein referred to as the Subject Site) is 178ha and located approximately 6km north of the Albany CBD. The Subject Site is bound by Chester Pass Road to the west, Mercer Road to the south, Terry Road to the north and a City of Albany (CoA) reserve to the east. The location of the Subject Site is shown on Figure 1.

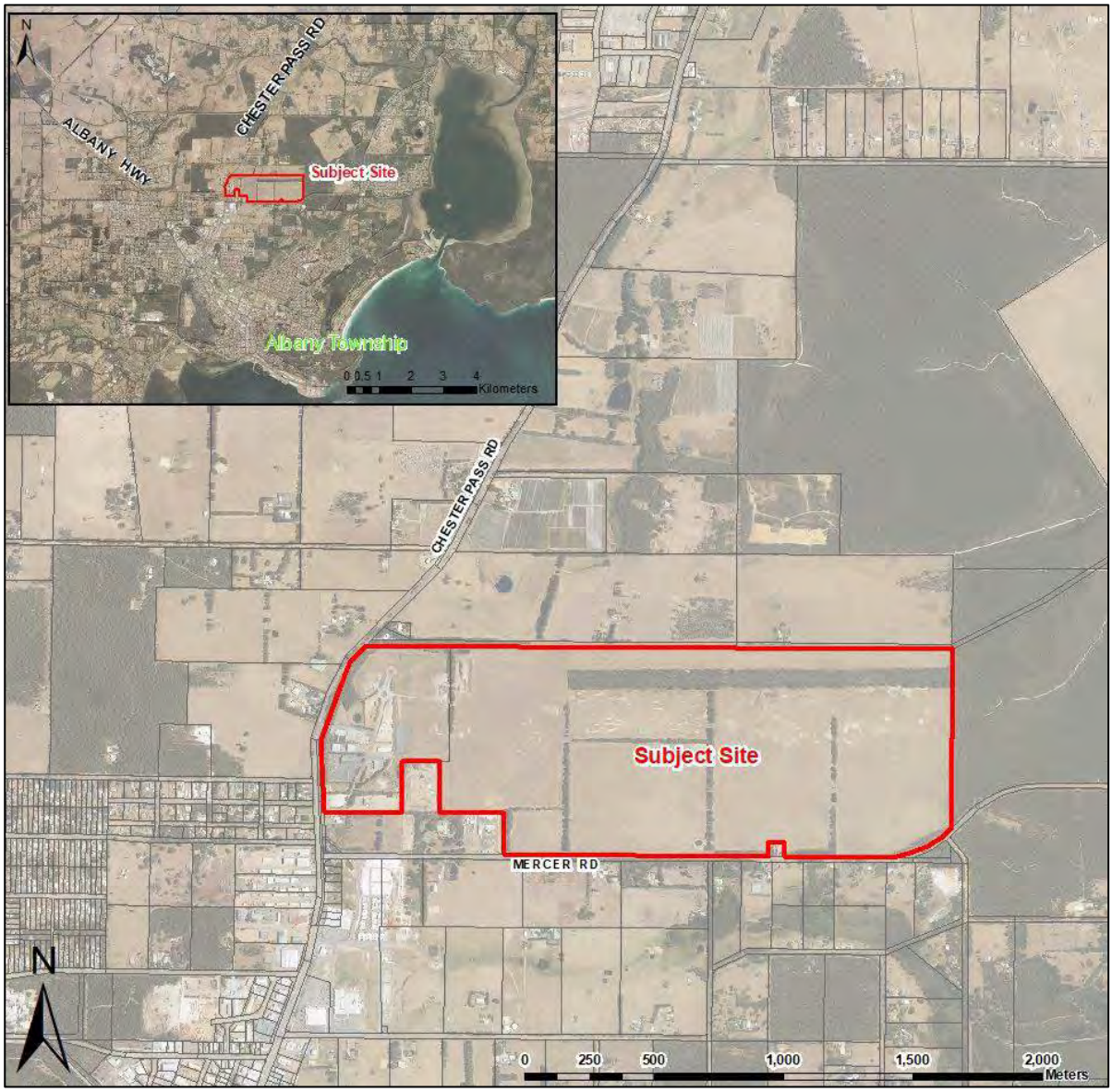

Figure 1: Location Plan

2.2. Local Structure Plan

The Local Structure Plan (LSP) has been developed to guide the subdivision and development of the Subject Site, the Draft LSP for the site has been included as Appendix A.

The proposed LSP includes the following land uses:

- Residential (R30-R60);
- Residential (R20-R30);
- Residential (R15-R25);
- Primary School Site;
- Public Open Space (POS); and
- Light Industrial.

There is no current staging plan for the LSP however the initial stage/s of the subdivision will include the extension of the existing light industrial area within the Subject Site (Ardess Industrial Estate) further to the north and east. There is currently no reticulated sewerage at the location of the Subject Site and as such the lots within the proposed Light Industrial Area will require on-site sewerage disposal and a minimum lot size of 1ha consistent with guidelines set out in the Draft Government Sewerage Policy (Gov. of WA, 2016).

Subsequent stage/s of the subdivision will include the development of the central and eastern portion of the site into a residential zone, including a Primary School and two areas of POS. Residential densities within the residential zone will range from R15 to R60. The residential zone of the subdivision will only be feasible and environmentally sustainable once reticulated sewerage has been established in the area. Therefore, there will be no on-site sewerage disposal within this area.

This EAR and LCA identifies the measures proposed to mitigate and manage the environmental features of the site, and focuses on the natural areas to be retained within the LSP.

2.3. Statutory Framework

Development within the site is required to comply with relevant environmental legislation, policy and guidelines. This document and the recommendations contained within are aligned to the following key state and Commonwealth legislation and regulations;

- *Environmental Protection Act 1986*;
- *Environmental and Protection and Biodiversity Conservation Act 1999 (EPBC Act);*
- *Environment Protection and Biodiversity Conservation Regulations 2000*;
- *Conservation and Land Management Act 1984;*
- *Conservation and Land Management Regulations 2002;*
- *Environmental Protection (Noise) Regulations 1997;*
- *State Legislation Aboriginal Heritage Act 1972;*
- *Heritage of Western Australia Act 1950;*
- *Land Administration Act 1997;*
- *Planning and Development Act 2005;*
- *Rights in Water and Irrigation Act 1914;*
- *Contaminated Sites Act 2003;*
- *Wildlife Conservation Act 1950;*
- Draft Government Sewerage Policy – Consultation Draft 2016;
- DER Acid Sulphate Soils Assessment Guidelines;
- Western Australian State Planning Policy (SPP) 3.7; and
- Guidelines for Planning in Bushfire Prone Areas 2017.

2.4. Suitably Qualified Environmental Consultants

This EAR and LCA has been prepared by suitable qualified personnel from Bio Diverse Solutions. The three qualified personnel responsible for delivery of this assessment include; Chiquita Burges (Senior Hydrologist/Environmental Consultant), Bianca Theyer (Conservation and Wildlife Biologist/Environmental Consultant) and Kathryn Kinnear (Level 2 BPAD Accredited 30794 Bushfire Consultant).

Chiquita Burges

The existing environment and general environmental management section of this report has been prepared by Chiquita Burges. Chiquita has the following Tertiary Qualifications:

- B.Sc. Natural Resource Management; and
- Graduate Certificate in Hydrogeology

Chiquita has over 8 years of experience working as a hydrologist and senior hydrologist, her experience includes preparation of local and urban water management strategies, surface water and groundwater monitoring programs and hydrogeological reports. Tasks undertaken by Chiquita include report writing, mapping, field work including installation and monitoring of groundwater bores, modelling of stormwater and groundwater and liaising with clients, sub-consultants and approving agencies. Since joining Bio Diverse Solutions in early 2017 Chiquita has diversified her skills and knowledge to include more general environmental consultancy work.

Bianca Theyer

The flora and fauna component of this assessment has been prepared by Bianca Theyer. Bianca has the following Tertiary Qualifications:

- B.Sc. Conservation and Wildlife Biology; and
- Honours Conservation Biology.

Bianca has experience in biodiversity management with direct experience including: biodiversity surveys, fauna surveys, monitoring and trapping programs (invertebrates, mammals, amphibians, and reptiles); flora surveys and vegetation assessments. Bianca has been responsible for several projects during her time at Bio Diverse Solutions, these include multiple flora (including threatened) and vegetation surveys; fauna habitat survey at Frenchman Bay, Albany; Environmental Assessment Reports for a proposed liquid waste facility, a pastured egg farm and a proposed gravel extraction project; Foreshore Management Plans for projects in South Moorlands, Bunbury and Frenchman Bay Albany; a Mosquito Management Plan for Meadowbrook Lifestyle Villages in Boyanup, and development of an Environmental Management Plan for a proposed Solar Station in Kalbarri.

Kathryn Kinnear

The bushfire assessment and management component of the assessment has been prepared by Kathryn Kinnear. Kathryn Kinnear currently has the following tertiary Qualifications:

- BAS Technology Studies & Environmental Management;
- Diploma Business Studies; and
- Graduate Diploma in Environmental Management.

Kathryn Kinnear is an accredited Level 2 Bushfire Practitioner (Accreditation No: BPAD30794) who has 10 years operational fire experience with the (formerly) DEC (1995-2005) and has the following accreditation in bushfire management:

- Incident Control Systems;
- Operations Officer;
- Prescribed Burning Operations;
- Fire and Incident Operations;
- Wildfire Suppression 1, 2 & 3;

- Structural Modules – Hydrants and hoses, Introduction to Structural Fires, and Fire extinguishers; and
- Ground Controller.

Kathryn Kinnear has also worked in environmental management for 20 years within that time she has worked on a vast range of environmental projects and has developed specialist skills in field operations, reporting and project management.

Bio Diverse Solutions are Silver Corporate Members of the Fire Protection Australia Association. Kathryn is a committee member of the WA Bushfire Working Group (FPAA) and is a suitably qualified Bushfire Practitioner to assess the bushfire risks and management strategies.

3. Existing Environment

3.1. Existing Land use

The Subject Site currently consists of multiple land uses; Lot 10 Chester Pass Road (Lot to the west) comprises of an industrial area and cleared land used to keep current and old farm machinery and sand/gravel piles. The industrial area comprises of sheds, office building, car parks, an internal road network and cleared areas for future development. Businesses within the industrial area include; Albany Freight Lines, Designer Dirt (landscaping supplies) and Ardess Nursery.

Lot 521 Mercer Road (Lot to the east) encompasses the majority of the Subject Site and comprises of predominantly cleared rural land used for grazing cattle. There are no existing dwellings on Lot 521 Mercer Road, there are two small to medium sized sheds (one used to store hay and farm machinery and the other an old shearing shed), a set of cattle yards and a strip of remnant vegetation in the north-east of the Subject Site. Land use within the Subject Site is shown on Photographs 1 to 4.

Photograph 1 – View of cleared rural land within Lot 521 Mercer Road.

Photograph 2 – View of old farm machinery within Lot 10 Chester Pass Road.

Photograph 3 – View of hay and machinery shed located in the north of Lot 521 Mercer Road.

Photograph 4 – View of internal road and roundabout within industrial area in Lot 10 Chester Pass Road.

3.2. Surrounding land uses

The Subject Site is surrounded by rural properties to the north, west and south and remnant vegetation (CoA reserve) to the east. To the south-west of the Subject Site along Chester Pass Road and adjacent to the western most section of Mercer Road is Albany's light industrial area which includes a range of businesses and a lifestyle village and on the western side of Chester Pass Road is a residential area. The surrounding areas are shown on Photographs 5 to 8.

Photograph 5 – View of Albany Business Centre along Chester Pass Road to the south-west of Subject Site.

Photograph 6 – View of rural property to the north of Subject Site.

Photograph 7 – View of City of Albany holding facilities along Mercer Road to the south of Subject Site.

Photograph 8 – View of remnant vegetation directly east of the Subject Site.

3.3. Climate

The Albany area is characterised by a Mediterranean climate with warm dry summers and cool wet winters. Rainfall data is from the nearby Bureau of Meteorology (BoM) Albany Station (Site No. 9500).

The long-term average annual rainfall is 929 mm (1877 to 2016). This average has decreased between 2000 to present, to an average annual rainfall of 879 mm, reflecting a 5% reduction compared to the long-term average, consistent with a general trend in the South West of WA. The total rainfall distribution has also altered, with a reduction of average winter monthly rainfall, but no significant reduction in average summer monthly rainfall.

The average annual pan evaporation for the Albany area is approximately 1397 mm (Luke *et al,* 1988).

3.4. Topography

Topography over the Subject Site is undulating ranging from a high point of 51m AHD in the central northern portion of the site to a low point of 22m AHD in the southern central portion of the site. There is a ridge that runs from the central northern portion of the site to the south-west corner with topography decreasing in a radial manner from the ridge. Topographic contours (1 metre contours are shown on Figure 2).

The effective slopes (measured as per AS3959-2009) for the Subject Site are flat/upslope to low ranging from 0 to 5 degrees. The effective slopes for the Subject Site and surrounding areas are shown in the BAL Contour Plan Report included as Appendix D.

3.5. Acid Sulphate Soils

Acid sulphate soils (ASS) are naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). When undisturbed below the water table, these soils are benign and not acidic (potential acid sulphate soils). However, if the soils are drained, excavated or exposed by lowering of the water table, the sulphides will react with oxygen to form sulphuric acid (EPA 2008). Acid Sulphate Soil (ASS) Risk Mapping (Figure 2) indicates the Subject Site does not sit within any known areas of ASS.

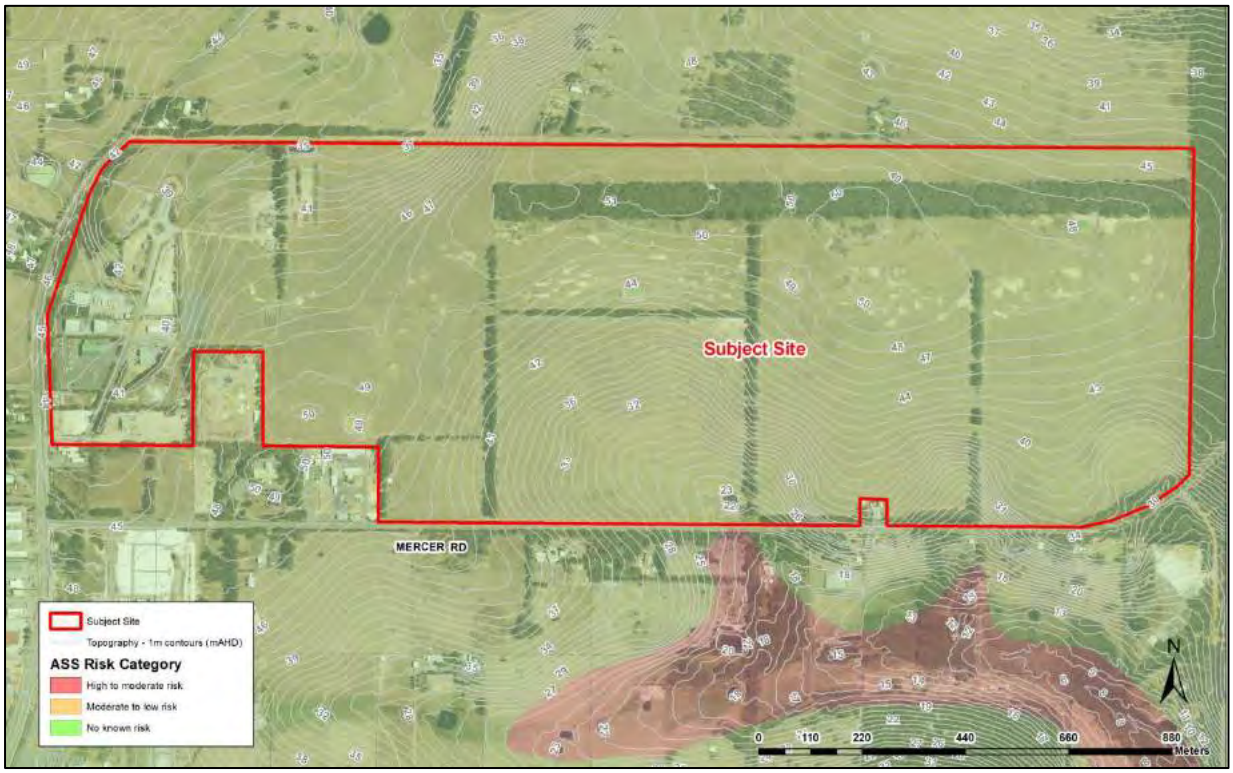

Figure 2: Topography and ASS Risk Mapping

3.6. Geology and Soils

Regolith of WA (Department of Mining, 2009) mapping indicates that soils across the Subject Site are classified as sandplain, mainly Aeolian and include some residual deposits.

A Geotechnical Investigation was conducted on the 29th of August 2017 by Great Southern Geotechnics under later winter conditions, the Geotechnical Investigation is included as Appendix B. The investigation included both soil analysis and measuring of water table. The soil testing was conducted to assess the suitability of the site for the proposed development including onsite effluent disposal for the extension of the industrial area.

Ten boreholes were constructed within the Subject Site to a depth of 2.3 metres and left open for a minimum of 1hr to identify water table present. The location of the boreholes are shown on Figure 3, lithological logs of the boreholes are shown in Appendix B.

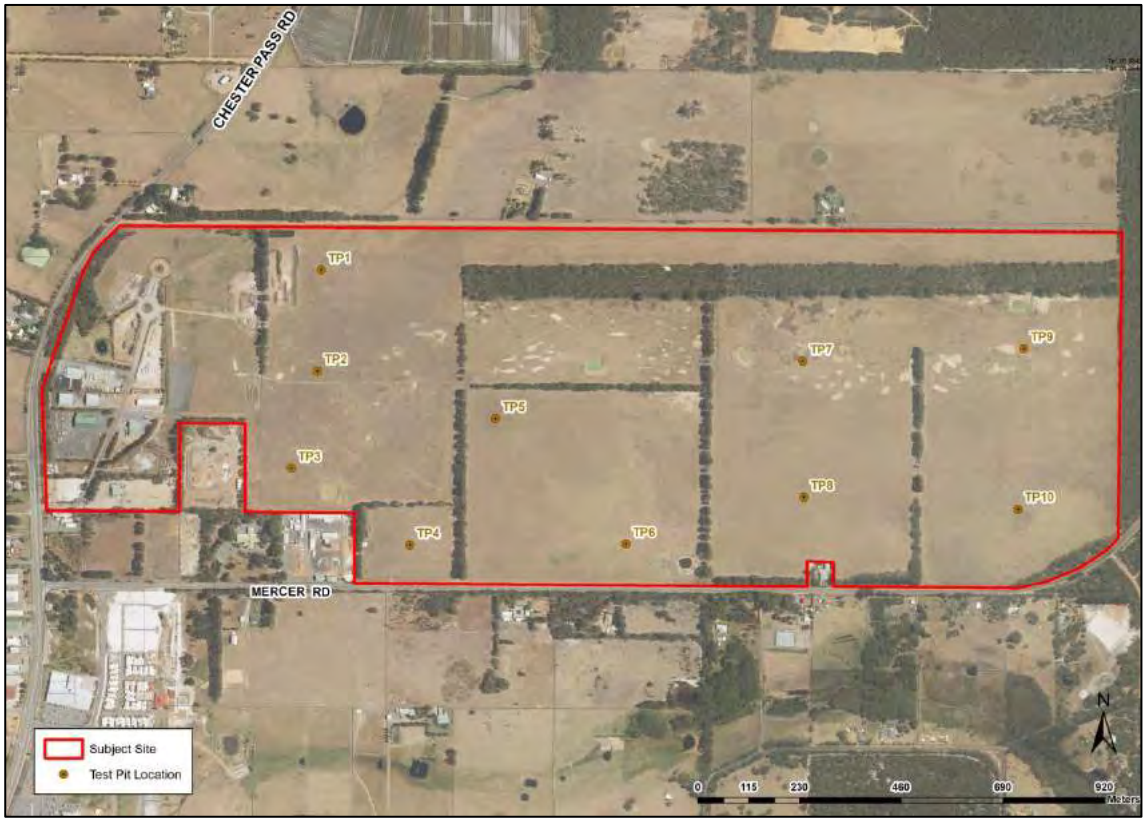

Figure 3: Borehole Locations

Soil Type

Soil testing showed that soils across the site comprised predominately of a silty sand topsoil, over sandy gravel (with a layer depth varying from 200 - 700mm), over sandy clay to the depth of the hole. This soil profile was encountered at each borehole location except TP6 and TP10. The soil profile at TP6 comprised of a silty sand topsoil, over silty sand (200 - 700mm depth), over gravelly sand (700 to 1500mm depth), over sandy gravel (1500 - 2300mm depth). The soil profile at TP10 comprised of a silty sand topsoil, over silty sand (200 - 400mm), over sandy clay (400 – 2300mm) (Great Southern Geotechnics, 2017).

Permeability

Permeability testing was conducted on TP3 (400 – 1100mm BGL) and TP10 (400 – 2300mm BGL) by Liquid Labs WA as part of the Geotechnical Investigation. TP3 recorded a permeability of 0.0035 m/day whilst TP10 recorded a permeability of 0.0015 m/day (refer to Liquid Labs WA Laboratory testing in Appendix B). Permeability at both TP3 and TP10 is considered to be extremely low this is consistent with the soil type (sandy clay) encountered at these locations.

Phosphorous Retention Index

Phosphorous retention Index (PRI) is the ability of soils to absorb nutrients and heavy metals within the soil (i.e. Soil microbe disinfecting ability). Soils with a PRI less than 1 have a very poor ability to retain nutrients and heavy metals, whilst soils with a PRI of >5 having a high ability to retain nutrients and heavy metals. PRI testing was conducted by CSBP Laboratory on soil samples from TP1, TP3, TP6 and TP10. The PRI results are shown in Table 1 and Appendix C.

Table 1: Phosphorus Retention Index Results

Borehole	Depth (mm)	Soil Type	Phosphorus Retention Index
TP1	200-900	Sand with gravel	2414.5
TP3	400-1100	Sandy clay	2387.4
TP6	200-700	Silty sand	0.8
TP10	400-2300	Sandy clay	608.0

PRI results across the site varied consistent with soil type. The sandy clays found across the majority of the site (as seen at TP3 and TP10) were found to have a very high PRI and therefore a very high ability to fix nutrients and heavy metals. The sandy gravel found at TP1 also had an extremely high PRI, particularly for a sand, whereas the light grey sand found at TP6 had a low PRI and therefore a low ability of fixing nutrients and heavy metals.

3.7. Surface Water Hydrology

There are no major naturally existing drainage networks or water bodies within the Subject Site. There is one minor waterway situated in the north-western extent of Lot 10. This area will need to be managed sensitively in relation to stormwater planning within the site. Surface water generally runs off the central and eastern portions of the site in a southerly and south-easterly direction towards Mercer Road. The western portion of the site generally drains in a north westerly direction towards Terry Road and Chester Pass Road.

Hydrographic Sub-catchments (DoW, 2008) show the Subject Site to be within two surface water sub-catchments; with the northern and western portion of the site discharging to Willyung Creek to the north of the Subject Site and the central and southern portion of the site discharging to Yakamia Creek to the south of the site. Both the Willyung Creek and Yakamia Creek sub-catchments form part of the Oyster Harbour/Kalgan/King Catchment ultimately discharging to Oyster Harbour.

There are several man-made dams across the site, which are surface water fed and used for livestock drinking water. The majority of the Subject Site drains towards a dam in the central southern portion of the site, whilst the eastern rural areas drain to a large dam located in the north-east corner of Lot 521 Mercer Road.

3.8. Groundwater Hydrology and Hydrogeology

Australian Geoscience Mapping and Department of Water 250K Hydrogeological mapping places the Subject Site within the; '*Tertiary - Cainozoic - Phanerozoic (TPw) period: Plantagenet Group - siltstone, spongolite; minor sandstone, peat, and conglomerate.'* The aquifer is a *'sedimentary aquifer with intergranular porosity – extensive aquifers, major groundwater resources.*' (DoW, 2015).

A Geotechnical Investigation was conducted on the 29th of August 2017 by Great Southern Geotechnics under late winter conditions. The investigation included both soil analysis and measuring of water table. Ten boreholes were constructed within the Subject Site to a depth of 2.3 metres, the location of the boreholes is shown on Figure 3. Groundwater was not observed in any of the boreholes indicating there is no likely groundwater present beneath the Subject Site to a depth of 2.3 metres. The Geotechnical Investigation (Great Southern Geotechnics, 2017) was undertaken in accordance with Australian Standards and has been included as Appendix B.

The subject site is not located within a Public Drinking Water Source Protection Area (DoW 2001).

3.9. Wetlands

There are no significant wetlands within or within the vicinity of the Subject Site.

3.10. Sewerage Sensitive Area

The Subject Site is located in a Sewerage Sensitive Area according to the Department of Planning's Sewerage Sensitive Area Mapping (DoP, 2017). The draft Government Sewerage Policy (2016) describes Sewerage Sensitive Areas, as areas; '*within 10 kilometres of Wilson Inlet, Torbay Inlet, Manarup Lagoon, Lake Powell, Princess Royal Harbour and Oyster Harbour'.*

3.11. Flora and Vegetation

The Subject Site lies within the Jarrah Forest IBRA bioregion. Hearn et al (2002) describes the bioregion as; '*Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Wandoo - Marri woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands.'*

The vegetation has been mapped on a broad scale by J.S. Beard (Shepherd et al 2002) in the 1970's, where a system was devised for state-wide mapping and vegetation classification based on geographic, geological, soil, climate structure, life form and vegetation characteristics (Sandiford and Barrett 2010). A GIS search of J.S. Beards (DEC, 2005) vegetation classification places the Subject Site within one System and Vegetation Association (Source DEC Pre-European Vegetation GIS dataset, 2005):

- **System Association Name:** Albany.
- **Vegetation Association Number:** 3.
- **Vegetation Description:** Low forest; jarrah, *Eucalyptus staeri* & *Allocasuarina fraseriana.*

The Albany Regional Vegetation Survey (ARVS) undertaken by Sandiford and Barret in 2010 identified the vegetation within the Subject Site as belonging to the Jarrah/Marri/Sheoak Laterite Forest unit. This unit is described as occurring on well drained shallow loamy/sandy soil with outcropping laterite (Sandiford and Barret, 2010). Key defining features of this vegetation type are a canopy of *Eucalyptus marginata* and *Allocasuarina fraseriana* over a relatively open and diverse understorey. The understorey is dominated by *Bossiaea linophylla, Agonis theiformis* and *Xanthosia rotundifolia. Banksia grandis* is often present within this vegetation type as a tall shrub. Common identifying species of the open sedge component of this vegetation type are *Tetraria octandra, Tetraria capillaris, Desmocladus fasciculatus* and *Anarthria prolifera* (Sandiford and Barret, 2010). Furthermore, this vegetation type has been assessed as having a modified condition (Thackway and Leslie, 2006) (equivalent to "good to very good" on the Keighrey (1994) Condition Scale) whereby the native vegetation community structure, composition and regenerative capacity is intact, but is perturbed by land use / land management practices (Thackway and Lesslie 2006). ARVS Mapping within the Subject Site and its vicinity is shown on Figure 4.

A search of publicly available databases through WA Atlas, Nature Map, and EPBC Protected Matter Search Tool indicates that no threatened, priority or declared rare flora is present on the site, or within the surrounding Nature Reserves and remnant vegetation.

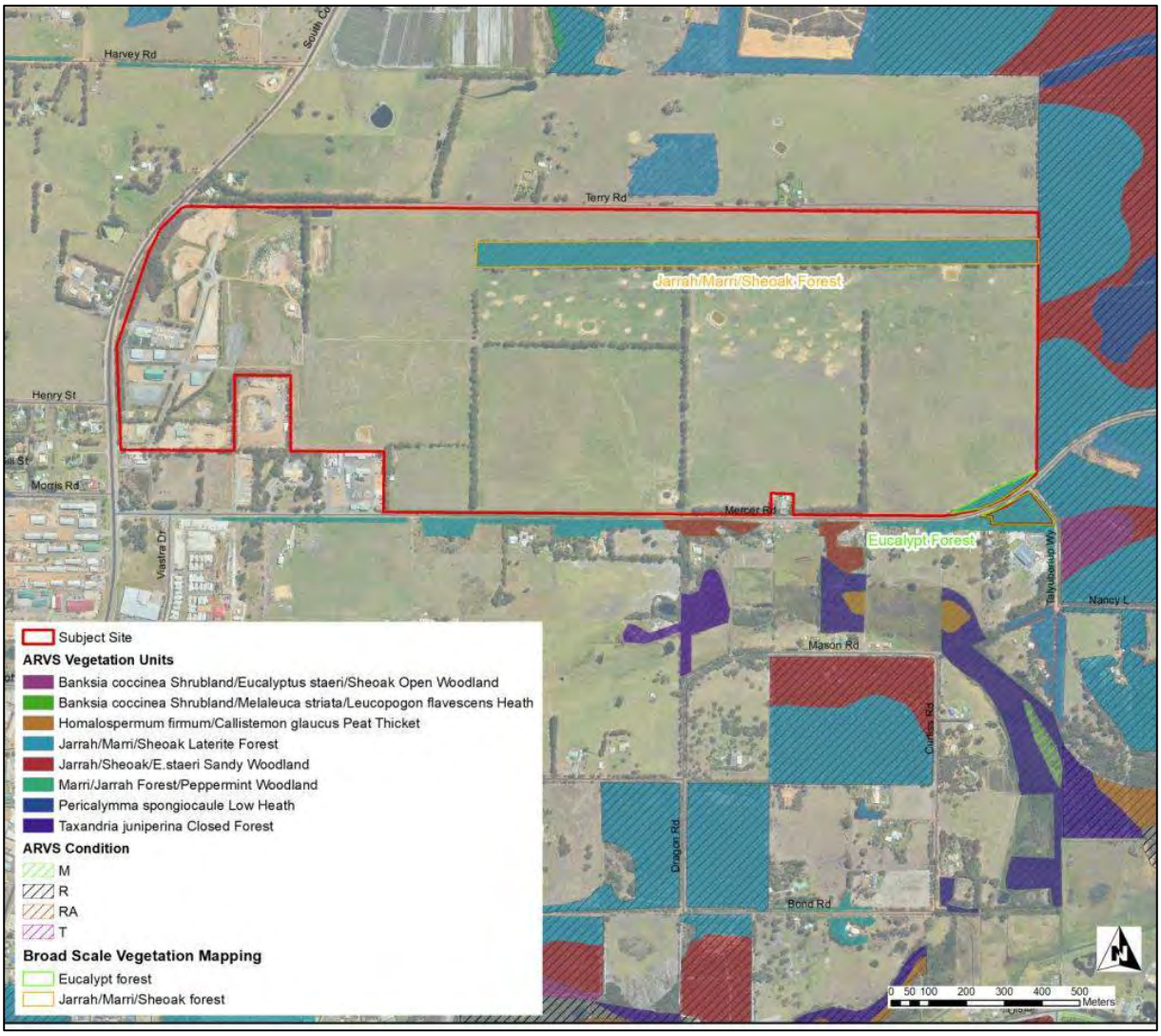

Figure 4: ARVS & Broad Scale Vegetation Survey Mapping

3.12. Vegetation Survey

The vegetation across the Subject Site and surrounding areas is consistent with rural farmland, with the majority of the site and surrounds comprising of heavily grazed pasture dominated by pasture grass species. There are two areas of remnant vegetation within the Subject Site, a strip of vegetation running parallel with the northern boundary of the site (approximately 12 ha) and a small area in the south-eastern corner of the site on either side of Mercer Road.

As part of this EAR a broad scale vegetation survey was conducted on the 29 August 2017 on the two areas of remnant vegetation. Two vegetation types were identified; the strip of vegetation in the north was identified as Jarrah/Marri Sheoak Forest and the vegetation in the south-east corner was identified as Eucalypt Forest. Broad scale Vegetation Mapping is shown on Figure 4. As per the Draft Structure Plan the internal remnant vegetation is to be retained as Public Open Space (POS).

Jarrah/Marri/Sheoak Forest

This area was previously described as being Jarrah/Marri/Sheoak Laterite Forest by Sandiford and Barrett (2010). The species identified during this survey are consistent with the ARVS vegetation type. The overstorey composition consisted of *Eucalyptus marginata, Allocasuarina fraseriana, Corymbia calophylla* and occasional patches of *Eucalyptus cornuta* and *Banksia grandis.* Midstorey species identified were *Agonis flexuosa, Bossiaea linophylla, Beaufortia decussata, Hakea amplexicaulis, Persoonia longifolia, Leucopogon verticillatus, Xanthorrhoea platyphylla, Bossiaea dentata, Hakea ruscifolia, Xanthosia rotundifolia, Tetratheca setigera, Sphaerolobium alatum (?), Hovea chorizemifolia, Hibbertia sp.,* and *Pimelea sp.* Understorey species

identified included natives such as *Chamaescilla corymbosa var. corymbosa, Dampiera sp., Lomandra sp.,* and *Conostylis sp.,* as well as weed species such as **Cirsium sp., *Olaxis sp., *Cenchrus clandestinus, and *Hypochaeris sp.* (* Denotes weed species). Based on the species composition observed during the survey this vegetation type is still consistent with ARVS.

The condition of this strip of vegetation varied throughout its extent with condition improving closer to the fenced remnant vegetation to the east. The western half of the strip was quite open, with very few midstorey species and a high proportion of sedges and grasses with areas of bare ground. This is likely due to grazing pressures from cattle. There was evidence of cattle activity throughout this area with cattle tracks, hoof prints and cow dung detected. There were areas where midstorey and understorey vegetation increased with fewer signs of disturbance present. Vegetation in this unit is considered to be in very good condition as there are obvious signs of disturbance to the vegetation structure from cattle grazing, weeds and human disturbances (Keighrey, 1994). Photographs 9 to 12 show images of Jarrah/Marri/Sheoak Forest within Subject Site.

Photograph 9 to 12 – View of Jarrah/Marri/Sheoak Forest within Subject Site

Eucalypt Forest

This area of vegetation was mapped in the ARVS as Jarrah/Marri/Sheoak Laterite Forest, however during this survey few species associated with this vegetation type were identified, there were also a high proportion of weed species were identified. The overstorey composition consists of *E. marginata*, *Eucalyptus gomphocephala, A. fraseriana, C. calophylla, Eucalyptus megacarpa, *Acacia longifolia, *Acacia dealbata, Eucalyptus sp.,* and **Pinus radiata* (* Denotes weed species). The midstorey composition was far less diverse than the northern strip of vegetation. Species identified included *Callistemon sp., Beaufortia decussata, Leucopogon verticillatus, Leucopogon sp., Pimelea sp., Hibbertia sp., Adenanthos cuneatus, Hemiandra pungens,* and *Chamelaucium ciliatum*. There were very few understorey species present, with most of the area covered with plant litter, of the groundcover/understorey species present these were weed species such as Kikuyu and *Watsonia sp*.

Vegetation condition within this area is considered to be degraded as the basic vegetation structure has been severely impacted by multiple disturbances such as aggressive weed species and clearing activities (Keighrey, 1994). Evidence of clearing was observed during this survey as several trees and larger shrubs had been cut down. Photographs 13 to 16 show images of Eucalypt Forest within Subject Site.

Photograph 13 to 16 – View of Eucalypt Forest within Subject Site.

3.13. Fauna

The majority of the site has been historically and extensively cleared and as a consequence significant fauna habitat has been removed. Opportunistic Fauna sightings were recorded during the Broad Scale Vegetation Survey on the two areas of remnant vegetation within the Subject Site.

3.13.1. Opportunistic Fauna Sightings

During the Broad Scale Vegetation Survey of the strip of remnant vegetation in the north of the Subject Site various birds were observed and heard within the Jarrah/Marri/Sheoak Forest such as Red-Capped Parrot (*Purpureicephalus spurius*), Galah (*Eolophus roseicapillus*), Willie Wagtail (*Rhipidura leucophrys*), New Holland Honeyeater (*Phylidonyris novaehollandiae*), Yellow rumped Thornbill (*Acanthiza chrysorrhoa*), Western Gerygone (*Gerygone fusca*), Rufous Whistler (*Pachycephala rufiventris*) and Magpie (*Cracticus tibicen*). A flock of 6-10 Forest Red-tailed Black Cockatoos (*Calyptorhynchus banksii naso*) were observed feeding in the adjacent remnant vegetation to the east of the Subject Site. A potential Quenda (*Isoodon obesulus fusciventer*) runnel was identified within the understorey of the Jarrah/Marri/Sheoak Forest (Photograph 17). Western Grey Kangaroos (*Macropus fuliginosus*) were also observed.

Photograph 17 – Potential Quenda Runnel within Subject Site remnant vegetation.

3.14. Contaminated Sites

A review of the DER's Contaminated Sites Database determined there are no registered contaminated sites within the Subject Site. However, prior to subdivision further investigations may be required to confirm there is no potential contamination on the site.

3.15. Heritage

A search of the Department of Aboriginal Affair's Aboriginal Heritage Inquiry System was conducted and no matches were recorded for the Subject Site or within the vicinity of the Subject Site.

A search of the Heritage Council's inHerit database and the City of Albany's Municipal Heritage Inventory (City of Albany 2000) was conducted with no matches found for the Subject Site or its surroundings.

3.16. Bushfire Risks and Bushfire Assessment

The publicly released Bushfire Prone Area Mapping (DFES, 2017) shows that the majority of the Subject Site is located within a Bushfire Prone Area (situated within 100m of >1 ha of bushfire prone vegetation). Bushfire Prone Area Mapping is shown on Figure 5.

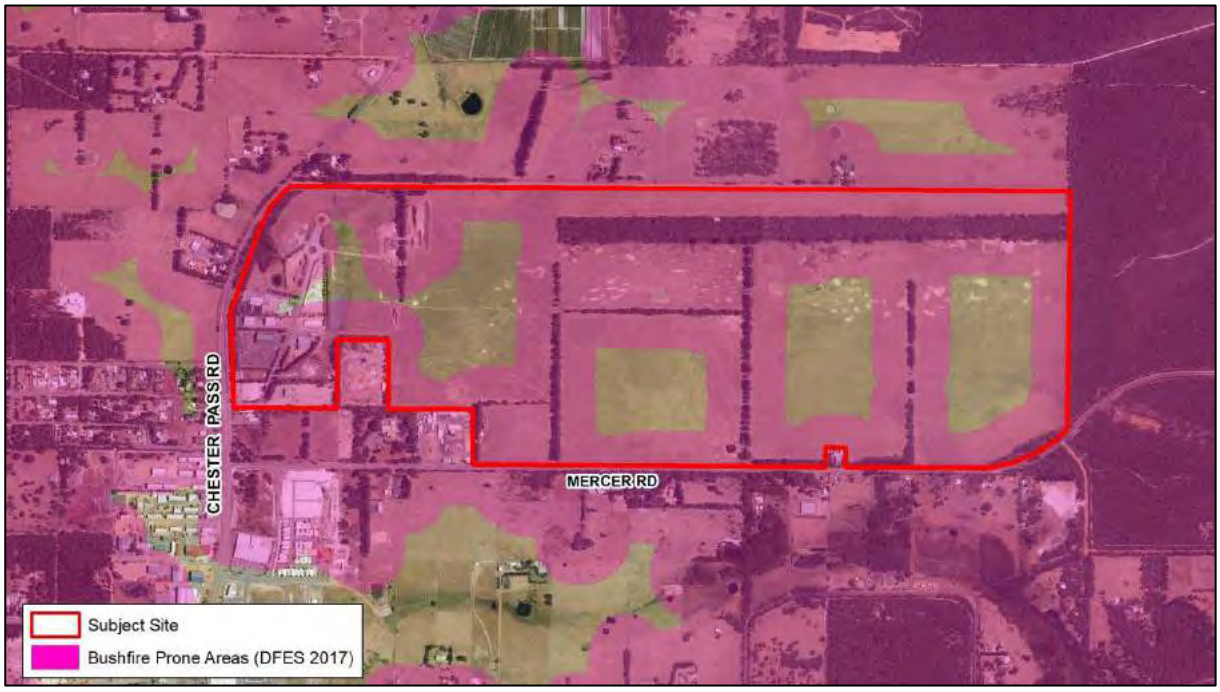

Figure 5: Bushfire Prone Area Mapping

A BAL Contour plan has been prepared for the site by Level 2 Bushfire Practitioner K. Kinnear (BPAD 30794). The BAL Contour Plan has been included as Appendix D. All vegetation within 150m of the site boundary/ proposed development was classified in accordance with Clause 2.3 and Exclusions as per Clause 2.2.3.2 of AS 3959-2009. Each distinguishable vegetation plot with the potential to determine the Bushfire Attack Level is identified in the BAL Contour document. Each plot is representative of the Vegetation Classification to AS3959-2009 Table 2.3 and shown on the Vegetation Classification Mapping (Appendix D).

The Subject Site was assessed as having internal areas of Grassland Type G consistent with rural farmland, low fuel/non- vegetated areas (associated with the industrial area, tracks/roads and buildings) and an area of Forest Type A (being the strip of remnant vegetation in the north). External bushfire risks are mostly associated with the Forest Type A (CoA reserve) directly to the east and south-east of the Subject Site and Forest Type A and Woodland Type B along Mercer Road (Bio Diverse Solutions, Appendix D).

The Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) outlines bushfire protection criteria which subdivision and development proposals are assessed for compliance. The bushfire protection criteria

(Appendix 4, WAPC, 2017) are performance based criteria utilised to assess bushfire risk management measures and they outline four elements, being:

- Element 1: Location
- Element 2: Siting and Design of Development;
- Element 3: Vehicle Access; and
- Element 4: Water.

(WAPC, 2017)

The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017). The proposal will be assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4.

Acceptable Solution A1- Location

It is recommended to guide the development of the LSP that the minimum separation apply to achieve BAL 29 or less on the future dwellings (as shown on the BAL Contour Plan):

- 21-27m Forest Type A;
- 14-17m Woodland Type B;
- 13-15m Scrub Type D; and
- 8-9m Grassland Type G.

This will ensure that Acceptable Solution 1 is achieved by setbacks to BAL 29 applied through the design and layout of the road reserves and (if required) building setbacks.

Acceptable Solution A2 – Siting and design

All buildings within the Structure plan shall have an Asset Protection Zone (APZ) area associated with BAL 29 or less. Setbacks for dwellings associated with the BAL Contours can be applied through the road design from external and internal bushfire risks. Future landscaped areas (internal shall below fuel in nature and maintained areas. The internal POS area in the north shall remain as native vegetation and the internal road design will ensure BAL 29 or less prevails over the proposed dwellings.

Any future plantings in POS areas (excepting the northern POS) are to be to a APZ standard as per WAPC requirements. The developer will be responsible for implementing revegetation standards as per APZ standards. New lot owners are to conform to any planting on their lot for revegetation, screening or windbreaks to APZ standards.

Staged construction is to ensure that separation distances to residential areas are maintained, as a guide 100m from any residential building should be maintained as low fuel areas (i.e. maintained by the Developer) to ensure that BAL does not apply from current land management practises to the proposed residential areas.

Acceptable Solution A3 – Vehicular Access

The internal road layout should ensure that every lot has the ability to exit the Structure Plan in two separate directions to a minimum of two destinations. Cul-de-sacs and battle axes are not recommended. The minimum technical requirements for public roads are shown in Table 9.

Table 9: Vehicular Access Technical Requirements (WAPC, 2017)

Technical requirements	Public Road
Minimum trafficable surface (m)	*6
Horizontal clearance (m)	6
Vertical clearance (m)	4.5
Maximum grades	1 in 10
Minimum weight capacity (t)	15
Maximum crossfall	1 in 33
Curves minimum inner radius (m)	8.5
Maximum Length	N/A

Fire Service Access and Emergency Access Way will be along the internal road network and will not be required separately. Staged development should include road network construction to ensure that no one-way or dead-end streets occur. Firebreaks are to be maintained on the parent lot according to CoA Fire Management Notice (annually updated). Compliance to these issues will ensure the Acceptable Solution A3 (1-8) can be achieved.

Acceptable Solution A4 – Water Supply

The development will be provided with reticulated scheme water in accordance with the specifications of the relevant water supply authority (Water Corporation WA (WCWA)) and DFES requirements. This will be detailed in the detailed engineering drawings and be subject to approval from WCWA and DFES at subdivision condition stages, meeting the Acceptable Solution. Fire hydrant (street) outlets are required, these must be installed to WCWA standards installed in accordance with the *Water Corporation's No 63 Water Reticulation Standard* and are to be identified by standard pole and/or road markings and installed by the Developer.

The Structure Plan is deemed compliant to this Acceptable Solution 4.1.

Overall Fire Management for the site

BAL contouring across the Subject Site has allocated BAL 29 or less to apply to any buildings and can be guided by the Structure Plan design. Setbacks from bushfire risks is to be maintained through road reserves and building setbacks. The inherent bushfire risks for the site is the internal strip of vegetation in the north and the remnant vegetation contained in CoA reserve to the east. Minimum setbacks to achieve BAL 29 in these areas is 21m (northern strip of remnant vegetation) and 27m (eastern CoA reserve). All future buildings can achieve an APZ area associated with a BAL allocation of BAL 29, BAL 19 or BAL 12.5.

Vehicle access standards can be achieved through the Structure Plan design. The minimum technical requirements for Public Roads is to meet Table 9. No Battle axes are proposed and FSA will be along the public road network. One Cul-de-sac is proposed near the intersection of Range and Terry Road, as the CoA seek to minimise new intersections to Range Road and the eastern extents of Terry Road. Where the cul-de-sac is present, an EAW is shown connecting to Range Road ensuring compliance to Element A3.3 of Acceptable Solution A3. Reticulated water will be provided water in accordance with the specifications of the relevant water supply authority WCWA and DFES requirements, meeting A4.1.

A detailed Bushfire Management Plan will be required if any industry is defined as "High Risk" or to support a future Development Application for the Primary School. Additionally, a detailed Bushfire Management Plan may be required to support the staged development of the subdivision.

High Risk Land use and Vulnerable Land Uses

The LSP contemplates potential "High Risk" land use (light industry) and "Vulnerable Land Use" as per the definitions of SPP 3.7. As defined by the Guidelines for Planning in Bushfire Prone areas Vers1.2 (2017):

"High-risk land uses may include, but are not limited to: service stations, landfill sites, bulk storage of hazardous materials, fuel depots and certain heavy industries as well as military bases, power generating land uses, saw-mills, highways and railways, among other uses meeting the definition.

Proposals for non-residential, high-risk land uses in bushfire prone areas are to comply with policy measure 6.6 which requires a Bushfire Management Plan jointly endorsed by the local government and the Department of Fire and Emergency Services. This may include establishing an appropriate Asset Protection Zone or Hazard Separation Zone, and should be supported by a risk management plan that addresses bushfire risk management measures for any flammable on-site hazards."

As Light industrial land use is proposed in the west of the Structure Plan, a detailed Bushfire Management Plan will be required to guide developers if any industry is defined as "High risk".

Policy measure 6.6 of SPP 3.7 applies to vulnerable land uses, and refers specifically to subdivision and development applications. However, if a scheme amendment or structure plan identifies a site for a vulnerable land use, then the policy requirements should be addressed. Typically, vulnerable land uses are those where persons may be less able to respond in a bushfire emergency. A detailed Bushfire Management Plan jointly endorsed by DFES and CoA will be required for any Primary School proposed in the Structure Plan area at the Development Application stage. A Bushfire Emergency Evacuation Plan (BEEP) will be required at Development Approval Stages.

4. Land Capability Assessment

Land capability is the ability of the land to sustain a specified land use without resulting in significant onsite or offsite degradation or damage to land resources. The Land Capability Assessment of the Subject Site is completed in accordance with the State Planning Commission's (1989) Land Capability Assessment for Local Rural Strategies. The assessment is a three-stage process and includes:

Stage 1 – Land Use Requirements

- Specify and define the proposed land use;
- Determine the specific land use requirements of that use;
- List the relevant land qualities to fulfil the land use requirements; and
- List the relevant land characteristics which determine each land quality.

Stage 2 – Land Resource Survey

- Divide the study area into mapping units which have a measurable difference in the land characteristics listed above and may be expected to influence the land quality attributes and land capabilities.

Stage 3 – Land Capability Analysis

- For each mapping unit rate each individual land quality; and
- For each mapping unit determine its overall capability to sustain the land use by comparing its land quality ratings in the capability rating table.

The WAPC (1989) utilises a five-class system of assessing Land Capability, these five classes rate the degree of physical limitations associated with land use and management needed for these. The land capability classes are shown in Table 2.

Table 2: Land Capability Classes

Capability Class	Degree of Limitation	General Description
I	Very low	Areas with a very high capability for the proposed activity or use. Very few physical limitations to the specified use are present or else they are easily overcome. Risk of land degradation under the proposed use is negligible.
II	Low	Areas with a high capability for the proposed activity or use. Some physical limitations to the use do occur affecting either its productive use or the hazard of land degradation. These limitations can however, be overcome through careful planning.
III	Moderate	Areas with a fair capability for the proposed activity or use. Moderate physical limitations to the land use do occur which will significantly affect its productive use or result in moderate risk of land degradation unless careful planning and conservation measures are undertaken.
IV	High	Areas with a low capability for the proposed activity or use. There is a high degree of physical limitations which are either not easily overcome by standard development techniques or which result in a high risk of land degradation without extensive conservation requirements.
V	Very High	Areas with a very poor capability for the proposed activity or use and the severity of physical imitations is such that its use is usually prohibitive in terms of either development costs or the associated risk of land degradation.

4.1. Land Use Requirements

There are two land uses proposed for the Subject Site as defined by the State Planning Commission (1989) Urban Development and Light Rural Industry (note these definitions are as per this policy for the purposes of this report and not any other planning instrument/policy). The location of the two proposed land uses is shown on the LSP in Appendix A, with "Urban Development" shown as "Residential" and "Light Rural Industry" shown as "Light Industry".

4.1.1. Urban Development

The WAPC Land Capability Assessment for Rural Strategies Guideline defines Urban Development areas as follows;

'Urban use consists of mostly residential development, but includes the use of land for extensive building complexes (such as shopping centres and offices). Urban development is an intensive form of land use which requires a high level of servicing and site disturbance.

Services include sealed and kerbed roads and carparks, storm water drainage and underground services (including reticulated water, gas and telephone connections) to cater for single housing allotments in the order of 500-700m^2 but also up to 2000 m^2.

The Water Authority's Country Sewerage Policy indicates that deep sewerage should be provided where it is already provided within the town, or where soil, land and environmental factors specifically indicate it should be provided. Deep sewerage may not need to be provided if there are no environmental or public health problems arising from the operation of on-site septic tanks.'

The WAPC Land Capability Assessment for Rural Strategies Guideline identifies land use requirements for Urban Development areas as follows;

- Availability of extensive flat to gently sloping areas (preferably 0-2% but up to 8%);
- Deep well drained soils which are easy to excavate and provide a stable foundation for building;
- Disposal of liquid effluent via a treatment plant or from onsite septic tanks should not result in pollution of surface water bodies or groundwater resources;
- Urban stormwater is often highly polluted (high in BOD, nutrients, heavy metals and hydrocarbons) and may need to be treated to prevent point source pollution at the disposal site; and
- Urban development results in increased stormwater runoff which may raise the level of the unconfined water table or result in soil instability where steep slopes occur. The land should therefore not be subject to slumping/ landslips, water logging or water erosion.

Table 3 outlines the land qualities to fulfil the Urban Development land use requirements. The land characteristics for each land quality are shown in the guideline document (WAPC 1989).

Table 3: Land Qualities to fulfil Urban Development Land Use Requirements

Land Qualities	**Rating**				
Ease of excavation, x	Very high	High	Moderate	Low	Very Low
Foundation stability, b	Very high	High	Moderate	Low	Very Low
Water logging hazard, i	Low		Moderate	High	Very high
Water erosion hazard, e	Low		Moderate	High	Very high
Soil salinity, y	Very Low	Low	Moderate	High	
Soil absorption ability, a	High	Moderate	Low	Very Low	
Wind erosion hazard, w			Low	Moderate	High-Very high
Bushfire hazard, z	Very Low	Low	Moderate	High	Very high
Wave erosion hazard, u					High – Very high
Flood hazard, f	Very low				High -Very high
Water pollution hazard, s			Low	Moderate	High
Water availability, g	High			Moderate	Low
Overall capability rating	**I**	**II**	**III**	**IV**	**V**

4.1.2. Light Rural Industry

The WAPC Land Capability Assessment for Rural Strategies Guideline defines Light Rural Industry areas as follows;

'This land use comprises mixed industrial uses (such as light industry, agriculture support industries) often with showroom/warehouse developments along major roads on the periphery of towns. These industries are generally controllable. The activities are mostly undertaken in warehouses or factories, while the external area, being used for traffic circulation, storage and display purposes, is generally cleared of all vegetation and compacted or sealed. Lot sizes may vary considerably but are often about 2000 m^2. These areas may be deep sewered (especially if the town is sewered) but this is generally not a requirement. A reticulated water supply is provided to each lot.'

The WAPC Land Capability Assessment for Rural Strategies Guideline identifies land use requirements for Light Rural Industrial areas as follows:

- Availability of extensive flat to gently sloping areas (0 - 8%);
- Deep to moderately deep well drained soils which are easy to excavate and provide a stable foundation for building. Moderately well drained soils with a slight susceptibility to waterlogging may be tolerated;
- The land should not be susceptible to flooding; and
- Disposal of septic effluent or other waste waters should not result in water pollution.

Table 4 outlines the land qualities to fulfil the Light Rural Industry land use requirements. The land characteristics for each land quality are shown in the guideline document (WAPC 1989).

Table 4: Land Qualities to fulfil Light Rural Industry Land Use Requirements

Land Qualities	**Rating**				
Ease of excavation, x	Very high-high		Moderate	Low	Very Low
Foundation stability, b	Very high-high		Moderate	Low	Very Low
Water logging hazard, i	Low	Moderate	High	Very High	
Water erosion hazard, e	Low	Moderate	High	Very High	
Soil absorption ability, a	High	Moderate	Low	Very Low	
Flood hazard, f	Nil		High		Very high
Water pollution hazard,s	Very low	Low	Moderate	High	
Water availability, g	High		Moderate		Low
Overall capability rating	**I**	**II**	**III**	**IV**	**V**

4.2. Land Resource Survey

The land characteristics have been analysed to determine mapping units at the Subject Site for assessing land capability. The mapping units were determined using the following land characteristics:

- Soils, including: soil type, texture, depth, PRI and permeability;
- Slope;
- Depth to groundwater;
- Land use; and
- Vegetation type.

The two distinguishable Mapping Units are defined in Table 5.

Table 5: Mapping Units

Map Unit	Characteristics within the Subject Site
Map Unit 1	Silty sand topsoil over sandy gravel over sandy clay or silty sand topsoil over sandy clay. Soils have low permeability. Soils have high PRI. Groundwater > 2.3m BGL. Slope <0 to 5%. Predominately cleared land with pasture grasses. Rural land use.
Map Unit 2	Silty sand topsoil over gravelly sand over sandy gravel. Soils have low PRI. Groundwater > 2.3m BGL. Slope <0 to 5%. Predominately cleared land with pasture grasses. Rural land use.

The mapping units for the Subject Site are shown on Figure 6.

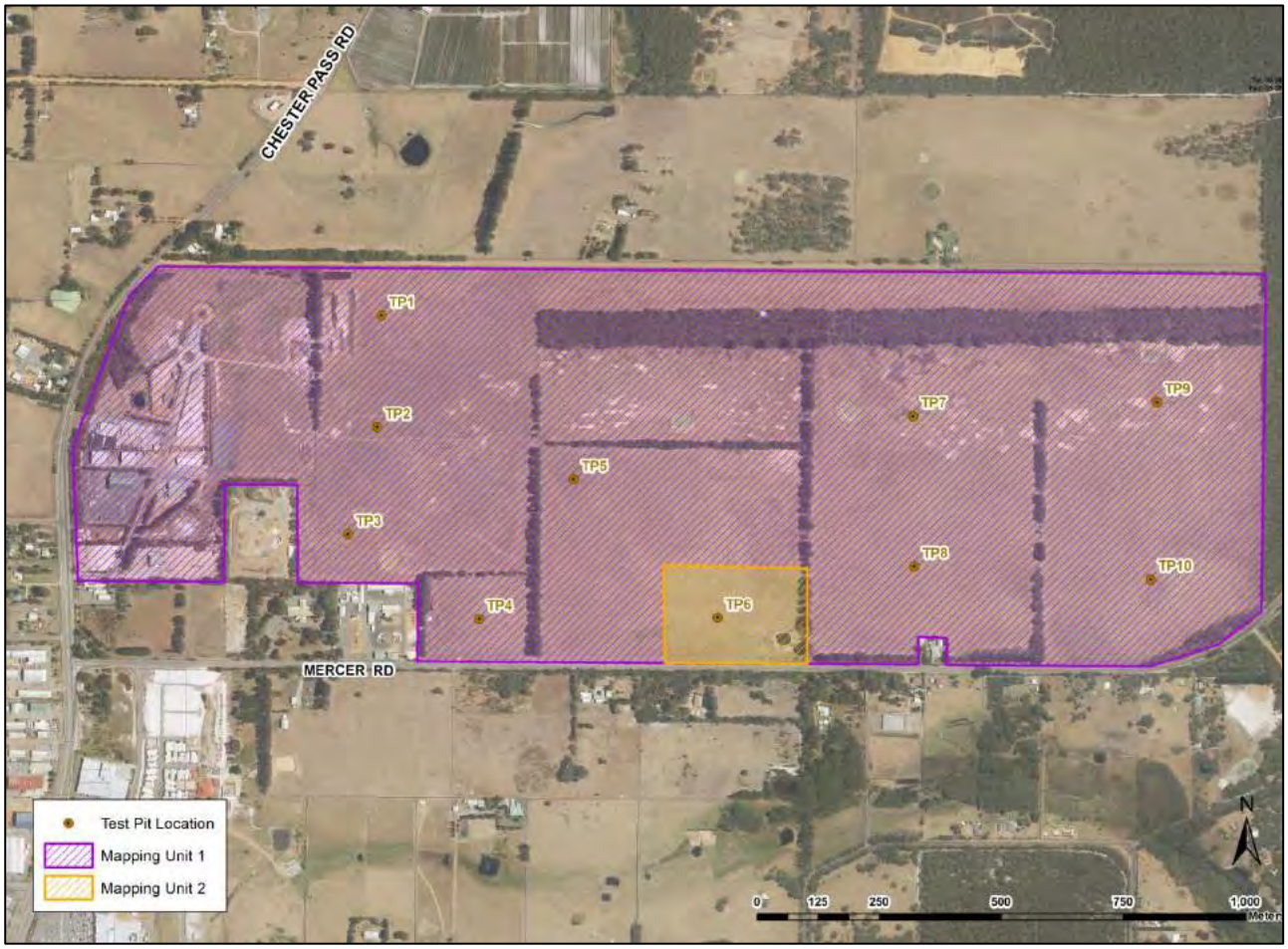

Figure 6: Land Capability Mapping Units

4.3. Land Capability Analysis

4.3.1. Urban Development

The land capability assessment for the Urban Development portion of the Subject Site is presented in Table 6. Two mapping units (Mapping Unit 1 and 2) are present in the location of the proposed Urban Development.

Table 6: Land Capability Assessment for Urban Development

Land Qualities	Mapping Unit 1	Mapping Unit 2
Ease of excavation, x	High	Very high
Foundation stability, b	High	Very high
Water logging hazard, i	Moderate	Low
Water erosion hazard, e	Low	Low
Soil salinity, y	Very Low	Very Low
Soil absorption ability, a	Moderate	Very Low
Wind erosion hazard, w	Low	Low
Bushfire hazard, z	Moderate	Moderate
Wave erosion hazard, u	Nil	Nil
Flood hazard, f	Nil	Nil
Water pollution hazard, s	Low	Moderate
Water availability, g	High (scheme water)	High (scheme water)
Overall capability rating	**II**	**IV**

The overall capability of the Subject Site supporting the Urban Development land use is rated as highly capable for Mapping Unit 1 and low capability for Mapping Unit 2 (refer to Table 2 for full description of capability rating).

4.3.2. Light Rural Industry

The land capability assessment for the Light Rural Industry portion of the Subject Site is presented in Table 7. Only Mapping Unit 1 is present in the location of the proposed Light Rural Industrial area.

Table 7: Light Rural Industry Land Capability Rating

Land Qualities	Mapping Unit 1
Ease of excavation, x	High
Foundation stability, b	High
Water logging hazard, i	Moderate
Water erosion hazard, e	Low
Soil absorption ability, a	Moderate
Flood hazard, f	Nil
Water pollution hazard, s	Low
Water availability, g	High (scheme water)
Overall capability rating	**II**

The overall capability of the Subject Site supporting the Light Rural Industry land use is rated as highly capable (refer to Table 2 for full description of capability rating).

5. Potential Environmental Impacts and Management Measures

5.1. Acid Sulphate Soils

Acid Sulphate Soils (ASS) are stable when left undisturbed, but when they are exposed to air, during excavation or dewatering, this can set off a reaction resulting in acidity (sulfuric acid) being produced. The potential impacts relate to the potential for oxidation of excavated or in situ ASS generating acidic conditions, and possibly releasing metals into groundwater or surface water catchments. ASS mapping indicates the Subject Site is not situated on any known Acid Sulphate Soils (Figure 2). There is however a section of high to moderate risk of ASS occurring within 3m of natural soil surface to the south of the Subject Site on Mercer Road.

The final fill levels and excavation requirements of the proposed subdivision will determine if an ASS and Dewatering Management Plan (ASSDMP) is required to be prepared prior to subdivision. If required, the ASSDMP will be prepared to satisfy the DER and will outline the soil management measures, the groundwater and dewatering effluent monitoring measures and the contingency management measures required to minimise any environmental impacts.

5.2. Water Management

Findings outlined in Sections 3.7 and 3.8 indicate there are limited water management risks associated with development of the Subject Land. Based on the investigations, there is no requirement to undertake pre-development groundwater monitoring. Overall, the soil types enable stormwater infiltration at source.

The water management objectives are to maintain the quantity of surface water and groundwater so that existing and potential environmental values are protected and to ensure that the quality of water emissions (surface and ground) do not adversely affect environmental values or the health, welfare and amenity of people and land uses, and meets statutory requirements and acceptable standards.

A number of management/design measures will be implemented to reduce the impact of the proposed development on surface water and groundwater flows, levels and quality, the function and environmental values of the site, or its interconnected areas. Management measures relevant to construction and the development will be identified in a Local Water Management Strategy (LWMS).

The LWMS details the integrated water management strategies to facilitate future urban water management planning. The LWMS will achieve integrated water management through the following design objectives:

- Effectively manage the risk to human life, property damage and environmental degradation from water contamination, flooding and waterlogging.
- Maintain and if possible improve water quality (surface and groundwater) within the development in relation to pre-development water quality.
- Reduce potable water consumption within both public and private spaces using practical and cost-effective measures.
- Promote infiltration of surface water on site to minimise the risk of further water quality degradation in the Catchment.
- Implement best management practices in regards to stormwater management.
- Incorporate where possible, low maintenance, cost-effective landscaping and stormwater treatment systems.

The LWMS will incorporate the following structural Best Management Practices (BMPs) to address water quantity and quality for the LSP:

- A conceptual drainage strategy demonstrating that the land is capable of retaining the 100 ARI event, while providing an indicative location of stormwater detention.

- Structural and non-structural controls will be used to improve stormwater quality, as compared to a development that does not actively manage stormwater.
- Rainfall from the 1 year 1-hour ARI (Annual Recurrence Interval) events will be retained and infiltrated as close to the source as possible.
- All residential lots will confine run-off from roofs and paving within the property boundary.
- Large rainfall events (10 ARI to 100 ARI) will be conveyed and retained through a network of roads, drainage reserves and POS within each catchment.
- It is anticipated that there will be no impacts from stormwater run-off to downstream ecosystems.

It is expected that development of the site will have a positive impact on groundwater and stormwater quality through BMPs and the treatment of stormwater prior to infiltration. Based on the site assessment and the management measures proposed, it is not expected that any changes to groundwater flows, levels or quality will have an adverse impact on the function and environmental values of the site.

5.3. Waste Water Management

The Subject Site is situated in a Sewerage Sensitive Area that does not have access to deep or reticulated sewerage. It is proposed the initial stage/s of the subdivision will involve the extension of the Light Industrial Area (similar to the existing Industrial Area) and on-site effluent disposal will be required for this area. All residential subdivision will be connected to reticulated sewerage.

The draft Government Sewerage Policy (DoP, 2016) outlines that on-site effluent disposal may be considered for non-residential subdivision that:

a) Are remote from existing or proposed sewerage schemes and the proposed development cannot be connected to reticulated sewerage;

b) Utilise secondary treatment systems with nutrient removal if in a sewage sensitive area or a public drinking water source area; and

c) Where the proponent has demonstrated, to the satisfaction of the Western Australian Planning Commission on the advice of the Department of Health and the Department of Water that there is sufficient capacity to treat and dispose of sewage and contain associated buffers on-site. Consideration will be given to the maximum hydraulic load that can be contained within the lot and the potential impacts on waterways and wetlands.

The minimum lot size for non-residential lots is determined on a case-by-case basis. Residential lots with on-site effluent disposal in sewerage sensitive areas must be at least 1 hectare in size (DoP, 2016).

The proposed industrial area as shown on the LSP was assessed against the requirements for lots with on-site effluent disposal as outlined in the draft Government Sewerage Policy (DoP, 2016). The requirements and assessment to each requirement is shown in Table 8.

Table 8: Assessment to On-site Effluent Disposal Lot Requirements

Lot Requirement (DoP, 2016)	Assessment to Requirement
Adequate separation from groundwater – the discharge point of the on-site sewage disposal system should be at least 1.2 to 1.5 metres, depending on soil type, in sewage sensitive areas.	Groundwater was not encountered to 2.3 metres depth (Great Southern Geotechnics, 2017).
An on-site sewage disposal system should not be located within 30 metres of a private bore used for household/drinking water purposes.	There are no private bores registered within the Subject Site or with in the vicinity of the proposed Industrial Area (DoW Water Register, 2017).

Table 8 continued over page.

Lot Requirement (DoP, 2016)	Assessment to Requirement
An on-site sewage disposal system should not be located within 100 metres of a waterway.	No waterways located within the Subject Site or within 100m of the proposed Industrial Area (Site inspection conducted 29/8/2017)
An on-site sewage disposal system should not be located within 100m of a significant wetland.	No significant wetlands located within the Subject Site or within the vicinity of proposed Industrial Area (DEC and CoA 2017 database search)
An on-site sewage disposal system should not be located within 100 metres of a surface or subsurface drainage system that discharges directly into a downstream waterway or waterbody.	No surface or subsurface drainage systems located within the Subject Site or within 100m of the proposed Industrial Area (Site inspection conducted 29/8/2017 and DoW database search)
An on-site sewage disposal system should not be located within any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event.	Given the relatively higher topography in the area and gradual slopes of the land inundation in the location of the proposed Industrial area is unlikely.

The assessment found that the proposed light industrial area is appropriate for effluent disposal and meets the stated minimum requirements for on-site sewage disposal systems as outlined in the *Draft Government Sewerage Policy* (Department of Planning, 2016). In addition, the low permeability and high PRI of the soils in the location of the proposed industrial area will allow for slow draining assisting the process of being fixed by soil microbes.

As the industrial area is in a sewerage sensitive area a secondary waste water treatment system with nutrient removal should be used. The provision of on-site sewage disposal systems including calculation of land application area shall be in accordance with minimum site requirements contained in Schedule 3 of the draft Government Sewerage Policy (DoP, 2016) and must be approved for use in Western Australia by the Department of Health. The Local Planning Scheme requirements for the current Light Industrial area require 'dry industry' and 'alternative treatment effluent disposal systems'.

Where on-site sewage disposal is to be provided by a secondary treatment system, the WAPC will require a notification on title pursuant to Section 70A of the *Transfer of Land Act 1893* (as amended) advising that an on-site secondary treatment sewage disposal system and unencumbered area to which treated sewage is to be distributed are required.

5.4. Flora and Vegetation

The aim of the flora and vegetation management strategy is to maintain the abundance, diversity, geographic distribution and productivity of flora at the species and ecosystem levels through the avoidance or management of adverse impacts and through improvement in knowledge.

The site's historical use for agriculture and grazing has degraded the vegetation on site and reduced the native vegetation cover to a strip of remnant vegetation in the north of the site and a small area in the south-east corner of the site. Consequently, it is anticipated that the proposed development would have very little impact on native vegetation. All efforts should be made to conserve existing native vegetation. There is support however to clear, as required, replanted vegetation which is Bluegums given they are generally unsuitable in an urban area.

The following management measures have been developed and incorporated into the LSP to reduce the likelihood of impacts to vegetation and flora. These measures have been developed with the aim of retaining the key existing biological values of the site:

- Remnant vegetation will be retained within the vegetation strip in the north of the Subject Site and in the south-east corner of the site (inclusion within POS will provide the most effective way of managing the conservation values of the native vegetation).
- Access crossings within the vegetation strip will be limited to facilitate retention and natural regeneration of vegetation.
- Use of native vegetation species in areas of POS and revegetation areas to maintain local biodiversity.

5.5. Fauna

The aim of the fauna management strategy is to maintain the abundance, diversity, geographic distribution and productivity of native fauna at the species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

As the majority of the site has been historically cleared and as a result, fauna habitat has largely been removed. The only potentially significant fauna habitat on site is within the two areas of remnant vegetation.

The following management measures have been developed and incorporated into the LSP to reduce the likelihood of impacts to native fauna:

- Regional fauna corridor will be retained through maintaining the strip of remnant vegetation in the north of the Subject Site and the vegetation in the south-east corner.
- Use of native vegetation species in areas of POS to promote habitat for native fauna species.

5.6. Fire Management

The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017). The proposal has been assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4, as per the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017).

The Subject Site was assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4. Please refer to the summary table below.

Table 9: Bushfire protection criteria applicable to the site

Element	Acceptable Solution	Applicable or not Yes/No	Meets Acceptable Solution
Element 1 – Location	A1.1 Development Location	Yes	Compliant BAL 29 or less applied to lots
Element 2 – Siting and Design	A2.1 Asset Protection Zone	Yes	Compliant, APZ in BAL 29 or less N/A
Element 3 – Vehicular Access	A3.1 Two Access Routes A3.2 Public Road A3.3 Cul-de-sacs A3.4 Battle axes A3.5 Private driveways A3.6 Emergency Access Ways A3.7 Fire Service Access Ways A3.8 Firebreaks	Yes Yes Yes N/A Yes Yes N/A Yes	Compliant two access to 2 destinations Compliant Compliant with EAW N/A Compliant Compliant N/A Compliant on parent lot
Element 4 – Water	A4.1 Reticulated areas A4.2 Non-reticulated areas A4.3 Individual lots in non-reticulated areas	Yes N/A N/A	Compliant N/A N/A

5.7. Light Industrial Area and Associated Buffers

The EPA Draft Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses* (EPA, 2015) provides generic separation distances from particular industries to sensitive land uses. Sensitive land uses are land uses applied to places where people live or regularly spend time and which are therefore sensitive to emissions from industry.

The EPA's hierarchy for the management of emissions is:

- Avoid or minimise the creation and discharge of emissions through design and operation of the facility;
- Ensure environmental impacts from emissions are acceptable and meet the relevant regulations and health criteria at the boundary of the site; and
- Implement separation distances to ensure that any residual emissions and unintended emissions do not impact adversely on sensitive land uses.

The generic separation distances are based on the consideration of typical emissions that may affect the amenity of nearby sensitive land uses. These include:

- Gaseous and particulate emissions;
- Noise;
- Dust; and
- Odour.

The only 'Sensitive Land Use' within the vicinity of the proposed Light Industrial area is the proposed Residential area. According to the EPA (2015) the general minimum vegetated setback of 200m is required to private residences, however the *Guidance Number 3 Separation Distances between Industrial and Sensitive Land Uses* - Appendix 1 (EPA, 2015) must be consulted for the industry types proposed within the development area and their associated separation to distance to sensitive land use prior to development.

6. Management Commitments and Conclusions

The proposed LSP recognises the importance of the key environmental and landscape attributes of the area, and incorporates these in an urban form, that creates an environmentally responsive urban development that meets the EPA and City of Albany's environmental requirements. Consequently, the environmental outcomes of the proposed LSP are considerable and include:

- Providing an improvement in groundwater and surface water quality through residential and industrial development and implementation of water sensitive urban design and best stormwater drainage management practices.
- Revegetation using native species (where currently there is very little native species and diversity) in areas of POS to promote fauna habitat and flora diversity. Landscaped urban areas to promote biodiversity using native plants.
- Maintaining areas of remnant vegetation and limiting access points through these areas to the subdivision to prevent adverse impacts particularly for transient fauna.
- The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017).
- As Light industrial land use is proposed in the west of the Structure Plan, a detailed Bushfire Management Plan will be required to guide developers if any industry is defined as "High Risk".
- A detailed Bushfire Management Plan jointly endorsed by DFES and CoA will be required for any Primary School proposed in the Structure Plan area at the Development Application stage. A Bushfire Emergency Evacuation Plan (BEEP) will be required at Development Approval Stages.
- The proposed light industrial area is deemed appropriate for effluent disposal and meets the state's minimum requirements for on-site sewage disposal systems as outlined in the *Draft Government Sewerage Policy* (Department of Planning, 2016). Where on-site sewage disposal is to be provided by a secondary treatment system, the WAPC will require a notification on title pursuant Section 70A of the *Transfer of Land Act 1893* (as amended) advising that an on-site secondary treatment sewage disposal system and unencumbered area to which treated sewage is to be distributed are required.
- Provide vegetated buffer and/or other management techniques between industrial areas to sensitive land uses (such as residential) in accordance with the EPA's (2015) Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses.*

7. References

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Appendices

Appendix A – Draft Local Structure Plan (Edge Planning & Property, 2017)

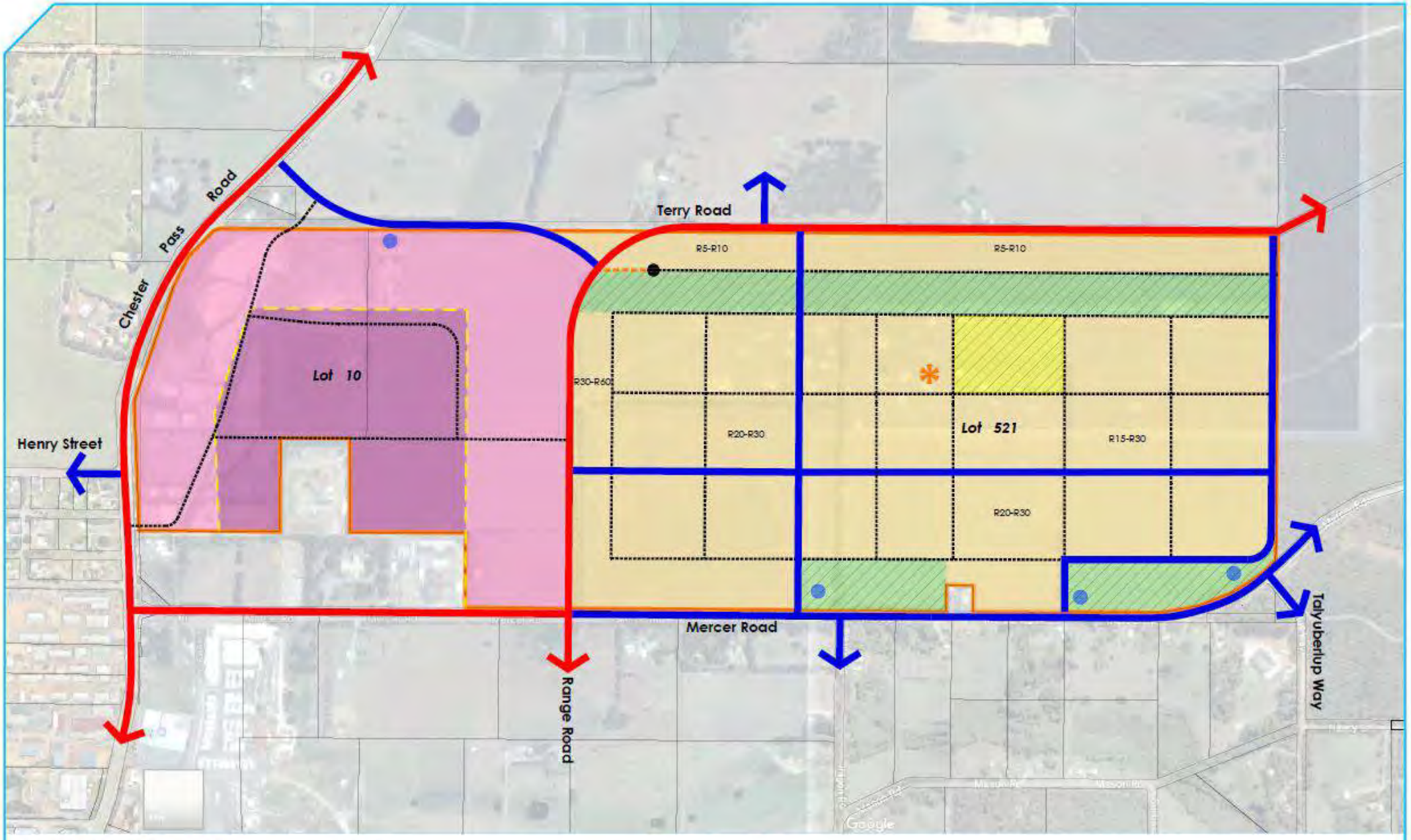
Appendix B – Geotechnical Investigation (Great Southern Geotechnics, 2017)

Appendix C – Phosphorous Retention Index Test Results (CSBP Laboratory, 2017)

Appendix D – BAL Contour Plan (Bio Diverse Solutions, 2017)

Appendix A

Draft Local Structure Plan (Edge Planning & Property, 2017)



LOCAL STRUCTURE PLAN

Lot 10 Chester Pass Road and
Lot 521 Mercer Road
Walmsley

LEGEND

- Local Structure Plan Boundary
- Integrator Arterial Road
- Neighbourhood Connector Road
- Local Road
- Parks and Recreation
- Public Use - School
- Residential
- Drainage
- Light Industry Precinct A
- Light Industry Precinct B
- Community Purpose Site
- 200m Buffer to Sensitive Uses
- Emergency Access Way

REV	DESCRIPTION	YYMMDD
D	ADD EMERGENCY A. WAY.	171116
C	MINOR MODIFICATIONS	171025
B	MINOR MODIFICATIONS	171022
A	LOCAL STRUCTURE PLAN	171012

DRAWING NUMBER EP 170620-06 REV D SCALE 1:7500 SHEET A3

edge PLANNING & PROPERTY

Appendix B

Geotechnical Investigation (Great Southern Geotechnics, 2017)

VERSION 1

Report No 104/1

SEPTEMBER 17, 2017

GEOTECHNICAL INVESTIGATION

BIO DIVERSE SOLUTIONS

LOT 10 CHESTER PASS RD & LOT 521 MERCER RD, MILPARA WA 6330

PRESENTED BY: M.COFFEY

GREAT SOUTHERN GEOTECHNICS
5A 209 CHESTER PASS RD, ALBANY WA

ACN: 613 485 644 ABN: 77 613 485 644
Info@gsgeotechnics.com

1.0 INTRODUCTION

As authorised by Kathryn Kinnear of Bio Diverse Solu s, a site inves n for the proposed development of Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA 6330 was preformed on the 29th of August, 2017.

2.0 GENERAL

This purpose of the inves on was to determine the following:

- Surface site cond ons
- Subsurface soil pro es & characteris s
- Depth of ground water tables .

3.0 SITE INVESTIGATION

The site is approximately 5.0kms North of the Albany CBD and is located on the Northern side of Mercer Road spanning over 2kms West to East.

Established trees border the fence lines of grassy paddocks and natural bushland can be found adjacent to the eastern boundary.

Site cond ons and Test pit lo s were recorded and are shown in Appendix 2

The eld inves a consisted of ten test pits excavated on-site to depths of up to 2.3m using a Kubota KX41-3V Mini Excavator with a 300mm wide Hydraulic open ight auger achment.

All soil layers encountered were visually assessed and classi on-site

The subsurface soil pro s are shown on the Test pit logs located in Appendix 1

IMPORTANT NOTE: We have endeavoured to locate the test pits so that they are representa e of the subsurface materials across the site. However, soil cond ons may change dram lly over short distances and our inves ns may not locate all soil var s across the site.

This report and associated documenta was undertaken for the spec urpose described in the report and shall not be relied on for other purposes. This report was prepared solely for the use by Bio Diverse Solu s and any reliance assumed by other par s on this report shall be at such par s own risk.

Great Southern GEOTECHNICS

Explanatory Notes

COLOURS

BLACK - BROWN (bk)	BLUE (bl)	ORANGE (or)
BROWN (br)	BLUE – GREEN (bl/gr)	RED (rd)
GREY – BROWN (gy/br)	GREEN (gr)	RED – BROWN (rd/br)
GREY (gy)	YELLOW (yl)	PINK (pk)
BLUE – GREY (bl/gy)	YELLOW – BROWN (yl/br)	PURPLE (pr)

MOISTURE CONDITION OF SOIL

TERM	DESCRIPTION
Dry	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere and free water forms on hands when handling.

PARTICLE SHAPES

ANGULAR	SUB-ANGULAR	SUB-ROUNDED	ROUNDED

PARTICLE SIZES

BOULDERS	COBBLES	COARSE GRAVEL	MEDIUM GRAVEL	FINE GRAVEL	COARSE SAND	MEDIUM SAND	FINE SAND	SILT	CLAY
>200mm	63-200mm	20-63mm	6-20mm	2.36-6mm	0.6-2.36mm	0.2-0.6mm	0.075-0.2mm	0.002-0.075mm	<0.002mm

GRAIN SIZE

SOIL TYPE (ABBREV.)	CLAY (CL)	SILT (SI)	← SAND (SA) →		← GRAVEL (GR) →			COBBLES (CO)
SIZE	< 2µm	2–75µm	Fine 0.075-0.2mm	Medium 0.2-0.6mm	Coarse 0.6-2.36mm	Fine 2.36-6mm	Medium 6-20mm	Coarse 20-63mm	63-200mm
SHAPE & TEXTURE	Shiny	Dull	← angular or subangular or subrounded or rounded →						
FIELD GUIDE	Not visible under 10x	Visible under 10x	Visible by eye	Visible at < 1m	Visible at < 3m	Visible at < 5m	Road gravel	Rail ballast	Beaching

Great Southern GEOTECHNICS

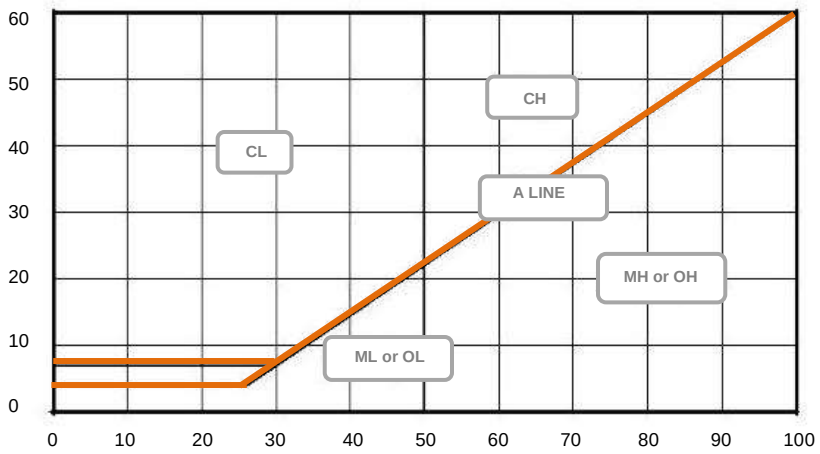
CLASSIFICATION CHART

Explanatory Notes

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60mm and basing fractions on estimated mass)					GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% of material less than 63 mm is larger than 0.075 mm	GRAVELS More than 50% of coarse fraction is larger than 2.36mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		GW	Well graded gravels, gravel-sand mixtures, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		GP	Poorly Graded gravels and gravel-sand mixtures, little or no fines, uniform gravels
		GRAVELS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength		GM	Silty gravels, gravel-sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction is smaller than 2.36mm	CLEAN SANDS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		SW	Well graded sands, gravelly sands, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength '		SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands
		SANDS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength		SM	Silty sands, sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2mm					
	SILTS AND CLAYS Liquid limit less than 50	DRY STRENGTH	DILATANCY	TOUGHNESS		
		None to low	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity. Silts of low to medium Liquid Limit.
		Medium to high	None to very slow	Medium	CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		Low to medium	Slow	Low	OL	Organic silts and organic silt-clays of low to medium plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Low to medium	Slow to none	Low to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, silts of high Liquid Limit.
		High to very high	None	High	CH	Inorganic clays of high plasticity.
		Medium to high	None to very slow	Low to medium	OH	Organic clays of high plasticity
HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture				Pt	Peat and other highly organic soils

PLASTICITY CHART

For laboratory classification of fine grained soils



Great Southern GEOTECHNICS

Explanatory Notes

PLASTICITY

DESCRIPTIVE TERM	OF LOW PLASTICITY	OF MEDIUM PLASTICITY	OF HIGH PLASTICITY
Range Of Liquid Limit (%)	≤ 35	> 35 ≤ 50	> 50

DESCRIPTION OF ORGANIC OR ARTIFICIAL MATERIALS

PREFERRED TERMS	SECONDARY DESCRIPTION
Organic Matter	Fibrous Peat/ Charcoal/ Wood Fragments/ Roots (greater than approximately 2mm diameter)/ Root Fibres (less than approximately 2mm diameter)
Waste Fill	Domestic Refuse/ Oil/ Bitumen/ Brickbats/ Concrete Rubble/ Fibrous Plaster/ Wood Pieces/ Wood Shavings/ Sawdust/ Iron Filings/ Drums/ Steel Bars/ Steel Scrap/ Bottles/ Broken Glass/ Leather

CONSISTENCY - Cohesive soils

TERM	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD
Symbol	VS	S	F	St	VSt	H
Undrained Shear Strength (kPa)	< 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
SPT (N) Blowcount	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Field Guide	Exudes between the fingers when squeezed	Can be moulded by light finger pressure	Can be moulded by strong finger pressure	Cannot be moulded by fingers. Can be indented by thumb nail	Can be indented by thumb nail	Can be indented with difficulty with thumb nail

CONSISTENCY - Non-cohesive soils

TERM	VERY LOOSE	LOOSE	MEDIUM DENSE	DENSE	VERY DENSE	COMPACT
Symbol	VL	L	MD	D	VD	CO
SPT (N) Blowcount	0 - 4	4 - 10	10 - 30	30 - 50	50 - 100	> 50/150 mm
Density Index (%)	< 15	15 - 35	35 - 65	65 - 85	85 - 95	> 95
Field Guide	Ravels	Shovels easily	Shovelling very difficult	Pick required	Pick difficult	Cannot be picked

MINOR COMPONENTS

TERM	TRACE	WITH
% Minor Component Field Guide	Coarse grained soils: < 5% Fine grained soils: <15% Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary components	Coarse grained soils: 5 – 12% Fine grained soils: 15 – 30% Presence easily detectable by feel or eye, soil properties little different to general properties of primary component

Great Southern GEOTECHNICS

Explanatory Notes

GEOLOGICAL ORIGIN

	TYPE	DETAILS
TRANSPORTED SOILS	Aeolian Soils	Deposited by wind
	Alluvial Soils	Deposited by streams and rivers
	Colluvial Soils	Deposited on slopes
	Lacustrine Soils	Deposited by lakes
	Marine Soils	Deposited in ocean, bays, beaches and estuaries
FILL MATERIALS	Soil Fill	Describe soil type, UCS symbol and add 'FILL'
	Rock Fill	Rock type, degree of weathering, and word 'FILL'.
	Domestic Fill	Percent soil or rock, whether pretrucible or not.
	Industrial Fill	Percent soil, whether contaminated, particle size & type of waste product, i.e. brick, concrete, metal

STRENGTH OF ROCK MATERIAL

TERM	SYMBOL	IS(50)	(MPA)	FIELD GUIDE TO STRENGTH
Extremely Low	EL	≤0.03		Easily remoulded by hand to a material with soil properties.
Very Low	VL	>0.03	≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxle sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
Low	L	>0.1	≤0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	>0.3	≤1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
High	H	>1	≤3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	>3	≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	>10		Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water.
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. Rock may be highly discoloured, usually be ironstaining. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

Appendix 1

Test Pit Logs

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 1 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580601 6128901
Test Pit No.:	**TP1** Sample No. **17G288**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 900	700	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	D-VD				
		Fine to medium grained sand.						
900 - 2300	1400	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	S / F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 2 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580560 6128698
Test Pit No.:	**TP2** Sample No. **17G289**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
100 - 300	200	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	W	L				
		Fine to medium grained sand.						
300 - 700	400	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	S				
700 - 2300	1600	**Sandy CLAY:** Low to medium plasticity, Grey mottled orange/red. Fine to medium grained sand.	M	S-F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 3 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580597 6128498
Test Pit No.:	**TP3** Sample No. **17G290**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						Water table not encountered		
0 -150	150	**(Topsoil) SAND with silt:** Dark grey/brown, fine to medium grained. Roots & root fibres.	M	L				
150 - 400	250	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	D-MD				
		Medium to coarse grained sub-angular to angular sand.						
400 - 1100	700	**Sandy CLAY:** Low to medium plasticity, Brown/orange. Fine to medium grained sand.	M	S-F				✓
1100 - 2300	1200	**Sandy CLAY:** Low to medium plasticity, Red mottled grey/brown. Fine to medium grained sand.	M	S-F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 4 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580829 6128337
Test Pit No.:	**TP4** Sample No. **17G291**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 550	350	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	D-VD				
		Cobbles up to 100mm. Fine to medium grained sand.						
550 - 900	350	**Sandy CLAY:** Low to medium plasticity, Light brown mottled red/orange.	M	S-F				
		Fine to medium grained sand.						
900 - 2300	1400	**Sandy CLAY:** Low to medium plasticity, Grey mottled red/brown. Fine to medium grained sand.	M	F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 5 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580977 6128666
Test Pit No.:	**TP5** Sample No. **17G292**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey/brown, fine to medium grained. Roots & root fibres.	M	L		1200mm below existing ground level		
200 - 500	300	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	MD				
		Fine to medium grained sand.						
500 - 1000	500	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	VD				
		Cobbles & Boulders up to 200mm. Fine to medium grained sand.						
1000 - 1200	200	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	F				
1200 - 2300	1100	**Sandy CLAY:** Low to medium plasticity, Red mottled grey. Fine to medium grained sand.	M	F				

Comments:

Water table measured 1200mm below existing ground level 3hrs 55mins after achieving full depth of test pit.

Water noted seeping into test pit at 500mm below surface level.

Pit Terminated at:	✓ or ×	(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water

Water first Encountered

Moisture

D - Dry M - Moist W - Wet

General

N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 6 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 581324 6128351
Test Pit No.:	**TP6** Sample No. **17G293**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m) Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey/brown, fine to medium grained. Roots & root fibres.	M	L		1700mm below existing ground level		
200 - 400	200	**SAND with silt:** Grey, fine to medium grained.	M	L				
400 - 700	300	**SAND with silt:** Light grey, fine to medium grained.	M	L				
700 - 1500	800	**Gravelly SAND with silt:** Brown, fine to medium grained.	M	MD				
		Fine to medium grained, sub-rounded to sub-angular gravel.						
1500 - 2300	800	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	MD				
		Fine to medium grained sand.						

Comments:

Water table measured 1700mm below existing ground level 1hr 55mins after achieving full depth of test pit.

Pit Terminated at:	✓ or ×	(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water

Water first Encountered

Moisture

D - Dry M - Moist W - Wet

General

N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 7 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 581693 6128729
Test Pit No.:	**TP7** Sample No. **17G294**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		900mm below existing ground level		
200 - 800	600	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	L-MD				
		Cobbles & boulders up to 200mm. Fine to medium grained sand.						
800 - 1200	400	**Sandy CLAY:** Low to medium plasticity, Brown/orange. Fine to medium grained sand.	M	S-F				
1200 - 2300	1100	**Sandy CLAY:** Low to medium plasticity, Red mottled grey. Fine to medium grained sand.	M	F				

Comments:

Water table measured 900mm below existing ground level 3hrs 55mins after achieving full depth of test pit.

Water noted seeping into test pit at 700mm below surface level.

Pit Terminated at:	✓ or ×	(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water

Water first Encountered

Moisture

D - Dry M - Moist W - Wet

General

N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS

Report No. **104/1** | Job No. **104** | Sheet 8 of 10

Client: Bio Diverse Solutions
Project: Proposed Light Industrial Area
Project No. n/a
Location: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA
Test Pit No.: **TP8** Sample No. **17G295**

Operator/Contractor: GSG
Equipment type: Kubota KX41-3V
Excavation Method : 300mm Auger
Position: 50 H 581720 6128505
Elevation:

Date Commenced: 29.08.2017
Date Completed: 29.08.2017

Logged By M.Coffey
Checked By: M.Coffey

Excavation Dimensions:
Depth 2.3 (m) Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 800	600	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	D-VD				
		Fine to medium grained sand.						
800 - 1000	200	**Sandy CLAY with gravel:** Low to medium plasticity**,** Light brown mottled red/orange.	M	F				
		Fine to medium grained sand. Fine to medium grained, angular to sub-angular gravel.						
1000 - 1900	900	**Sandy CLAY:** Low to medium plasticity, Red mottled light brown/orange.	M	F-VSt				
		Fine to medium grained sand. (VSt between depth 1700mm to 1900mm)						
1900 - 2300	400	**Sandy CLAY:** Low plasticity, orange mottled red/cream. Fine to medium grained sand.	M	S-F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength

Cohesive	Non-Cohesive
VS - Very Soft	VL - Very Loose
S - Soft	L - Loose
F - Firm	MD - Medium Dense
St - Stiff	D - Dense
VSt - Very Stiff	VD - Very Dense
H - Hard	CO - Compact

Rock
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Cementation
IN - Indurated
PC - Poorly Cemented
MC - moderately Cemented
WC - Well Cemented

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 9 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 582184 6128769
Test Pit No.:	**TP9** Sample No. **17G296**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 800	600	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	MD				
		Fine to medium grained sand.						
800 - 1100	300	**Sandy CLAY:** Low to medium plasticity**,** brown/orange. Fine to medium grained sand.	M	S-F				
1100 - 2300	1200	**Sandy CLAY:** Low to medium plasticity, Red mottled grey. Fine to medium grained sand.	M	F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 10 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 582184 6128441
Test Pit No.:	**TP10** Sample No. **17G297**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 400	200	**SAND with silt:** Grey/brown, fine to coarse grained sub-rounded to sub-angular.	M	L-MD				
		(Contains some cobbles up to 150mm)						
400 - 2300	1900	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	L				✓
		(Contains pockets of yellow/cream fine to medium grained sand).						

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

Appendix 2

Site Map & Test Pit Locations

The fieldwork was carried out on the 29th of August 2017 and comprised the following:
Ten test pits were excavated using a Kubota KX41-3V Mini Excavator with a 300mm wide Auger attachment to achieve depths of up to 2.3m to visually assess subsurface conditions and monitor any ground water present. Approximate Test Pit locations are shown on **Figure 2.**

Figure 1 - Site Location

Figure 2 - Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA 6330

Test Pit No. 1 Excavation

Test Pit No. 1 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP1**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 2 Excavation

Test Pit No. 2 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP2**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 3 Excavation

Test Pit No. 3 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP3**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 4 Excavation

Test Pit No. 4 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP4**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 5 Excavation

Test Pit No. 5 Spoil

Test Pit No. 6 Excavation

Test Pit No. 6 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP6**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 7 Excavation

Test Pit No. 7 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP7**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 8 Excavation

Test Pit No. 8 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP8**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 9 Excavation

Test Pit No. 9 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP9**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 10 Excavation

Test Pit No. 10 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP10**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Appendix 3

Test Results

GREAT SOUTHERN GEOTECHNICS

5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgeotechnics.com

Dry Density / Moisture Content Relationship Test Report — Sheet 1 of 1

Report No. 104/1 **Job No.** 104

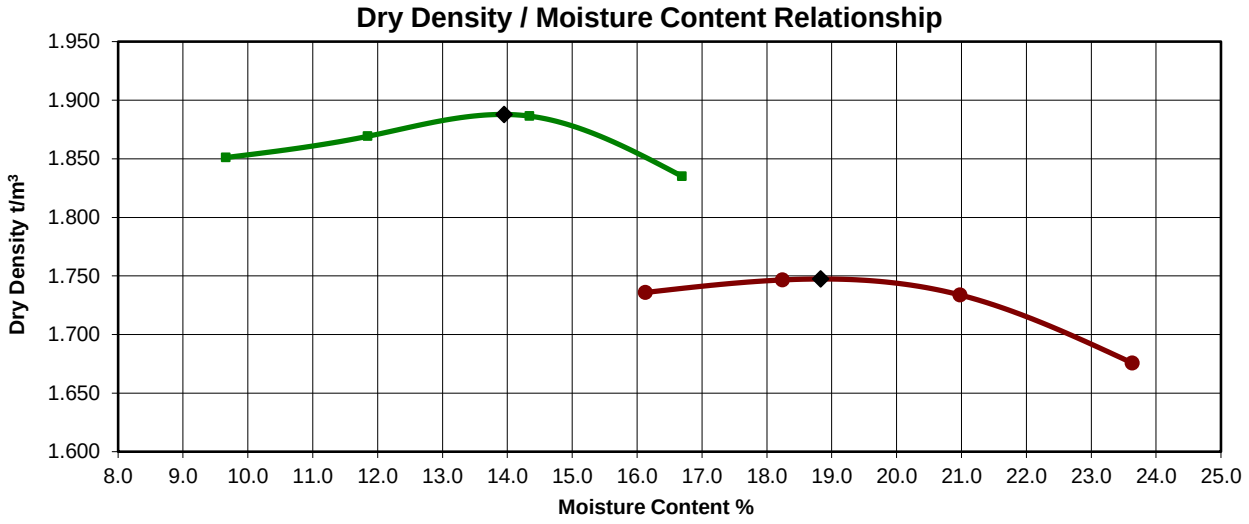
Client: Bio Diverse Solutions

Project: Proposed Light Industrial Area

Road: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA 6330

Section N/A

Sample No.	Sample Location	Field Description
17G298	Test Pit 3	Sandy CLAY
17G299	Test Pit 10	Sandy CLAY



Sample Number		17G298	17G299	
Depth		400mm - 1100mm	400mm to 2300mm	
Stabiliser Used				
Stabiliser Added %				
Curing Period	Water (Days)	Field	Field	
	Stabiliser (Hrs)			
Moisture Content Method used		AS 1289.2.1.1	AS 1289.2.1.1	
Sampling Method		AS 1289.1.2.1 Proc 6.5	AS 1289.1.2.1 Proc 6.5	
Date Sampled		29.08.2017	29.08.2017	
Date Received		29.08.2017	29.08.2017	
Date Tested		02.09.2017	02.09.2017	
Test Method		AS 1289.5.2.1	AS 1289.5.2.1	
Maximum Dry Density t/m^3		**1.75**	**1.89**	
Optimum Moisture Content %		**19.0**	**14.0**	
Adjusted Maximum Dry Density t/m3				
Adjusted Optimum Moisture Content %				
Percentage Retained %	37.5 mm	**0**	**0**	
Percentage Retained %	19.0 mm	**0**	**0**	

NATA WORLD RECOGNISED ACCREDITATION

Comments: N/a

Distribution: Laboratory File / Kathryn Kinnear

Approved Signatory:

Name: M.Coffey

Function: Laboratory Manager

Date: 17.09.2017

LIQUIDLABSWA
CONSTRUCTION MATERIALS TESTING LABORATORY
UNIT 4, 96 BRIGG ST, WELSHPOOL, WA 6106 LIQUIDLABSWA.COM.AU

Falling Head Permeability Report		**Test Method: AS 1289.6.7.2**	
Client:	Bio Diverse Solutions	**Ticket No:**	S812
Project:	Lot 10 Chester Pass Rd & Lot 521 Mercer Road	**Report No:**	LLS17/2133 _2
Location:	Milpara, WA 6339	**Sample No:**	LLS17/2133
Sample ID:	TP3 400-1100mm (17G298)	**Issue Date:**	14-September-2017

Sampling Procedure: Tested as Received

Laboratory Moisture Ratio (%)	100.5
Laboratory Density Ratio (%)	95.0
Compactive Effort	Modified
Surcharge (kPa)	3
% Retained on 19mm Sieve	0
Coefficient of Permeability (m / sec)	$4.1 \times 10^{(-8)}$

Client Address: 5a 209 Chester Pass Road, Albany WA 6330

Comments: MMDD and OMC Values supplied by Great Southern Geotechnics

NATA WORLD RECOGNISED ACCREDITATION

Accredited for Compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872

Approved Signature:
Name: Matt van Herk
Function: Laboratory Manager
Date: 14-September-2017

LIQUIDLABSWA
CONSTRUCTION MATERIALS TESTING LABORATORY
UNIT 4, 96 BRIGG ST, WELSHPOOL, WA 6106 LIQUIDLABSWA.COM.AU

Falling Head Permeability Report		**Test Method: AS 1289.6.7.2**	
Client:	Bio Diverse Solutions	**Ticket No:**	S812
Project:	Lot 10 Chester Pass Rd & Lot 521 Mercer Road	**Report No:**	LLS17/2134 _2
Location:	Milpara, WA 6339	**Sample No:**	LLS17/2134
Sample ID:	TP10 400-2300mm (17G299)	**Issue Date:**	14-September-2017

Sampling Procedure: Tested as Received

Laboratory Moisture Ratio (%)	98.5
Laboratory Density Ratio (%)	95.0
Compactive Effort	Modified
Surcharge (kPa)	3
% Retained on 19mm Sieve	0
Coefficient of Permeability (m / sec)	$1.8 \times 10^{(-8)}$

Client Address: 5a 209 Chester Pass Road, Albany WA 6330

Comments: MMDD and OMC Values supplied by Great Southern Geotechnics

NATA WORLD RECOGNISED ACCREDITATION

Accredited for Compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872

Approved Signature:
Name: Matt van Herk
Function: Laboratory Manager
Date: 14-September-2017

Appendix C

Phosphorous Retention Index Test Results (CSBP Laboratory, 2017)

Customer Bio Diverse Solutions

Job Chiquita Burgers

Date Rec'd 1/09/2017

Lab Number	Name	Code	Customer	Depth	Phosphorus Retention Index
2ZS17085	Test Pit 3	01/09/17	Bio Diverse Solutions	40-110	2387.4
2ZS17086	Test Pit 6	01/09/17	Bio Diverse Solutions	20-70	0.8
2ZS17087	Test Pit 10	01/09/17	Bio Diverse Solutions	40-230	608.0
2ZS17088	Test Pit 1	01/09/17	Bio Diverse Solutions	20-90	2414.5

Appendix D

BAL Contour Plan (Bio Diverse Solutions, 2017)

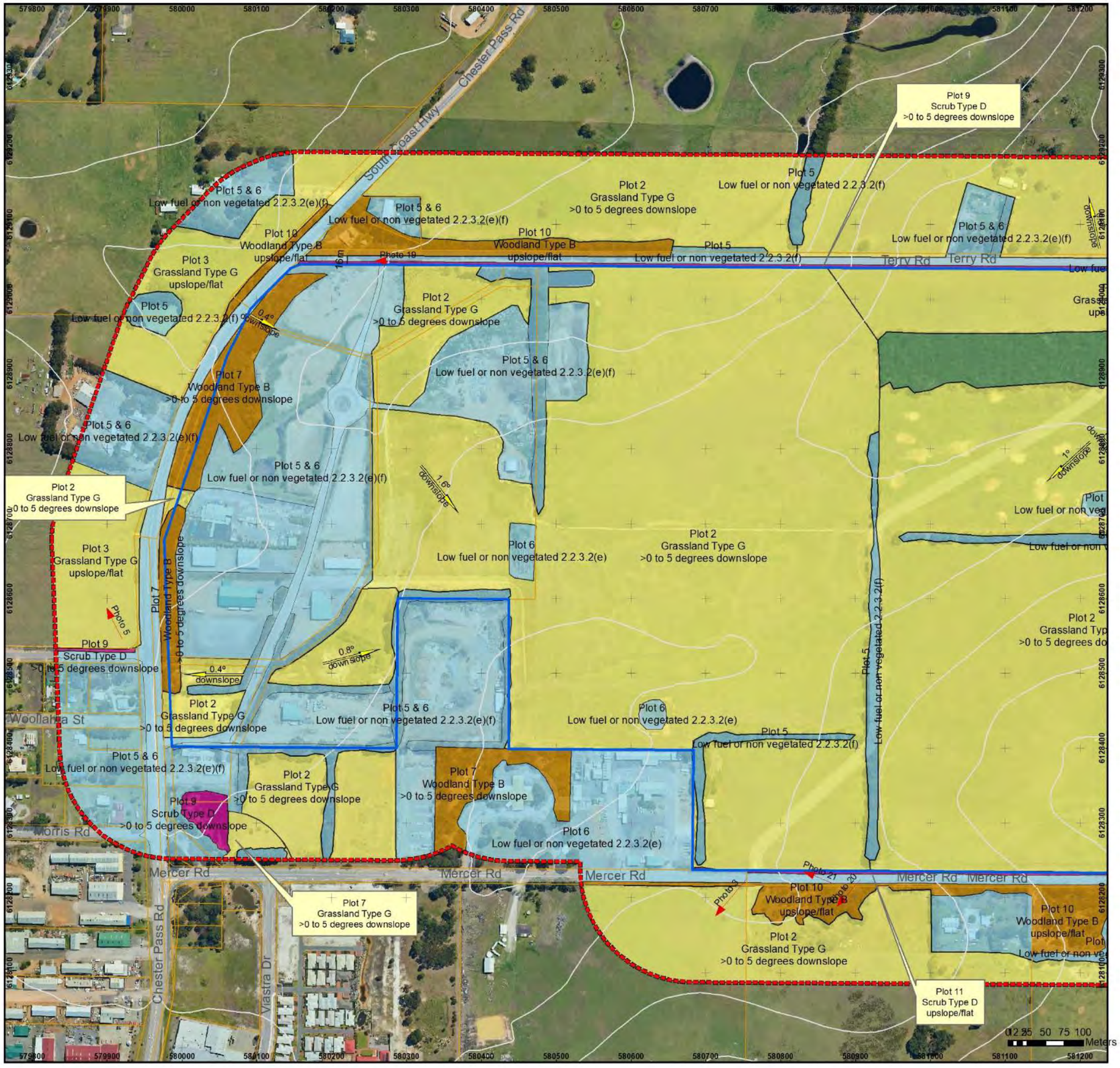
AS 3959 Bushfire Attack Level (BAL) Contour Plan Report

Site Details			
Address:	Lot 10 Chester Pass Road and Lot 521 Mercer Road		
Suburb:	Walmsley	**State:**	W.A.
Local Government Area:	City of Albany		
Description of Building Works:	N/A		
Stage of WAPC Planning	Structure Plan		

BAL Contour Plan Details			
Report / Job Number:	EPP 004	**Report Version:**	Final
Assessment Date:	29/8/2017	**Report Date:**	25/10/2017
Practitioner	Kathryn Kinnear	**Accreditation No.**	BPAD 30794

BIO DIVERSE SOLUTIONS

BPAD Bushfire Planning & Design Accredited Practitioner Level 2



This BAL Plan was prepared by:
Kathryn Kinnear, Bio Diverse Solutions
Accreditation No: BPAD30794
Jurisdiction: Level 2 - WA

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

BIO DIVERSE SOLUTIONS

29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575

Overview Map Scale 1:100,000

Legend

- Subject Site
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Slope Degrees
- Separation Distance
- Photo ID

Site Vegetation

- Forest Type A
- Grassland Type G
- Low fuel or non vegetated 2.2.3.2
- Scrub Type D
- Woodland Type B

Scale
1:5,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Edge Planning & Property
Steve Thompson
Lot 10 Chesterpass Road
Ardess Warrenup, WA 6330

Figure 1.1. Vegetation Classes

BAL Assessor	QA Check	Drawn by
KK	KK	SA
STATUS	**FILE**	**DATE**
FINAL	EPP004	28/09/2017

Overview Map Scale 1:100,000

Legend

- Subject Site
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Slope Degrees
- Separation Distance
- Photo ID

Site Vegetation

- Forest Type A
- Grassland Type G
- Low fuel or non vegetated 2.2.3.2
- Scrub Type D
- Woodland Type B

Scale
1:5,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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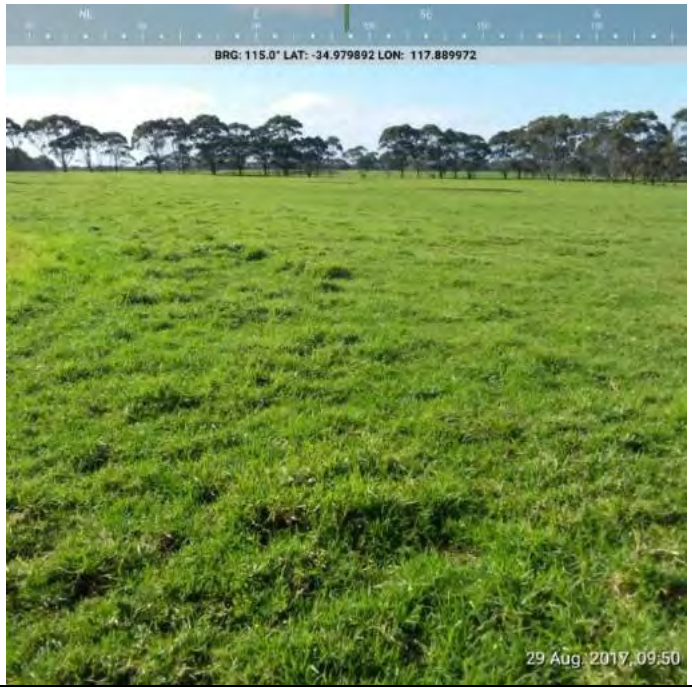
Lot 10 Chesterpass Road & Lot 521 Mercer Road
Ardess Warrenup, WA 6330

Figure 1.2. Vegetation Classes

BAL Assessor	QA Check	Drawn by
KK	KK	SA
STATUS	**FILE**	**DATE**
FINAL	EPP004	28/09/2017

SECTION 1 - Vegetation Classification

All vegetation within 150m of the site / proposed development was classified in accordance with Clause 2.2.3 of AS 3959-2009. Each distinguishable vegetation plot with the potential to determine the Bushfire Attack Level is identified below.

Plot	**1**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** internal to the site in proposed POS in the north east of the structure Plan. **Separation distance:** 0m. **Dominant species & description:** Jarrah, Marri, *Casuarina, Leucopogon, Acacia* and grasses. Presents in some areas as low amount of multilayering (borderline Woodland Type B), however once grazing ceases could re-grow to Forest Type A. **Average vegetation height:** 8m. **Vegetation Coverage:** >30-70%. **Available fuel loading:** 25-35t/ha. **Effective slope:** Flat.
Photo Id 1: View of Forest Type A internal to the site. View from south to north.			
Plot	**2**	**Classification or Exclusion Clause**	**Grassland Type G**
			**Location:** Internal to the site in grazed paddocks. Southern areas, north east and western paddocks. **Separation distance:** 0m. **Dominant species & description:** Kikuyu, ryegrasses, clovers and Capeweed. **Average vegetation height:** 120mm. **Vegetation Coverage:** <10% trees. **Available fuel loading:** 4.5t/ha. **Effective slope:** Downslope >0-5 degrees.
Photo Id 2: View to the east of internal Grasslands Type G. Grazed by cattle.			

Plot	2	Classification or Exclusion Clause	Grassland Type G
			**Location:** Located to the north and south of the subject site (north of Terry Road) and south of Mercer Road in grazed paddocks. **Separation distance:** 0m (north east boundary) and between 15-20m (established road reserves separation). **Dominant species & description:** Kikuyu, ryegrasses, clovers and capeweed. **Average vegetation height:** 120mm. **Vegetation Coverage:** <10% trees. **Available fuel loading:** 4.5t/ha. **Effective slope:** Downslope >0-5 degrees.

Photo Id 3: View to the south west (south of Mercer Road) of grasslands Type G. Grazed by cattle.

Plot	3	Classification or Exclusion Clause	Grassland Type G
			**Location:** Located in the north of the subject site in grazed paddocks. **Separation distance:** 0m. **Dominant species & description:** Kikuyu, ryegrasses, clovers and Capeweed. **Average vegetation height:** 120mm. **Vegetation Coverage:** 120mm. **Available fuel loading**: 4.5t/ha. **Effective slope:** Flat to upslope.

Photo Id 4: View internal of the subject site to the north of grazed paddocks.

Plot	3	Classification or Exclusion Clause	Grassland Type G
			**Location:** Located adjacent to the subject site to the west in adjacent grazed paddocks **Separation distance:** 20m (Chester Pass Road Reserve). **Dominant species & description:** Kikuyu, ryegrasses, clovers and Capeweed. **Average vegetation height:** 120mm. **Vegetation Coverage:** 120mm. **Available fuel loading**: 4.5t/ha. **Effective slope:** Flat to upslope.

Photo Id 5: View of adjacent paddocks to the west of Chester Pass Road, view to the north, northwest.

Plot	4	Classification or Exclusion Clause	Forest Type A
			**Location:** To the east of the subject site in City of Albany Reserve. **Separation distance:** 4-6m (firebreak, traversable) **Dominant species & description:** Jarrah, *Acacia, Melaleuca, Banksia*, Tea Tree, sedges and grasstrees. Multilayered vegetation structure. **Average vegetation height:** 6-10m. **Vegetation Coverage:** >30-70%. **Available fuel loading:** 12 35t/ha. **Effective slope:** Downslope >0-5 degrees.

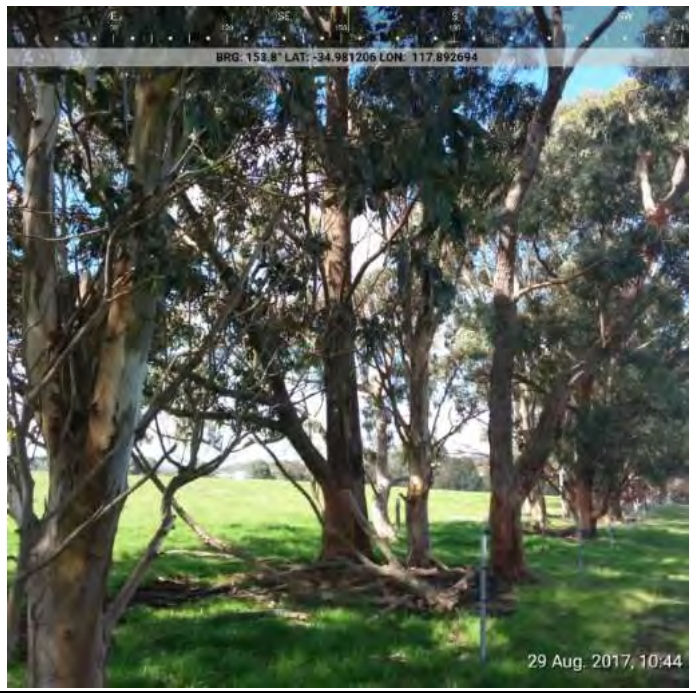
Photo Id 6: View to east-south east of Forest Type A in adjacent City of Albany Reserve.

Plot	4	Classification or Exclusion Clause	Forest Type A
			**Location:** To the south east in adjacent private property, south of Mercer Road. **Separation distance:** 20m (<Mercer Road reserve). **Dominant species & description:** Jarrah, *Acacia, Melaleuca, Banksia*, Tea Tree, sedges and grasstrees. Multilayered vegetation structure. **Average vegetation height:** 6-10m. **Vegetation Coverage:** >30-70%. **Available fuel loading:** 12 35t/ha. **Effective slope:** Downslope >0-5 degrees.

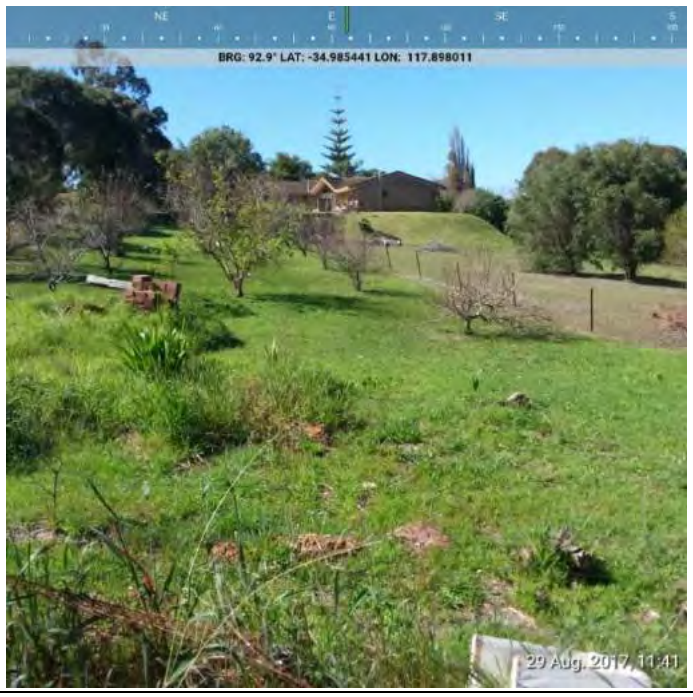
Photo Id 7: View to east-south east of Forest Type A in adjacent property south of Mercer Road.

Plot	4	Classification or Exclusion Clause	Forest Type A
			**Location:** To the south in adjacent private property, south of Mercer Road and Mercer Road reserve. **Separation distance:** 15-20m (<Mercer Road reserve). **Dominant species & description:** Jarrah, *Acacia, Melaleuca, Banksia,* Tea Tree, sedges and grasstrees. Multilayered vegetation structure. **Average vegetation height:** 6-10m. **Vegetation Coverage:** >30-70%. **Available fuel loading:** 12 35t/ha. **Effective slope:** Downslope >0-5 degrees.

Photo Id 8: View to south west of Forest Type A in road reserve and in private property south of Mercer Road.

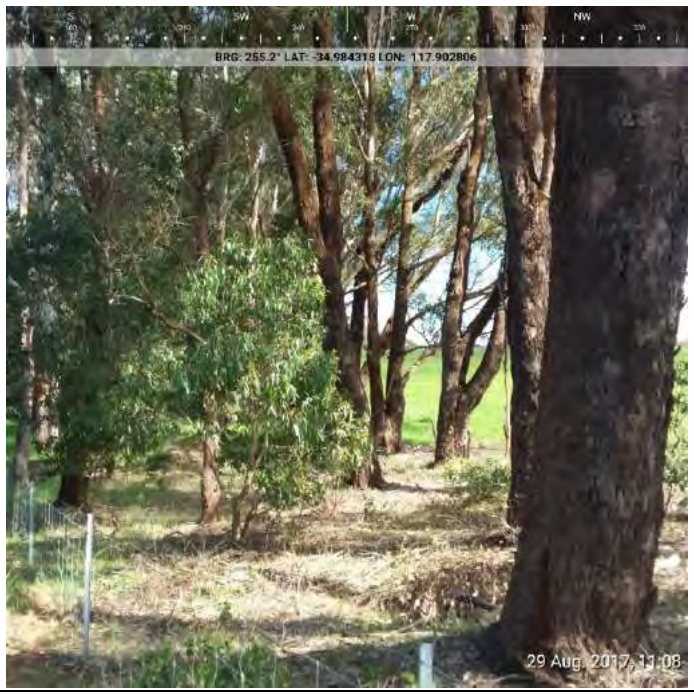
Plot	5	Classification or Exclusion Clause	Exclusion 2.2.3.2 (f)
			**Location:** Lawns, managed gardens, windbreaks and other low-threat vegetation. As per exclusion clause 2.2.3.2 (f) of AS3959-2009. Located internal and external to the site. **Separation distance:** NA. **Dominant species & description:** Mixed Eucalypts planted windbreaks. Single rows. **Average vegetation height:** 16m. **Vegetation Coverage:** NA. **Available fuel loading:** <2t/ha. **Effective slope:** NA.
Photo Id 9: View to south east of planted windbreak internal (south) central of the site.			

Plot	5	Classification or Exclusion Clause	Exclusion 2.2.3.2 (f)
			**Location:** Lawns, managed gardens, windbreaks and other low-threat vegetation. As per exclusion clause 2.2.3.2 (f) of AS3959-2009. Located internal and external to the site. **Separation distance:** NA. **Dominant species & description:** Mixed Eucalypts planted windbreaks. Single rows. **Average vegetation height:** 16m. **Vegetation Coverage:** NA. **Available fuel loading:** <2t/ha. **Effective slope:** NA.
Photo Id 10: View to east of planted windbreak to the north of the site (external).			

Plot	5	Classification or Exclusion Clause	Exclusion 2.2.3.2 (f)
			**Location:** Lawns and managed gardens associated with APZ areas, windbreaks and other low-threat vegetation. As per exclusion clause 2.2.3.2 (f) of AS3959-2009. Located internal and external to the site. **Separation distance:** NA. **Dominant species & description:** Mixed Eucalypts planted windbreaks. Single rows. **Average vegetation height:** 16m. **Vegetation Coverage:** NA. **Available fuel loading:** <2t/ha. **Effective slope:** NA.
Photo Id 11: View to the east of low fuel orchard and mowed managed lawns (background).			
Plot	**6**	**Classification or Exclusion Clause**	**Exclusion 2.2.3.2 (e)**
			**Location:** Roads, driveways, buildings, mineral earth, dams and other non-vegetated areas. As per AS3959-2009 exclusion clause 2.2.3.2 (e). **Separation distance:** NA. **Dominant species & description:** NA. **Average vegetation height:** NA. **Vegetation Coverage:** NA. **Available fuel loading:** NA. **Effective slope:** NA.
Photo Id 12: View of dam internal to the site (south central). View from north to south.			

Plot	6	Classification or Exclusion Clause	Exclusion 2.2.3.2 (e)
			**Location:** Roads, driveways, buildings, mineral earth, dams and other non-vegetated areas. As per AS3959-2009 exclusion clause 2.2.3.2 (e). **Separation distance:** NA. **Dominant species & description:** NA. **Average vegetation height:** NA. **Vegetation Coverage:** NA. **Available fuel loading:** NA. **Effective slope:** NA.
Photo Id 13: View of Talybenup Road (South of Mercer Road). View from north to south.			

Plot	6	Classification or Exclusion Clause	Exclusion 2.2.3.2 (e)
			**Location:** Roads, driveways, buildings, mineral earth, dams and other non-vegetated areas. As per AS3959 exclusion clause 2.2.3.2 (e). **Separation distance:** NA. **Dominant species & description:** NA. **Average vegetation height:** NA. **Vegetation Coverage:** NA. **Available fuel loading:** NA. **Effective slope:** NA.
Photo Id 14: View of building located south along Mercer Road. View from north east to south west.			

Plot	7	Classification or Exclusion Clause	Woodland Type B
			**Location:** Located internal to the site in the south east. **Separation distance:**0m **Dominant species & description:** Mixed planted eucalypts in south east area of site (internal). **Average vegetation height:** 18m. **Vegetation Coverage:** 10-30%. **Available fuel loading:** 15-25% **Effective slope:** Downslope >0-5 degrees.
Photo Id 15: View of planted eucalypt trees south east of the subject site.			

Plot	7	Classification or Exclusion Clause	Woodland Type B
			**Location:** Located external to the site (north) in adjacent private properties. **Separation distance:** 33.5m. **Dominant species & description:** Jarrah and Marri open woodland, not multilayered. **Average vegetation height:** 18m. **Vegetation Coverage:** 10-30%. **Available fuel loading:** 15-25% **Effective slope:** Downslope >0-5 degrees.
Photo Id 16: View of to the north from Terry Road to plot of Woodland in paddocks to the north.			

Plot	8	Classification or Exclusion Clause	Forest Type A
			**Location:** to the east in CoA managed reserve. **Separation distance:** 4-6m along trafficable firebreak. **Dominant species & description:** Jarrah, *Acacia, Melaleuca, Banksia*, Tea Tree, sedges and Grasstrees. **Average vegetation height:** 8m. **Vegetation Coverage:** >30-70%. **Available fuel loading:** 25-35t/ha. **Effective slope:** Upslope.

Photo Id 17: View of Forest Type A to the east in CoA Managed Reserve.

Plot	9	Classification or Exclusion Clause	Scrub Type D
			**Location:** Along public road reserves under western powerlines where vegetation is trimmed to 3-4m. **Separation distance:** 0-15m depending on road reserve and side of road. **Dominant species & description:** *Casuarina*, Teatree, trimmed Eucalypts and Peppermints. Note: Vegetation trimmed under powerline. **Average vegetation height:** 3m. **Vegetation Coverage:** >30%. **Available fuel loading:** 25t/ha. **Effective slope:** Downslope >0-5 degrees.

Photo Id 18: View along northern edge of Mercer Road Reserve. Trimmed vegetation under powerline.

Plot	9	Classification or Exclusion Clause	Scrub Type D
			**Location:** Along public road reserves under western powerlines where vegetation is trimmed to 3-4m. **Separation distance:** 0-15m depending on road reserve and side of road. **Dominant species & description:** *Casuarina*, Teatree, trimmed Eucalypts and Peppermints. Note: Vegetation trimmed under powerline. **Average vegetation height:** 3m. **Vegetation Coverage:** >30%. **Available fuel loading:** 25t/ha. **Effective slope:** Downslope >0-5 degrees.
Photo Id 19: View along northern edge of Terry Road Reserve. Trimmed vegetation under powerline (note tall trees in background associated with different plot).			
Plot	**10**	**Classification or Exclusion Clause**	**Woodland Type B**
			**Location:** Located in private properties to the south and north west of the subject site. **Separation distance:** 20m. **Dominant species & description:** Jarrah, Marri, Peppermints and *Casuarina* low open Woodlands, fuel reduced through grazing. Not multilayered. **Average vegetation height:** 10m. **Vegetation Coverage:** 10-30%. **Available fuel loading:** 15-25t/ha. **Effective slope:** Upslope.
Photo Id 20: View of to the south west off Mercer road into adjacent property to the south. Eucalypt trees grazed by stock.			

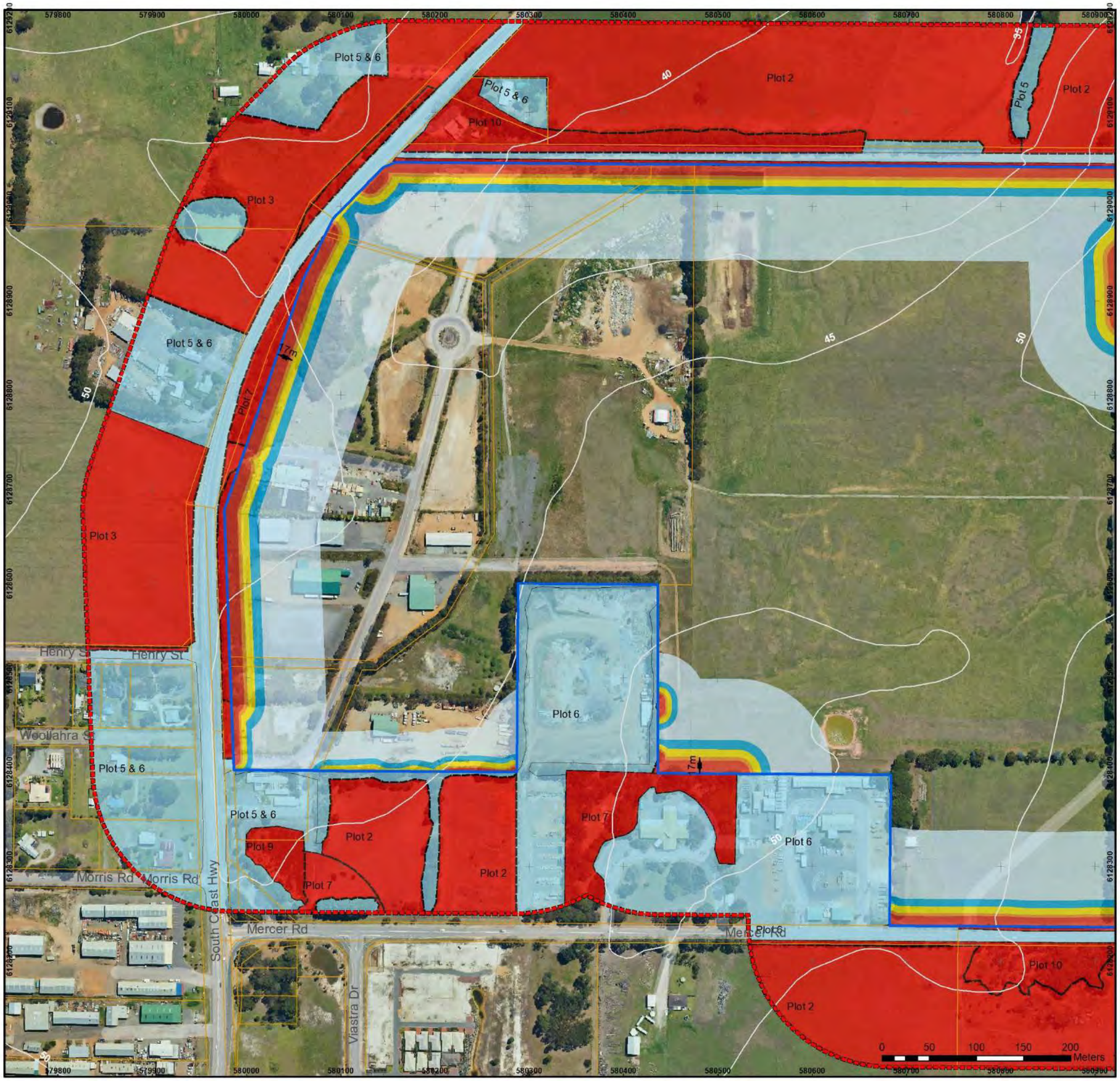
Plot	11	Classification or Exclusion Clause	Scrub Type D
			**Location:** Along public road reserves under western powerlines where vegetation is trimmed to 3-4m. **Separation distance:** 0m. **Dominant species & description:** *Casuarina* trimmed under the powerline, not exceeding 3m. Note: Vegetation trimmed under powerline **Average vegetation height:** 3m. **Vegetation Coverage:** >30%. **Available fuel loading:** 25t/ha. **Effective slope:** Upslope.
Photo Id 21: View of trimmed casuarina trees along Mercer Road.			

COMMENTS ON VEGETATION CALCULATIONS:

- Distances from vegetation were made based on surface fuels to edge of lot (subject site) boundary;
- Effective slopes were measured in the field using a Nikon Forestry Pro and represented on the respective plots;
- Method 1 (AS3959-2009) Simplified procedure was used for vegetation classification and BAL Assessment process;
- All vegetation was classified within the subject site and within 150m of the lot boundaries to AS3959 Table 2.3; and
- The perimeter of the vegetation was measured using field GPS and notations on field GIS maps.

COMMENTS ON BAL CALCUALTIONS

- Method 1 (AS3959-2009) Simplified procedure was used for the BAL Assessment process;
- The BAL Contour Plan was prepared by an Accredited Level 2 Bushfire Planning Practitioner (BPAD30794); and
- The BAL Contour Map has been prepared in accordance with Department of Planning (WAPC) Guidelines for Planning in Bushfire Prone areas Vers 1.2 August 2017
- Assessment based on draft Local Structure Plan as supplied by Edge Planning & Property dated 23/10/2017.
- Subject site is located in a Bushfire Prone Area, See Appendix 2 (Slip, 2016 & 2017).
- APZ areas will be maintained in a Low Fuel state as per AS3959-2009 Exc Clause 2.2.3.2 (f). Grasses <100mm in height and forest areas fuel reduced to <2T/ha. Refer to Appendix 3.
- Buildings are to be placed in BAL 12.5, BAL 19 and BAL 29 zones.



This BAL Plan was prepared by:
Kathryn Kinnear, Bio Diverse Solutions
Accreditation No: BPAD30794
Jurisdiction: Level 2 - WA

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

BIO DIVERSE SOLUTIONS

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Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575

Overview Map Scale 1:100,000

Legend

- Subject Site
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- BAL29 Separation Distance

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

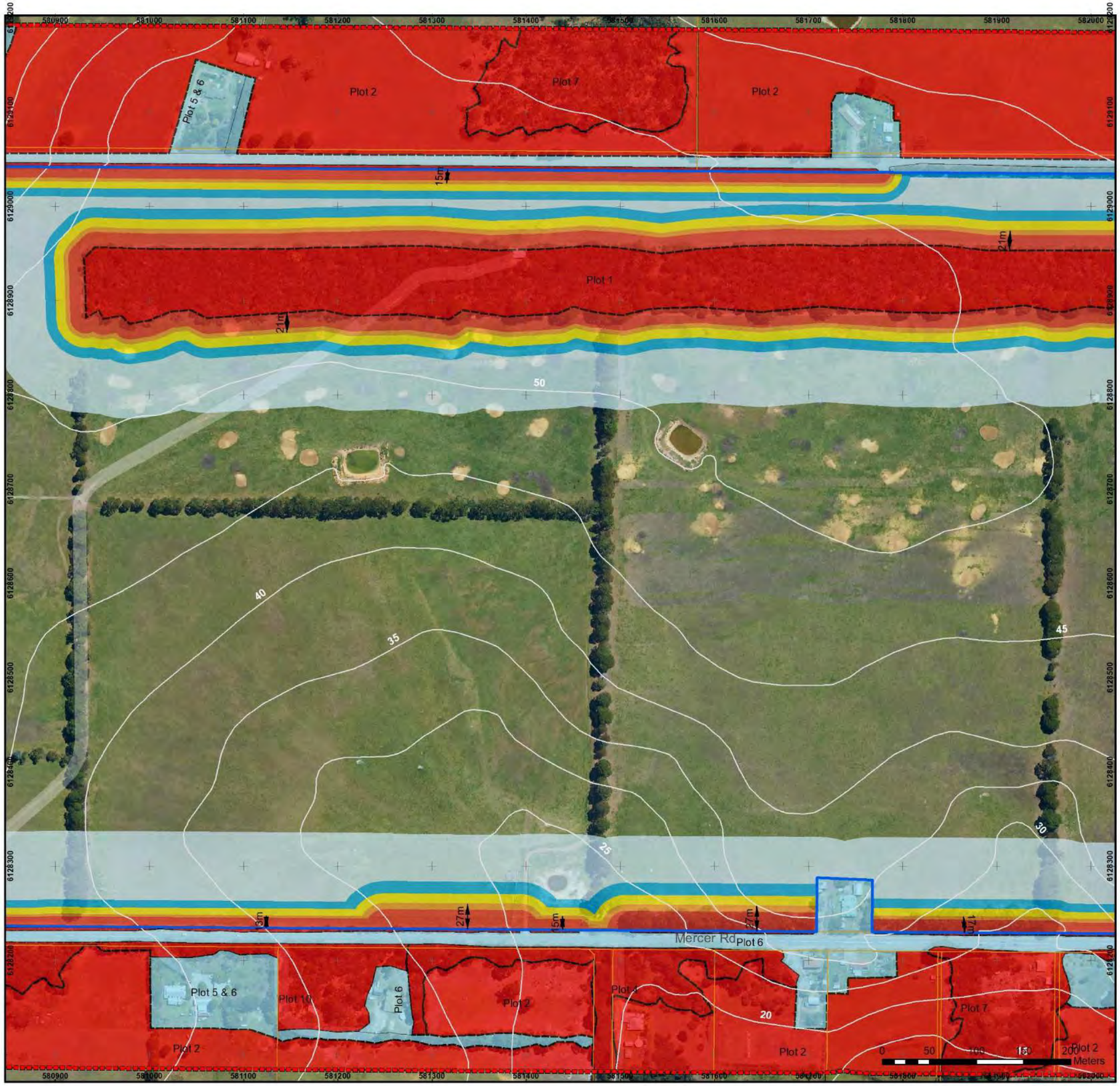
Scale
1:4,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT Edge Planning & Property
Steve Thompson
Lot 10 Chesterpass Road & Lot 521 Mercer Road
Ardess Warrenup, WA 6330

Figure 2.1. BAL Contour Plan

BAL Assessor	*QA Check*	*Drawn by*
KK	**KK**	**SA**
STATUS	*FILE*	*DATE*
FINAL	**EPP004**	**28/09/2017**



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Overview Map Scale 1:100,000

Legend

- Subject Site
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- BAL29 Separation Distance

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

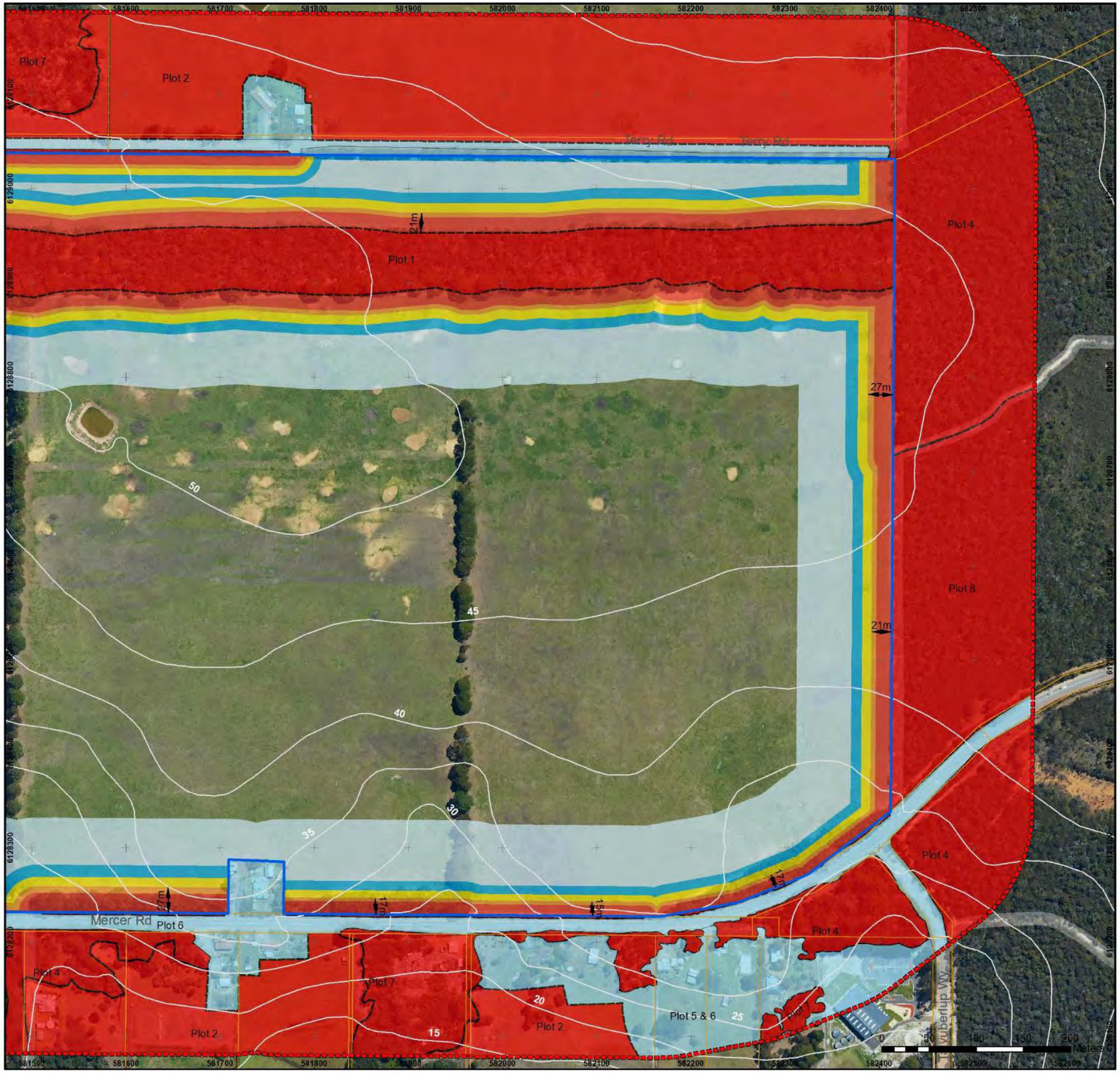
Scale
1:4,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Edge Planning & Property
Steve Thompson
Lot 10 Chesterpass Road & Lot 521 Mercer Road
Ardess Warrenup, WA 6330

Figure 2.2. BAL Contour Plan

BAL Assessor	*QA Check*	*Drawn by*
KK	**KK**	**SA**
STATUS	*FILE*	*DATE*
FINAL	**EPP004**	**28/09/2017**



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Accreditation No: BPAD30794
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BPAD Bushfire Planning & Design Accredited Practitioner Level 2

BIO DIVERSE SOLUTIONS

29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575

Overview Map Scale 1:100,000

Legend

- Subject Site
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- BAL29 Separation Distance

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

Scale
1:4,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Edge Planning & Property
Steve Thompson
Lot 10 Chesterpass Road & Lot 521 Mercer Road
Ardess Warrenup, WA 6330

Figure 2.3. BAL Contour Plan

BAL Assessor	*QA Check*	*Drawn by*
KK	**KK**	**SA**
STATUS	*FILE*	*DATE*
FINAL	**EPP004**	**28/09/2017**

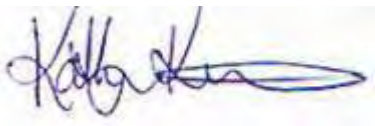
SECTION 3: DISCLAIMER

The recommendations and measures contained in this assessment report are based on the requirements of the Australian Standards 3959-2009 – Building in Bushfire Prone Areas, WAPC State Planning Policy 3.7 (WAPC, 2015), WAPC Guidelines for Planning in Bushfire Prone Areas (WAPC, 2015), and CSIRO's research into Bushfire behaviour. These are considered the minimum standards required to balance the protection of the proposed dwelling and occupants with the aesthetic and environmental conditions required by local, state and federal government authorities. They DO NOT guarantee that a building will not be destroyed or damaged by a bushfire. All surveys and forecasts, projections and recommendations made in this assessment report and associated with this proposed dwelling are made in good faith on the basis of the information available to the fire protection consultant at the time of assessment. The achievement of the level of implementation of fire precautions will depend amongst other things on actions of the landowner or occupiers of the land, over which the fire protection consultant has no control. Notwithstanding anything contained within, the fire consultant/s or local government authority will not, except as the law may require, be liable for any loss or other consequences (whether or not due to negligence of the fire consultant/s and the local government authority, their servants or agents) arising out of the services rendered by the fire consultant/s or local government authority.

AS3959-2009 disclaimer: It should be borne in mind that the measures contained within this Standard (AS3959-2009) cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behavior of fire and extreme weather condition.
(AS3959, 2009)
Building to AS39590-2009 is a standard primarily concerned with improving the ability of buildings in designated bushfire prone areas to better withstand attack from bushfire thus giving a measure of protection to the building occupants (until the fire front passes) as well as to the building itself.

SECTION 5: Certification

I hereby certify that I have undertaken the assessment of the above site and determined the Bushfire Attack Level stated above in accordance with the requirements of AS 3959-2009 (Incorporating Amendment Nos 1, 2 and 3) and the Guidelines for Planning in Bushfire Prone Areas Ver 1.2 (WAPC, 2017).

SIGNED, ASSESSOR:  ..... DATE: 28/9/2017

Kathryn Kinnear, Bio Diverse Solutions
Accredited Level 1 BAL Assessor
Accredited Level 2 Bushfire Practitioner (Accreditation No: BPAD30794)

BIO DIVERSE SOLUTIONS

BPAD Bushfire Planning & Design Accredited Practitioner Level 1

References

Western Australian Planning Commission (WAPC) (2015) Guidelines for Planning in Bushfire Prone Areas. Western Australian Planning Commission and Department of Planning WA, Government of Western Australia.

Western Australian Planning Commission (WAPC) (2017) State Planning Policy 3.2 Planning in Bushfire Prone Areas Vers 1.2. Department of Planning WA and Western Australian Planning Commission.

State Land Information Portal (SLIP) (2016, 2017) map of Bushfire Prone Areas. Office of Bushfire Risk management (OBRM) data retrieved from: https://maps.slip.wa.gov.au/landgate/bushfireprone/

APPENDIX 10

PRINTED : Fri Oct 13 16:31:13 2000

Checked : PH

Drawn : AH

Date : 13/10/2000

File Ref: 99176/2000_115_F4A

Oyster Harbour

King George Sound

Princess Royal Harbour

Middleton Beach

ALBANY TOWNSITE

CUTHBERT TOWNSITE

Kalgan River Circuit Trail

Proposed King River Trail

Proposed Yakamia Creek Trail

Proposed Mt. Melville Circuit Trail

Proposed Middleton Beach Dual Use Path Extension

Frenchman Bay Dual Use Path

ALBANY HIGHWAY

CHESTER PASS ROAD

MERCER ROAD

MERCER ROAD EXTENSION

PROPOSED RING ROAD

SOUTH COAST HIGHWAY

LOWER DENMARK ROAD

FIVE MILE CREEK

SEVEN MILE CREEK

Wilkyung Creek

YAKAMIA CREEK

NANARUP ROAD

GULL ROCK ROAD

LOWER KING ROAD

MIDDLETON ROAD

COLLINGWOOD ROAD

PRINCESS ROYAL DRIVE

HANRAHAN ROAD

LEGEND

GREENWAYS

CONSERVATION

- Ecological Corridor (Vegetated)

UTILITARIAN

- Existing or Potential Corridor requiring Revegetation/ Landscaping

RECREATION

- Existing Trail
- Proposed Trail
- Remnant Vegetation
- Reserve
- Wetland
- Waterway
- Prominent Ridge Line
- Cadastral Boundary

Note: Where Greenways go through a reserve the entire reserve functions as a Greenway.
Source : City of Albany, 2000; DOLA, 2000

1 0 1
Kilometres
Scale 1 : 60,000

ATA Environmental
environmental scientists

ALBANY GREENWAYS

GREENWAYS IN ALBANY TOWNSITE

FIGURE 3A

APPENDIX 11

Local Water Management Strategy
Supporting the Ardess-Walmsley Local Structure Plan

Prepared by Edge Planning & Property for Ardess 1607 Pty Ltd and Ten Year Developments Pty Ltd

www.edgeplanning.com.au

January 2018

Executive Summary

This Local Water Management Strategy (LWMS) has been prepared to support the *Ardess-Walmsley Local Structure Plan* and the associated Scheme Amendment No. 26 to the *City of Albany Local Planning Scheme No. 1* (LPS1). The Structure Plan provides a planning framework to Lot 10 Chester Pass Road, Walmsley and Lot 521 Mercer Road, Walmsley (the 'site') to facilitate proposed residential, light industrial, education/community and public open space (POS) uses. Amendment 26 proposes a planning rule change to permit transport depots in the Ardess Industrial Estate (Lot 10 Chester Pass Road). The Structure Plan site is shown in Attachment 1.

This LWMS is intended to:

- inform the planning and design process;
- provide an overview of water resources on the site; and
- present a recommended approach for total water cycle management with an emphasis placed on water sensitive urban design (WSUD) which is appropriate for the site's context, the site's characteristics, risk, available and expected servicing and the downstream environment.

The development is considered a low risk to water resources given the site's location, environmental characteristics, proposed servicing and the approach to development. The LWMS concludes that the site is capable of supporting residential and light industry subdivision/development and is able to achieve appropriate water management outcomes. An Urban Water Management Plan (UWMP) is required to support residential subdivision, however not UWMP is required to support light industrial subdivision. There will however be a requirement for engineering drawings and specifications to be submitted for the light industrial subdivision and approved by the City which are generally consistent with the LWMS which adopt WSUD.

Key strategies and initiatives proposed for the subdivision/development are summarised below:

Water sustainability initiatives

- Provision of awareness raising material on water saving measures and benefits for new residents and business occupants including Waterwise and nutrient wise gardens.
- Conservation of potable water through utilising water-efficient fixtures and fittings and encouraging water wise practices by households.
- Encouraging all new dwellings, larger outbuildings and light industrial operations to be provided with a rainwater tank.
- Promoting greywater for non-edible garden irrigation.
- Connecting all lots to the reticulated water supply.
- Capturing stormwater and reusing it to irrigate POS.

Stormwater management

Managing stormwater for the site includes both structural and non-structural measures. These include:

- adopting WSUD which maintain the existing water balance, promotes retention, at source infiltration and treatment of stormwater before it is discharged to receiving water bodies;
- post development flows to be as close as possible to the pre-development flow;
- treating stormwater on lots for storm events up to the 1 in 1 year, 1 hour average recurrence interval (ARI) event including through rainwater tanks and soakwells;
- treating stormwater in road reserves at or near to the source for the 1 in 5 year ARI event through swales;
- creating detention basins to intercept and store flows from major storm events;
- leaving the seasonal watercourse undeveloped and not obstructed;
- accommodating major storm events in road reserves and POS;
- ensuring that buildings are setback from the seasonal watercourse, with buildings raised above the natural ground level and where possible above roads;
- integrating stormwater treatment into the landscape;

- creating a 'living stream' adjoining the seasonal watercourse on the site;
- providing suitable conditions for urban development (dwellings and light industry);
- adopting a Waterwise and nutrient wise approach to gardens;
- undertaking sediment and litter control and construction management; and
- providing educational material to prospective purchasers of lots and to builders.

Groundwater management

- Residential development to be connected to reticulated sewerage.
- Suitably designed and located on-site effluent disposal systems for light industrial development.
- Adopting a treatment train approach to runoff and infiltration through the use of WSUD.
- Promoting nutrient wise gardens and minimising the use of fertilisers.

Contents

1. INTRODUCTION

1.1 Purpose

For the site shown in Attachments 1 and 2, this LWMS is intended to:

- inform the planning and design process;
- provide an overview of water resources on the site; and
- present a recommended approach for total water cycle management with an emphasis placed on water sensitive urban design (WSUD) which is appropriate for the site's context, the site's characteristics, risk, available and expected servicing and the downstream environment.

The objective of this LMWS is to achieve water management outcomes which are consistent with State and local requirements.

1.2 Total water cycle management – principles and objectives

State Planning Policy 2.9 Water Resources outlines the key principles of integrated water cycle management as:

- consideration of all water resources, including wastewater, in water planning;
- integration of water and land use planning;
- the sustainable and equitable use of all water sources, having consideration of the needs of all water users, including the community, industry and the environment;
- integration of human water use and natural water processes; and
- a whole of catchment integration of natural resource use and management.

Total water cycle management 'recognises that water supply, stormwater and sewage services are interrelated components of catchment systems and therefore must be dealt with using a holistic water management approach that reflects the principles of ecological sustainability' (Department of Water: 2007).

WSUD objectives set out in *State Planning Policy 2.9 Water Resources* are to:

- manage a water regime;
- maintain and, where possible, enhance water quality;
- encourage water conservation;
- enhance water-related environmental values; and
- enhance water-related recreational and cultural values.

The objectives for managing stormwater as stated in the *Stormwater Manual for Western Australia* (Department of Water: 2007) are:

- Water Quality: to maintain or improve the surface and groundwater quality within the development areas relative to predevelopment conditions.
- Water Quantity: to maintain the total water cycle balance within the development areas relative to the predevelopment conditions.
- Water Conservation: to maximise the reuse of stormwater.
- Ecosystem Health: to retain natural drainage systems and protect ecosystem health.
- Economic Viability: to implement stormwater management systems that are economically viable in the long term.
- Public Health: to minimise the public risk, including risk from injury or loss of life, to the community.
- Protection of Property: to protect the built environment from flooding and waterlogging.
- Social Values: to ensure that social, aesthetic and cultural values are recognised and maintained when managing stormwater.
- Development: to ensure the delivery of best practice stormwater management through planning and development of high quality developed areas in accordance with sustainability and precautionary principles.

1.3 Planning framework

There are a number of State, regional and local documents that set the framework for land and water planning including *State Planning Policy 2 Environment and Natural Resources Policy* (2003), *State Planning Policy 2.9 Water Resources (2006), State Water Plan* (2007), *Better Urban Water Management* (2008), *Stormwater Management Manual for Western Australia* (2007), *Liveable Neighbourhoods* (2007), *Great Southern Water Strategy* (2014) and LPS1. Further details are set out in the Structure Plan report. The LWMS has been prepared to address the objectives outlined in the planning framework.

Of particular significance to the site is LPS1 where the site is zoned 'Light Industry' and 'General Agriculture' The *Albany Local Planning Strategy* allocates Lot 521 Mercer Road as 'Future Urban'.

1.4 Previous studies

No district water management strategy has been prepared for the area. A LWMS was prepared for the adjoining *Warrenup-Walmsley Local Structure Plan*.

In support of the LWMS, Bio Diverse Solutions prepared an Environmental Assessment Report and Land Capability Assessment to guide future environmental management for the Structure Plan and future subdivision/development of the site (see Attachment 3).

2. PROPOSED DEVELOPMENT

2.1 Ardess-Walmsley Local Structure Plan

A Structure Plan has been prepared (see Attachment 4) to provide a framework for the site and to guide the subdivision and development. The Structure Plan proposes an extension of the Ardess Industrial Estate, a residential area which includes a range of residential densities, a primary school and three POS areas. The proposed light industrial area will require on-site effluent disposal, where-as the residential area will be developed once reticulated sewerage has been established in the area.

The Structure Plan responds to the site's context, opportunities and constraints and the planning framework. The rationale behind the Structure Plan includes to take account of site characteristics, soil types, conserve the site's remnant native vegetation, and to provide lots that are capable and suitable of accommodating residential and light industrial development.

The development will be staged. The first stage is expected to be adjoining the existing Ardess Industrial Estate to reduce upfront servicing costs. The timing, location and configuration of lot releases will consider demand, feasibility and the location and capacity of services.

The Structure Plan provides context to Amendment 26.

2.2 Scheme Amendment No. 26

Scheme Amendment No. 26 proposes a planning rule change to permit transport depots in the Ardess Industrial Estate (Lot 10 Chester Pass Road).

3. DESIGN CRITERIA

3.1 Overview

The LWMS set outs the approach to managing and conserving the total water cycle for this development and to integrate water and land use planning. The design criteria adopted for this LWMS is based on the design objectives outlined in *Better Urban Water Management* (2008). The design criteria are set out under the headings of water conservation, water quantity management, water quality management, and commitment to best management practice. Strategies to address the design criteria are set out later in this report.

The LWMS is used to provide information on the potential impact of development on water resources. The LWMS will consider the management of stormwater for the development for different ARI events.

3.2 Water conservation

The LWMS considers water resources related to the site and the development and seeks to achieve the sustainable management of all aspects of the water cycle. This includes minimising potable water in and outside the home/businesses and using reticulated potable water as efficiently as possible. The principles are:

- minimising total water use to address *State Water Plan* targets; and
- substituting drinking quality water with fit-for-purpose water for non-drinking water uses.

3.3 Water quantity management

The principle is that post development stormwater discharge volumes and peak flows are to be maintained relative to the existing conditions. This will be achieved through:

- ecological protection - the post development discharge volume and peak flow rates will be maintained relative to pre-development conditions on the site for the 1 in 1 year ARI event;
- flood management - manage the catchment run-off for up to the 1 in 100 year ARI event in the development area to pre-development peak flows; and
- protect infrastructure and assets from inundation and flooding – residential and light industry subdivision/development can increase impervious areas without appropriate management, and development can result in increased volumes and flows of surface runoff. This in-turn has the potential to contribute to localised flooding and inundation. The location of development, detailed engineering design and the construction of buildings are to suitably address localised flooding and inundation.

3.4 Water quality management

The principles are to:

- maintain surface and groundwater quality at pre-development levels through adopting WSUD; and
- restore environmental assets where possible and practical.

3.5 Commitment to best management practice

The planning framework sets out a requirement to address WSUD and strive towards best management practice. There are opportunities ranging from a structure plan scale to an individual lot scale along with structural and non-structural strategies. A combination of strategies is required to achieve required outcomes. Additionally, best management practice strategies will vary based on matters including site characteristics and the development proposal. Adopting WSUD and best management practice strategies will reduce risks of localised flooding on development and infrastructure while maximising the potential for stormwater to be treated as a resource.

The principles are:

- implement controls at or near the source to prevent pollutants entering the system and/or treat stormwater;
- installing in-transit measures to treat stormwater and mitigate pollutants that have entered the conveyance system; and
- implement 'end-of-system' controls to treat stormwater, addressing any remaining pollutants prior to discharging to receiving environments.

4. EXISTING ENVIRONMENT

4.1 Study area

The Structure Plan area is located approximately 5 kilometres north of the Albany central area in the locality of Walmsley (see Attachment 2). The site is generally bordered by Chester Pass Road, Terry Road, Reserve 27179 and Mercer Road. Attachment 5 shows the context plan.

The site (see Attachment 1) is 178.3348 hectares in area. Lot 10 Chester Pass Road is 25.7335 hectares in area and Lot 521 is 152.6013 hectares in area.

The site consists of multiple land uses. Lot 10 Chester Pass Road comprises the Ardess Industrial Estate and cleared land used to keep current and old farm machinery and sand/gravel piles. The industrial area comprises of sheds, office buildings, car parks, an internal road network and cleared areas for future development. Businesses within the industrial area include Albany Freight Lines, Designer Dirt (landscaping supplies) and Ardess Nursery. The Ardess Industrial Estate is subject to various leases.

Lot 521 Mercer Road encompasses the majority of the site and comprises predominantly cleared rural land used for grazing cattle. There are no dwellings on Lot 521 Mercer Road. There are two small to medium sized sheds (one used to store hay and farm machinery and the other an old shearing shed), a set of cattle yards and a strip of remnant vegetation in the northern part of Lot 521.

4.2 Climate

The Albany area is characterised by a Mediterranean climate with warm dry summers and cool wet winters. Rainfall data is from the nearby Bureau of Meteorology (BoM) Albany Station (Site No. 9500).

The long-term average annual rainfall is 929 mm (1877 to 2016). This average has decreased between 2000 to present, to an average annual rainfall of 879 mm, reflecting a 5% reduction compared to the long-term average, consistent with a general trend in the South West of WA. The total rainfall distribution has also altered, with a reduction of average winter monthly rainfall, but no significant reduction in average summer monthly rainfall.

Based on the climatic characteristics of the district, climate is not considered to be a limiting factor to development.

4.3 Landform and topography

Overall, the site has a gentle to moderate gradient. Topography over the site is undulating ranging from a high point of 51m AHD in the central northern portion of the site to a low point of 22m AHD in the southern central portion of the site. There is a ridge that runs from the central northern portion of the site to the south-west corner.

4.4 Aboriginal heritage sites

The Department of Planning, Lands and Heritage's database has no known sites of Aboriginal cultural significance on the site. While noting this, land developers have an obligation under the *Aboriginal Heritage Act 1972* to protect places and objects in Western Australia that are important to Aboriginal people because of the connections to their culture.

4.5 Environmental assets

A) Overview

To inform the LWMS, an environmental assessment was carried out by Biodiverse Solutions (Attachment 3).

It is expected the development will have a limited environmental impact given the site is generally cleared, remnant native vegetation will be conserved, residential lots will be connected to reticulated sewerage, light industrial subdivision will 1 hectare and above with effluent disposal systems to be appropriately designed and located, and stormwater will be appropriately managed. There are also opportunities for revegetation including enhancing the seasonal watercourse on the site.

B) Vegetation and flora

There are two areas of remnant vegetation within the site. A broad scale vegetation survey of these two areas was conducted by Bio Diverse Solutions on 29 August 2017 (see Attachment 3). The strip of vegetation running parallel with the northern boundary of the site (approximately 13 hectares in size) comprises Low Open Jarrah/Marri/Sheoak Forest in good condition. The small area of remnant vegetation in the south-east corner comprises mixed Eucalypt Forest in a degraded condition.

A search of publicly available databases through WA Atlas, Nature Map, and EPBC Protected Matter Search Tool indicates that no threatened, priority or declared rare flora is present on the site, or within the surrounding Nature Reserves and remnant vegetation. There are no Ramsar listed sites, Wetlands of National Importance or Declared Rare or Priority species of vegetation. Nevertheless, the remaining native vegetation has value and it is proposed to retain these areas.

There are opportunities to connect the bush corridor on Lot 521 Mercer Road to the north and west. This includes planting native vegetation on the western section of Terry Road adjoining the site and opportunities through the adjoining *Warrenup-Walmsley Local Structure Plan* to provide revegetation in drainage lines, as part of POS and within relevant road reserves.

Bio Diverse Solutions advise 'all efforts should be made to conserve existing native vegetation. There is support however to clear, as required, replanted vegetation which is Blue gums given they are generally unsuitable in an urban area.'

The following management measures are proposed to reduce the likelihood of impacts to vegetation and flora and to retain the key existing biological values of the site:

- remnant vegetation will be retained within the vegetation strip in the north-east of the site and in the south-east corner of the site. Inclusion of the native vegetation within POS will provide the most effective way of managing the conservation values of the native vegetation;
- access crossings within the vegetation strip will be limited to facilitate retention and natural regeneration of vegetation and to prevent adverse impacts particularly for transient fauna;
- there will be revegetation using native species, where currently there is very little native species and diversity, in the two southern areas of POS along with other areas to promote fauna habitat, flora diversity and biodiversity;
- rehabilitating waterways/drainage lines to create a 'living stream' through revegetation and as required fencing; and
- develop a greening strategy to increase green canopy and green spaces.

C) Fauna and habitat

The majority of the site has been cleared. As a result, fauna habitat has largely been removed. The only potentially significant fauna habitat on site is within the two areas of remnant vegetation.

Within the bush corridor, in the northern section of Lot 521, there is the potential for black cockatoo foraging, roosting and breeding habitat, and any impacts on these habitats should be minimised.

The Department of Biodiversity Conservation and Attractions have recently advised that vegetation in this bush corridor will support roosting Black Cockatoos species that are listed as threatened under the *State Wildlife Conservation Act 1950* and the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999*. Additionally, significant areas of native vegetation are located in Crown reserves to the east of the site that provide habitat for cockatoo and other threatened and non-threatened species along with landscape connectivity. The Department of Biodiversity Conservation and Attractions encourage the retention of as much of the strip of vegetation as possible on Lot 521 to support roosting habitat and landscape connectivity in the form of 'stepping stones'.

To reduce likely impacts to native fauna, the bush corridor will be retained through maintaining the strip of remnant vegetation in the north of the site and the native vegetation in the south-east corner as POS. Additionally, native vegetation species will be used in areas of POS to promote habitat for native fauna species.

D) Wetlands and lakes

There are no protected wetlands or Environmental Protection Policy Lakes within the site.

E) Acid sulphate soils

Acid Sulphate Soil (ASS) mapping indicates the site is not situated on any known ASS. There is however a section of high to moderate risk of ASS occurring within 3m of natural soil surface to the south of the site on Mercer Road.

There is a low risk of acid sulphate soils on the site. This is confirmed by the geotechnical investigation undertaken by Great Southern Geotechnics who conclude that the risk of exposing or disturbing potential acid sulfate soil is negligible given soil types.

The final fill levels and excavation requirements of the future subdivision will determine if an ASS and Dewatering Management Plan is required to be prepared prior to subdivision. If required, the management plan will be prepared to satisfy the Department of Water and Environmental Regulation (DWER) and will outline the soil management measures, the groundwater and dewatering effluent monitoring measures and the contingency management measures required to minimise any environmental impacts.

F) Contamination

A search of the DWER's Contaminated Sites Database was conducted to determine locations of any known or suspected contaminated sites in the vicinity of the site. The search revealed that no known or suspected contaminated sites occur within the site.

G) Sedimentation and erosion

There is limited evidence of erosion on the site.

4.6 Surface water and drainage

There are no major naturally existing drainage networks or water bodies within the site. There is one minor seasonal watercourse situated in the north-western section of the site. This area will need to be managed sensitively in relation to stormwater planning within the site.

Hydrographic Sub-catchments (DoW, 2008) show the site to be within two surface water sub-catchments; with the northern and western portion of the site discharging to Willyung Creek to the north of the site and the central and southern portion of the site discharging to Yakamia Creek to the south of the site (see Attachment 7). Both the Willyung Creek and Yakamia Creek sub-catchments form part of the Oyster Harbour/Kalgan/King Catchment ultimately discharging to Oyster Harbour. These catchments are not proclaimed surface water areas.

There are several man-made dams across the site, which are surface water fed and used for livestock drinking water.

4.7 Geology and soils

Regolith of WA (Department of Mining, 2009) mapping indicates that soils across the site are classified as sandplain, mainly Aeolian and include some residual deposits.

A Geotechnical Investigation was conducted on the 29 August 2017 by Great Southern Geotechnics under later winter conditions. The Geotechnical Investigation is included in Attachment 3. The investigation included both soil analysis and measuring of water table. The soil testing was conducted to assess the

suitability of the site for the proposed residential and light industrial development including onsite effluent disposal for the extension of the industrial area.

Soil testing showed that soils across the site comprised predominately of a silty sand topsoil, over sandy gravel (with a layer depth varying from 200 - 700mm), over sandy clay to the depth of the hole.

Permeability testing was conducted by Liquid Labs WA as part of the Geotechnical Investigation. Permeability at both borehole site TP3 and TP10 is considered to be extremely low this is consistent with the soil type (sandy clay) encountered at these locations.

Phosphorous Retention Index (PRI) results across the site varied consistent with soil type. The sandy clays found across the majority of the site were found to have a very high PRI and therefore a very high ability to fix nutrients and heavy metals. The sandy gravel found at TP1 also had an extremely high PRI, particularly for a sand, whereas the light grey sand found at TP6 had a low PRI and therefore a low ability of fixing nutrients and heavy metals.

Ten boreholes were constructed within the site to a depth of 2.3 metres and left open for a minimum of 1 hour to identify water table present. No groundwater was encountered.

As set out in Attachment 3, a Land Capability Assessment of the site was conducted by Bio Diverse Solutions. The overall capability of the site supporting the Urban Development land use was rated as highly capable for Mapping Unit 1 and very highly capable for Mapping Unit 2. The overall capability of the site supporting the Light Rural Industrial is rated as highly capable for Mapping Unit 1. Mapping Unit 2 was not encountered at the location of the proposed Light Rural Industrial land use. The degree of limitations for both Urban Development and Light Rural Industry for Mapping Unit 1 and Mapping Unit 2 is low to very low.

Accordingly, the site is capable of supporting urban development and has similar soil types and hydrology to the surrounding urban areas. The soils have good foundation stability and any inconsistencies (e.g. lateritic cap rock) can be managed via design and normal construction techniques.

4.8 Groundwater

Australian Geoscience Mapping and Department of Water 250K Hydrogeological mapping places the site within the; 'Tertiary - Cainozoic - Phanerozoic (TPw) period: Plantagenet Group - siltstone, spongolite; minor sandstone, peat, and conglomerate.' The aquifer is a 'sedimentary aquifer with intergranular porosity – extensive aquifers, major groundwater resources.' (DoW, 2015).

As set out in section 4.7, a Geotechnical Investigation was conducted on the 29 August 2017 by Great Southern Geotechnics under late winter conditions. The investigation included measuring of water table. Ten boreholes were constructed within the site to a depth of 2.3 metres. Groundwater was not observed in any of the boreholes indicating there is no likely groundwater present beneath the site to a depth of 2.3 metres. The geotechnical investigation was undertaken in accordance with Australian Standards.

The site is not located within a Public Drinking Water Source Protection Area. The site is within an unproclaimed groundwater area under the *Rights in Water and Irrigation Act 1914*.

4.9 Existing infrastructure and constraints to design

A) Servicing overview

The subdivision/development of the site as advocated by the Structure Plan will require the extension and upgrading of essential civil infrastructure including reticulated water and reticulated sewerage to residential development. There is a need for more detailed investigations and design to ensure there is capacity of these services for the subdivision/development. The capacity of infrastructure to service future subdivision will need to be determined prior to the issue of titles.

B) Wastewater disposal

The site is located in a Sewerage Sensitive Area as set out in in the draft *Government Sewerage Policy*.

Residential development will be serviced with reticulated sewerage. Existing and future light industrial the subdivision/development will be serviced by on-site effluent disposal, with a minimum lot size of 1 hectare. The geotechnical assessment (Attachment 3) confirms site capability for onsite effluent disposal. There is a need for the development to comply with the draft *Government Sewerage Policy*. Any on-site wastewater disposal system is required to be located and designed to the satisfaction of the Department of Health and the City. This is given statutory backing through LPS1.

C) Water supply

Lot 10 Chester Pass Road is connected to the reticulated (scheme) water network.

Proposed residential and light industrial lots will be connected to the reticulated water system.

At the subdivision stage, the developer's consulting engineer will approach the Water Corporation for information about system capacity and constraints. Proposed lots are required to have sufficient pressure to meet Water Corporation's licence conditions and it's Customer Charter.

In addition to the reticulated water scheme, there are opportunities for additional water supply provision such as future landowner's installing rainwater tanks. The use of rainwater tanks is supported and this will complement the reticulated water supply.

D) Fire hydrants

Fire hydrants will be installed on the site at the subdivision stage.

E) Stormwater

Current drainage conditions are limited to the Ardess Industrial Estate which include open drains. It is proposed that stormwater drainage will be managed through on-site reuse, detention and treatment in accordance with WSUD principles which are outlined in section 6.

4.10 Existing environment conclusions

As outlined in section 4, the site has minimal environmental assets and is considered suitable and capable of accommodating residential and light industry subdivision/development. Key considerations, as part of future detailed design, include:

- conserving remnant native vegetation;
- effectively managing stormwater using WSUD;
- there is a need to extend services including reticulated water; and
- enhancing the seasonal watercourse in the north-west section of the site.

5. WATER SUSTAINABILITY INITIATIVES

5.1 Overview

It is desirable to reduce water demand in general and scheme water demand in particular for the development where possible and practical. The *State Water Plan (2007)* has set a target to reduce annual household use of scheme water in Perth to less than 100 kilolitres (kL) per person (page 61), while *Better Urban Water Management* has a target of not more than 40-60 kL per person per year for scheme water. These targets have been adopted for the development.

The *Perth Residential Water Use Study 2008/09* (Water Corporation: 2010) found that the average Perth household (2.4 people) water use was 255kL per annum.

The target water usage per household for use inside and outside dwellings is to 240kL per annum. The domestic irrigation demand could be reduced further if landscaping was redesigned and if the amount of lawn is minimised.

A range of water savings can be made by adopting Waterwise practices as part of future development as outlined below.

The main water use initiatives rely on individual landholders. The best way is not to mandate the water saving devices but rather to encourage prospective purchasers on water sustainability opportunities.

5.2 Drinking water

Reticulated water will be supplied to all lots. The reticulated water scheme will be operated by Water Corporation. Accordingly, scheme water will be from existing water sources which will provide the development with a potable water supply.

Water efficiency is part of Water Corporation's 'business as usual' approach and is enabled through the use of technology and by changing behaviour to use less water. The Western Australian Government has introduced a range of measures to ensure that new houses built in Western Australia meet minimum standards for energy and water efficiency. The 5 Star Plus building standards, introduced in September 2007, are based around two new building codes, the *Energy Use in Houses Code* and the *Water Use in Houses Code* and help to improve the energy and water efficiency of new homes. The *Water Use in Houses Code* requires:

- all tap fittings must be a minimum 4 stars Water Efficiency Labelling and Standards scheme (WELS) rated;
- all showerheads must be a minimum 3 stars WELS rated; and
- all sanitary flushing systems must be a minimum 4 stars WELS rated dual flush.

These ratings should be reviewed as more efficient appliances become available.

5.3 Fit-for purpose use

A) Rainwater

While noting the development will be connected with scheme water, rainwater tanks will be encouraged to be installed on all lots with water available for internal and external use. It is highlighted that the installation of rainwater tanks is the responsibility of the land owner.

Rainwater tanks provide a range of benefits including reducing use of the reticulated water supply and managing stormwater across the site (by detaining or retaining roof runoff). Captured rainwater can be used to supply in-house requirements and/or used outdoors including on gardens.

Landowners and business operators will be encouraged to install rainwater tanks to reduce the amount of water consumption from the water mains. Additionally, owners will be encouraged to install fittings to ensure the captured rainwater can service indoor and/or outdoor purposes. For instance, the installation of a 3,000 litre rainwater tank could potentially capture approximately 29kL per annum for each household's usage.

Water quality from rainwater tanks is generally considered to be of a high standard if regular maintenance is undertaken. This includes the installation of first flush diverters, prevention of access to any vermin or disease vectors, filters to minimise the entry of large particles and leaves, regular de-sludging to avoid a build-up of sediments at the base of the tank and regular inspection and maintenance of gutters and downpipes.

With appropriate maintenance, it is considered that the water quality from rainwater tanks should be of a sufficient standard to be used for non-potable in-house use without further treatment. With further treatment, and subject to City approval, rainwater is expected to be suitable for potable use.

B) Groundwater

Groundwater abstraction is generally the easiest and usually most cost effective method of providing an alternative to scheme water for irrigation in domestic gardens.

Groundwater is predominantly used externally for non-potable purposes. The use of groundwater presents a small risk in terms of water quality. With respect to irrigation, the presence of significant iron concentrations,

hardness, alkalinity or nutrients can impact upon the receiving vegetation and soils and/or contribute to scaling or scour of irrigation pipework.

It is generally acknowledged that the consumption of groundwater by individual households owning a private bore is greater than for those households irrigating from scheme water. Accordingly, it is considered that encouraging private bore use on the site would not lead to achievement of the water conservation objectives. However, if available and cost effective, it will reduce the use of scheme water.

Subject to availability and water quality, the use of groundwater for private lot irrigation will be the decision of the landowner. There is no requirement for DWER to licence groundwater on the site.

C) Stormwater

There are various options to utilise stormwater as a resource which include promoting rainwater tanks for each dwelling, larger outbuildings and business premises and directing stormwater from roads and driveways into detention basins for re-use.

D) Domestic greywater

At the household or business scale, treated greywater is suitable for garden irrigation or infiltration in accordance with the *Code of Practice for the Reuse of Greywater in Western Australia*. Greywater can generally only be stored for up to 24 hours after which time there are significant impacts to water quality and subsequent risks to public health.

Households choosing to install a greywater system for garden irrigation or appropriate non-potable indoor use will be responsible for adhering to the *Code of Practice for Greywater Reuse in Western Australia* along with associated costs for operation and maintenance of the greywater system.

If greywater is used for domestic garden use, the supply may be greater than the demand during the winter months. Alternative uses or disposal to the sewerage network may have to be made during the winter months. However, during the summer months greywater could provide approximately 60% of the supply for domestic irrigation (Loh and Coghlan: 2003).

E) Wastewater

As outlined in section 4.9, residential subdivision/development will be serviced with reticulated sewerage, while light industrial subdivision will be serviced through appropriate on-site effluent disposal systems. It is not expected that treated wastewater will be reused on this site other than for irrigating open space.

The draft *Government Sewerage Policy* outlines that on-site effluent disposal may be considered for non-residential subdivision that:

> a) Are remote from existing or proposed sewerage schemes and the proposed development cannot be connected to reticulated sewerage;
>
> b) Utilise secondary treatment systems with nutrient removal if in a sewage sensitive area or a public drinking water source area; and
>
> c) Where the proponent has demonstrated, to the satisfaction of the Western Australian Planning Commission on the advice of the Department of Health and the Department of Water that there is sufficient capacity to treat and dispose of sewage and contain associated buffers on-site. Consideration will be given to the maximum hydraulic load that can be contained within the lot and the potential impacts on waterways and wetlands.

The minimum lot size for non-residential lots is determined on a case-by-case basis.

The proposed industrial area was assessed by Biodiverse Solutions against the requirements for lots with on-site effluent disposal as outlined in the draft Government Sewerage Policy (DoP, 2016). The requirements and assessment to each requirement is shown below.

Lot Requirement (DoP, 2016)	Assessment to Requirement
Adequate separation from groundwater – the discharge point of the on-site sewage disposal system should be at least 1.2 to 1.5 metres, depending on soil type, in sewage sensitive areas.	Groundwater was not encountered to 2.3 metres depth (Great Southern Geotechnics, 2017).
An on-site sewage disposal system should not be located within 30 metres of a private bore used for household/drinking water purposes.	There are no private bores registered within the Site or with in the vicinity of the proposed Industrial Area (DoW Water Register, 2017).
Lot Requirement (DoP, 2016)	Assessment to Requirement
An on-site sewage disposal system should not be located within 100 metres of a waterway.	No waterways located within the Site or within 100m of the proposed Industrial Area (Site inspection conducted 29/8/2017)
An on-site sewage disposal system should not be located within 100m of a significant wetland.	No significant wetlands located within the Site or within the vicinity of proposed Industrial Area (DEC and CoA 2017 database search)
An on-site sewage disposal system should not be located within 100 metres of a surface or subsurface drainage system that discharges directly into a downstream waterway or waterbody.	No surface or subsurface drainage systems located within the Site or within 100m of the proposed Industrial Area (Site inspection conducted 29/8/2017 and DoW database search)
An on-site sewage disposal system should not be located within any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event.	Given the relatively higher topography in the area and gradual slopes of the land inundation in the location of the proposed Industrial area is unlikely.

The assessment by Biodiverse Solutions concluded that the proposed light industrial area is appropriate for effluent disposal and meets the stated minimum requirements for on-site sewage disposal systems as outlined in the draft *Government Sewerage Policy*. In addition, the low permeability and high PRI of the soils in the location of the proposed industrial area will allow for slow draining assisting the process of being fixed by soil microbes.

As the industrial area is in a sewerage sensitive area, a secondary waste water treatment system with nutrient removal should be used. The provision of on-site sewage disposal systems including calculation of land application area shall be in accordance with minimum site requirements contained in Schedule 3 of the draft *Government Sewerage Policy* and must be approved for use in Western Australia by the Department of Health. LPS1 requirements for the current Light Industrial area require 'dry industry' and 'alternative treatment effluent disposal systems'.

Where on-site sewage disposal is to be provided by a secondary treatment system, the WAPC will require a notification on title pursuant to Section 70A of the *Transfer of Land Act 1893* (as amended) advising that an on-site secondary treatment sewage disposal system and unencumbered area to which treated sewage is to be distributed are required.

5.4 Water balance modelling

The adoption of the initiatives set out in the LWMS have the potential to significantly reduce water demands. Key opportunities include the use of rainwater tanks; all dwellings having Waterwise fittings, infiltrated runoff through soakwells on each lot and grassed or vegetated swales as part of future roads.

5.5 Waterwise landscaping and irrigation

As outlined above, there are opportunities for domestic gardens and industrial/commercial landscaping to be irrigated by non-scheme water (including rainwater tanks, groundwater and greywater).

Waterwise gardens

The water savings from planning and implementing Waterwise gardens and implementing other outdoor Waterwise techniques can be in the order of 50kL per household per annum. This includes reducing the amount of lawn and planting water wise species which are generally endemic to the region or appropriate water-wise exotic plant species.

To achieve the necessary target of 240kL per household per annum, an achievable target of 84kL (approximately 35%) per annum has been allocated to gardens and other outside usages. The installation of a rainwater tank can be used to supplement for the use of mains potable water for usage on garden and other outdoor requirements.

Public open space

The Structure Plan proposes considerable POS. In particularly, the Structure Plan provides the following POS:

- a vegetated bush corridor containing remnant vegetation in the north-east section;
- two generous sized neighbourhood parks incorporating an incidental drainage function; and
- a community centre site located near the proposed primary school.

The design of the POS system responds to a wide number of opportunities presented by the site, namely:

- retaining key environmental features such as remnant vegetation;
- integrating surface water management measures into POS;
- providing well-distributed and generous sized POS that provide a range of recreational opportunities;
- fostering a sense of community, place and local identity through the creation of an urban village in a bush setting, bordered by open spaces (bush corridor on Lot 521, Reserve 27179 and POS adjoining Mercer Road); and
- providing an attractive entry frontage to Mercer Road that enhances the site's sense of place.

Two large neighbourhood parks are proposed on Lot 521 in the central-south and south-east sections. The central-south POS is 3.2 hectares and is expected to incorporate a drainage basin of around 0.7 hectare. The south-eastern POS is 5.15 hectares and is expected to incorporate a drainage basin of around 0.46 hectare.

The POS location provides an opportunity to create an attractively landscaped entry statement to the area. There is an opportunity to provide attractively designed areas of POS which will be overlooked by the surrounding residential areas. The POS should be maintained to a high standard to be appealing to the community.

It is expected that the neighbourhood parks will be used for active recreation, passive recreation, nature space and unstructured active play. These sites could be developed for active recreational use such as playgrounds, exercise facilities, half-court basketball courts along with passive facilities such as picnic/barbecue areas and seating.

Drainage areas for the one in 100 year event within POS near Mercer Road have the potential to combine passive recreation and unstructured active play opportunities through WSUD. Where drainage basins remain dry for most of the year, they can be designed to enable them to be used for recreational purposes.

There are opportunities to captured stormwater from the detention basins to irrigate the POS.

5.6 Water source recommendations

A key component of achieving water sustainability measures is adopting an educational approach. To assist in achieving this, the developer will provide relevant information to prospective purchasers and builders regarding the range of measures and household products that can be utilised to harvest rainwater and reduce scheme water use. This includes providing information on the following:

- promoting rainwater tanks for each dwelling, larger outbuildings and industrial premises for external and/or internal use;
- promoting Waterwise gardens including relevant Water Corporation's publications;
- promoting the use of Waterwise practices including water efficient fixtures and fittings (e.g. taps, showerheads, toilets); and
- maximising on-site retention of stormwater and associated re-use.

6. STORMWATER MANAGEMENT STRATEGY

6.1 Overview

The stormwater management strategy for the site is to maintain pre-development flows while maintaining and/or improving water quality. The stormwater system is required to adequately manage small, minor and major storm events.

In order to meet the design criteria, it is necessary to use a combination of appropriate stormwater management strategies that are suitable for the development and site characteristics. They include structural and non-structural measures. Structural measures include those undertaken on a lot, street and estate scale. Non-structural measures include educational material and interpretive signage.

Key components of managing stormwater for the development are shown on the Strategy Plan (Attachment 8). The strategies and initiatives are intended to meet the principles and objectives (section 1.2) and the design criteria (section 3).

Stormwater infrastructure will be designed to ensure stormwater discharges and volumes do not exceed pre-development levels for the 1 in 1 ARI year, 1 in 5 ARI year and the 1 in 100 year ARI storm events in relation to volume and rate.

Development of the site will increase the amount of impervious surfaces through dwellings, outbuildings, light industry, driveways and roads. The total hard surface for the subdivision/development will vary depending on land use and lot size. There should be space on each lot for appropriate stormwater attenuation/detention. The degree of attenuation required to address the design criteria will be addressed during the detailed civil engineering phase of the project.

6.2 Surface water quantity management

A) Stormwater retention/detention on each lot

Stormwater for the 1 in 1 year, 1 hour ARI event will be retained on each lot predominantly through rainwater tanks and soakwells, possibly other than for medium density development e.g. R60. Excess stormwater from major rainfall events will flow onto the ground for infiltration over a broad area. This can be readily accommodated given the soil types which are overall suitable for infiltration.

B) Stormwater retention/detention in road reserves

Roads will be sealed, designed and constructed in accordance with City requirements which are expected to be the *Local Government Guidelines for Subdivision Development* and *Austroads Design Guidelines*. Detailed design will accommodate topography, drainage and possible erosion requirements etc.

The design of the road drainage is expected to include:

- stormwater from roads will be through overland flow, via shallow open channels (swales) where possible rather than via pipes. The swales will collect and slowly channel stormwater (to act as

detention areas) towards the discharge point. There will be culverts as required including at crossovers;
- swales on at least one side of the road especially if the detailed road design has one way cross-fall;
- likely detention features to slow run-off and minimise erosion in portions of the site;
- possible concrete covered sumps to collect stormwater and sediment where required; and
- various shallow vegetated detention basins in low points.

Erosion risk from the development is expected to be low given the gentle to moderate slopes, soil types and mitigation measures to reduce run-off volumes and reduce flow rates.

C) 1 in 1 year, 1 hour ARI event

The intent of managing the 1 in 1 year, 1 hour ARI storm event is source control. In particular, to capture or prevent runoff from constructed impervious surfaces and to manage water quality. Adopting WSUD will result in stormwater harvesting (including rainwater tanks), detaining and slowing down peak flows that especially address the 'first flush' run-off.

Stormwater from minor storm events up to the 1 in 1 year, 1 hour ARI event will be retained as close to source as possible. The strategy is to:

- require that lots retain the 1 in 1 year, 1 hour ARI event with water then re-used (through rainwater tanks) or slowly recharged into the groundwater (including soakwells and rain gardens);
- encourage future lot owners to direct run-off from their dwelling, large outbuilding or industrial premise into rainwater tanks to reduce stormwater runoff. The City will apply appropriate development conditions to address stormwater management for the 1 in 1 year, 1 hour ARI event at the Development Application and/or Building Permit stages; and
- ensure that road reserves retain the 1 in 1 year, 1 hour ARI event as close to source as possible through grassed or vegetated swales.

D) 1 in 5 year ARI event

The intent of managing the 1 in 5 year ARI storm event is runoff control. In particular, it is to retain, detain and convey stormwater, to manage water quantity for serviceability and to prevent erosion. The strategy is to:

- require that soakage devices such as soakwells are provided with an overflow outlet for major storm events;
- provide open swales within road reserves which are designed to collect, treat (through the planting of nutrient stripping vegetation to promote bioretention or the filtration of stormwater) and slowly channel stormwater towards the discharge point;
- require the swales to be sized to adequately store up to the 1 in 5 year ARI event with a controlled outflow to match pre-development flow rates; and
- consider directing stormwater to the existing dam or future dams for on-site use as part of the detailed design.

E) 1 in 100 year ARI event

The intent of managing the 1 in 100 year ARI storm event is the safe conveyance and discharge of stormwater and to protect buildings and lots from flooding.

There is a minor seasonal watercourse in the north-west section. The site is not within an identified flood risk area. While noting this, the strategy is to:

- ensure that the watercourse is left undeveloped and unobstructed to not compromise upstream surface-water flows;
- maintain existing or provide alternative overland flow paths and drainage discharge points in order to preserve predevelopment conditions. Flows are to be conveyed along roads, road verges/swales, drainage lines and the floodway (seasonal watercourse);
- provide appropriate building setbacks from drainage lines;
- require that roads are designed to cater for the surface overflow for major storms;

- require that buildings should be at least 0.3 metre above the ground level and where possible above the road level to address the potential for localised flooding from roads; and
- require that swale profiles and culvert sizes for lot crossovers and intersections are designed to mitigate the flows and protect lots from flood levels in road reserves.

6.3 Surface water quality management

The impacts from the proposed development are expected to have minimal impact on water quality. Correspondingly, there are a number of ways in which surface water quality can be maintained or enhanced. The strategy is to:

- accommodate the 1 in 1 year ARI event which will treat around 99% of annual run-off volume which helps to protect ecological values;
- improve water quality via soil and vegetation filtration;
- adopt a treatment train to stormwater including in road reserves through the use of WSUD including vegetated roadside swales, detention basins and as required sediment traps and gross pollutant traps. This will assist to remove and treat sediments, phosphorous, nitrogen, suspended solids and other contaminants;
- implement controls at or near the source to prevent pollutants entering the system and/or treat stormwater;
- install in-transit measures to treat stormwater and mitigating pollutants that have entered the conveyance system. Appropriate native or possibly suitable non-native plant species that have fibrous roots to filter nutrients will be planted as required within the swales. The plants will be constructed according to the latest *FAWB Adoption Guidelines for Filter Media in Biofiltration Systems* and the *Stormwater Management Manual for WA* design guidelines in consultation and to the satisfaction of the City;
- implement 'end-of-system' controls to treat stormwater, addressing any remaining pollutants prior to discharging to receiving environments. This could include that surface run off from roads is directed to shallow vegetated detention basins prior to emptying to the seasonal watercourse;
- encourage all lot purchasers to practice Waterwise and nutrient wise practices including minimising the area of lawn established or possible alternatives to lawn;
- undertaken appropriate sediment and erosion control during construction;
- provide a suitable buffer between development and the watercourse;
- restore/revegetate the seasonal watercourse on the site to create a 'living stream' which will enhance the watercourse's ecological functions; and
- undertake additional revegetation and replanting in other parts of the site.

Water quality treatment systems and WSUD structures should be designed in accordance with the *Stormwater Management Manual for Western Australia* (Department of Water: 2007) and *Australian runoff quality: a guide to water sensitive urban design* (Engineers Australia: 2007).

6.4 Impact on water dependent ecosystems

The main water dependent ecological systems influenced by the development are groundwater and the watercourse. Stormwater and groundwater will be managed so that post development receiving hydrological regimes are comparable to pre-development. Accordingly, there should be minimal impact on water-dependent ecosystems.

There are a number of ways in which water quality can be maintained or enhanced. The strategy is to:

- undertake those measures set out in section 6.3;
- require that all lots have an appropriately designed and located on-site effluent disposal system;
- encourage appropriate fertiliser use including minimising where possible, not exceeding application rates, using low water soluble fertiliser, only fertilising when symptoms of nutrient deficiency occur and applying at the appropriate time of the year (spring or early autumn); and
- encourage appropriate weed management, spot spraying and general maintenance on the site.

6.5 Non-structural controls

A number of non-structural controls have been set out in this LWMS which include promoting education and undertaking Waterwise practices. Further non-structural controls are set out in the *Stormwater Management Manual of WA* (2007).

6.6 Stormwater management strategy conclusions

The proposed development has minimal limitations for effectively managing stormwater given the proposed lot sizes, the generous provision of POS and there are appropriate soil conditions for stormwater infiltration.

Environmentally sensitive stormwater management at the site is considered feasible by assisting recharge into the soils. Physical enhancement of the ground profile, by way of swales will contain runoff, facilitating sediment control and recharge to groundwater at the road side. Treatment of overflow stormwater resulting from major storm events that cannot otherwise recharge to groundwater can be addressed by contouring and planting detention basins prior to discharge into the seasonal water course.

The approach to managing stormwater includes:

- accommodating small, minor and major storm events;
- detention and gradual conveyance of stormwater rather than instantaneous rapid conveyance;
- on-site infiltration/groundwater recharge;
- localised stormwater harvesting; and
- promoting replanting to enhance water quality.

7. GROUNDWATER MANAGEMENT STRATEGY

7.1 Overview

As outlined in Attachment 3, it was determined there would be minimal impact on groundwater from the development given the depth of groundwater.

Biodiverse Solutions advise 'there are limited water management risks associated with development of the Subject Land. Based on the investigations, there is no requirement to undertake pre- development groundwater monitoring. Overall, the soil types enable stormwater infiltration at source.'

Biodiverse Solutions advise:

> 'It is expected that development of the site will have a positive impact on groundwater and stormwater quality through BMPs and the treatment of stormwater prior to infiltration. Based on the site assessment and the management measures proposed, it is not expected that any changes to groundwater flows, levels or quality will have an adverse impact on the function and environmental values of the site.'

As set out in section 4.8, impacts on groundwater will be further minimised with dwellings being raised at least 0.3 metre above the natural ground level.

7.2 Groundwater levels

As set out in Attachment 3 and section 4.8, no test pit encountered groundwater.

It is expected that post-development groundwater levels will be similar to pre-development levels. The site's soil types will assist infiltration and groundwater recharge close to the source.

7.3 Groundwater quality management

The environmental values of groundwater within and surrounding the site are required to be retained given groundwater is an important environmental asset. Implementation of WSUD is expected to result in maintaining or where possible improving groundwater quality. An example is the planting of fibrous rooted plants incorporated into the base of the roadside bioretention swales in portions of the site. This will provide

treatment of surface water runoff collected within the drainage network prior to infiltration into the groundwater. These products bind nutrients and other contaminants that are mobile.

Where fill is installed, it may be associated with a sub soil drainage system in order to maintain ground water levels at, or close to, that which currently exists. Subsoil drains should have 'open' outlets.

7.4 Impact on water dependent ecosystems

Overall, the development is expected to have minimal impacts on groundwater quantity and quality and according there are expected to be limited impacts on water dependent ecosystems. The recommended management practices will maximise the quality of the infiltration. This includes encouraging new residents to install nutrient wise gardens and to minimise the amount of lawn.

7.5 Implications for fill

There will be filling on various residential lots which will be addressed at the subdivision stage. Considerations include:

- ensuring there is sufficient clearance to the highest groundwater levels;
- filling for house pads will be required on some lots to increase heights above the adjacent road and/or ground level. In particular, it is recommended that all buildings are raised by 0.3 metre above the ground level; and
- where required, clean sand fill will be imported to the site to provide an appropriate clearance from subsoil drains.

8. MONITORING AND ADDITIONAL INVESTIGATIONS

8.1 Overview

An UWMP should be prepared to support residential subdivision.

Based on the development's site characteristics, the proposed generous lot sizes (1 hectare minimum) and the low level of risk of impacting water resources, it is considered unnecessary to prepare an UWMP for the light industrial subdivision. Engineering design drawings submitted to the City for approval at the subdivision stage and building plans submitted to the City at the Building Permit stage provide appropriate opportunities to implement the LWMS.

While noting the above, there are various matters to be addressed in progressing from conceptual designs and strategies to detailed civil engineering designs. Amongst matters, the detailed civil engineering design will address road, swale and detention basin design. Matters to address include:

- plans to be generally consistent with the LWMS including its objectives and design criteria including adopting WSUD principles;
- demonstration of compliance with regulatory requirements, including required licences and approvals, *Building Code of Australia* and *Plumbing Code of Australia*;
- ensuring that the construction and development works suitably address sediment and erosion control; and
- operational and maintenance responsibilities and liabilities.

The consulting engineer will incorporate any conditions and changed circumstances into the subdivision design and provide the detailed design drawings of the road network and drainage. At that time, detailed calculations will be made to confirm and design the drainage system including flow rates and attenuation.

There will be a need for a site classification report to determine in more detail soil conditions at the Building Permit stage.

8.2 Monitoring

No pre-development or post-development groundwater monitoring is required for the development due to the groundwater depth, soil types and the expected minimal impact of the development on groundwater.

While noting this, there is a need for routine inspection of WSUD elements by the developer, or developer's appointed consulting engineer/project manager, for a minimum of 12 months after the completion of works or for an agreed upon time between the developer and the City.

There is a need for cost effective methods to evaluate the adequacies of the operation and performance of WSUD elements. It will be assumed that if the WSUD elements operate in accordance to the designs then they are delivering the desired key management objectives. The WSUD elements should only require minimal routine maintenance and these are generally of a landscape maintenance nature, with the most common maintenance being the removal of debris and siltation.

9. IMPLEMENTATION

9.1 Developer commitments

Implementation will only occur at the construction stage following the full engineering calculations for the roads and stormwater management.

The developer, or the developer's appointed consulting engineer/project manager, is committed to the following:

- designing and constructing a reticulated water supply services for all lots;
- residential subdivision being connected to the reticulated sewerage system;
- designing and constructing the stormwater management system based on WSUD principles;
- providing lot owners and builders with information regarding Waterwise practices inside and outside the dwelling including promoting rainwater tanks, Waterwise appliances, Waterwise gardens, and providing information on appropriate fertiliser application;
- sediment and erosion control during construction;
- creating POS as outlined on the Structure Plan;
- creating a 'living stream' for the seasonal watercourse in the north-west of the site; and
- maintaining the stormwater system for a minimum period of 12 months from practical completion, or as agreed with the City, and ensuring that any remedial works as necessary for the upkeep of the system are undertaken.

Developer commitments would in part be set out in the conditions of subdivision.

9.2 Roles and responsibilities for implementation

The developer is responsible for the actions outlined in the LWMS until either handover to the City or until sale of the lots. Following handover, the City is then responsible for ensuring the stormwater system is maintained.

Landowners are responsible for various matters within and outside their home including the provision of stormwater tanks and adopting Waterwise and nutrient wise gardens.

9.3 Review of LWMS

There will be a need to review the LWMS given the anticipated long timeframe to implement the Structure Plan.

10. CONCLUSIONS

The development is considered a low risk to water resources given the site's location, environmental characteristics, proposed lot sizes and proposed servicing. Groundwater and surface water are not considered constraints to future development.

The LWMS concludes that the site is capable of supporting residential and light industrial subdivision/development and is able to achieve appropriate water management outcomes. Further, it is considered that an UWMP is required to support residential subdivision, however no UWMP is required to support light industrial subdivision. There will however be a requirement for engineering drawings and specifications to be submitted and approved by the City for the light industrial subdivision which are generally consistent with the LWMS and which adopt WSUD.

11. REFERENCES

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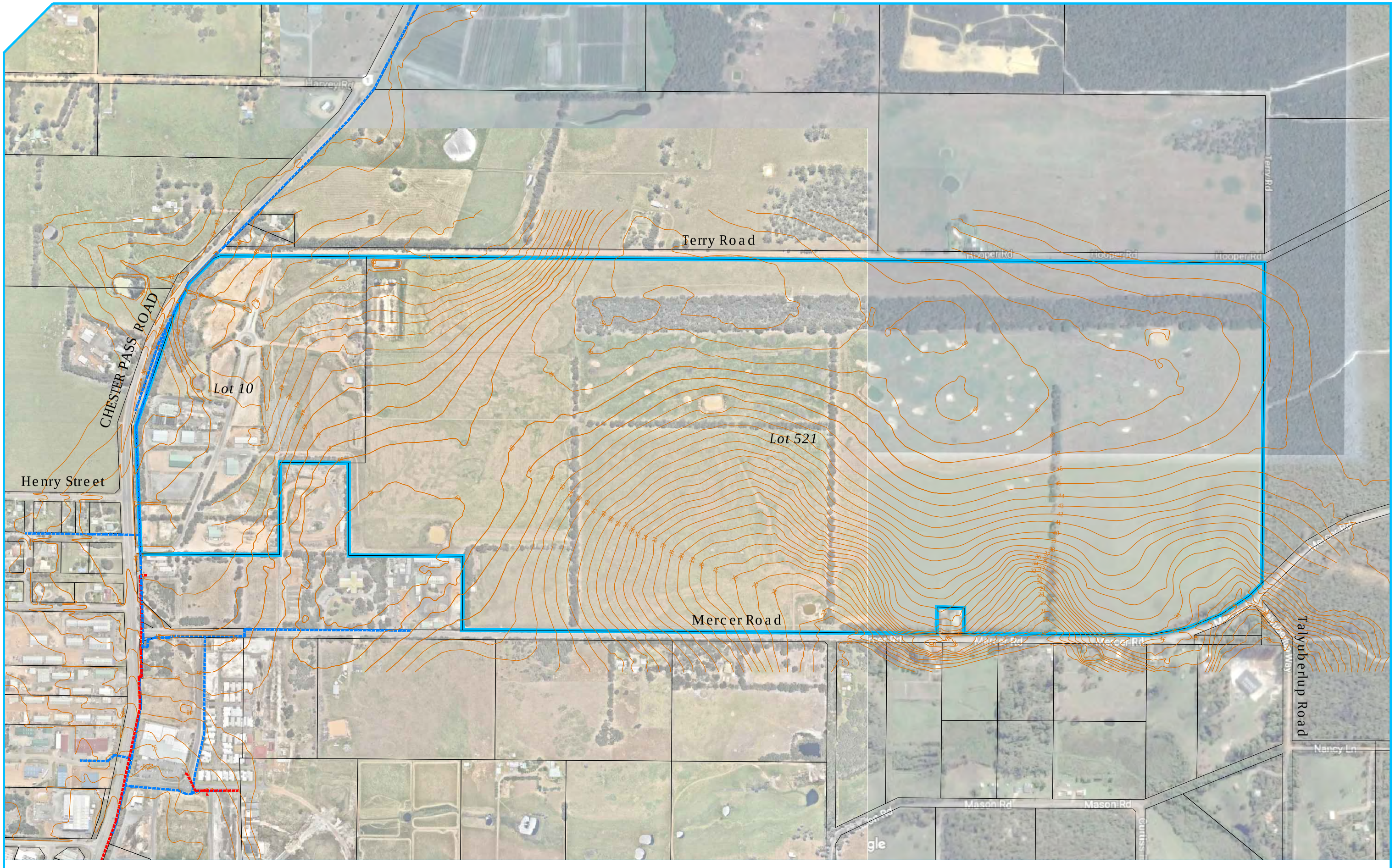
ATTACHMENT 1



SITE PLAN
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

Legend

- Structure Plan Boundary
- Existing Lot Boundary
- Contours
- Existing u/ground Water Pipe
- Existing u/ground Sewer Pipe

SCALE 1:7500
SHEET A3

NORTH

0 150 300m

REV	DESCRIPTION	YYMMDD	DRAWN	APPRVD
A	CONTEXT PLAN	170522	SJ	ST

DRAWING NUMBER EP 170520 01 REV A

Issued for design intent only. All areas and dimensions are subject to detail design + survey.

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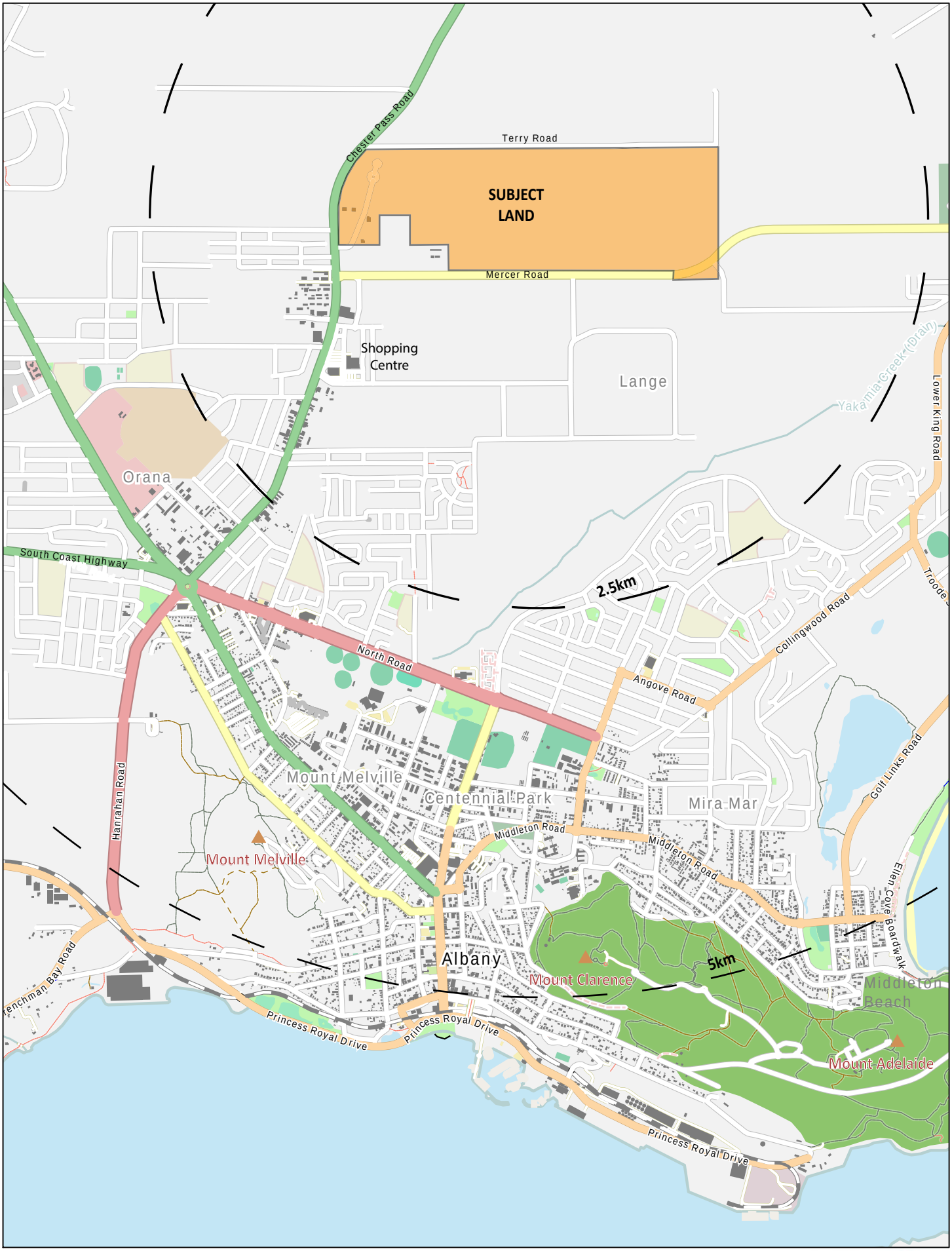
ATTACHMENT 2



LOCATION PLAN

Lot 10 Chester Pass Road
and Lot 521 Mercer Road
Walmsley, City of Albany

SUBJECT LAND

N

scale 1 : 30,000 @ A4

0 2km

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ATTACHMENT 3

Lot 10 Chester Pass Road &
Lot 521 Mercer Road,
Walmsley WA 6330

Environmental Assessment and Land Capability Assessment Report

BIO DIVERSE SOLUTIONS

21/11/2017
Kathryn Kinnear
Bio Diverse Solutions

DOCUMENT CONTROL

Title: Environmental Assessment Report – Lot 10 Chester Pass Road and Lot 521 Mercer Road, Walmsley WA

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Reviewer(s): Kathryn Kinnear & Steve Thompson

Job Number: EPP 004

Client: Ardess 1607 Pty Ltd

REVISION RECORD

Revision	Summary	Revised By	Date
Draft Id 26/09/2017	Internal QA Review	Kathryn Kinnear	26/09/2017
Draft Id 29/09/2017	Issued to client for review	K. Kinnear	29/9/2017
Draft Id 26/10/2017	Updated as per client review	B. Theyer	26/10/2017
Draft Id 13/11/2017	Issued to Client	K. Kinnear	13/11/2017
Final Id 21/11/2017	Final updates and Issued to Client	K. Kinnear	21/11/2017

The recommendations and measures contained in this assessment report are based on the requirements of the Australian Standards 3959 – Building in Bushfire Prone Areas, WAPC SPP3.7, Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) and CSIRO's research into Bushfire behaviour. These are considered the minimum standards required to balance the protection of the proposed dwelling and occupants with the aesthetic and environmental conditions required by local, state and federal government authorities. They DO NOT guarantee that a building will not be destroyed or damaged by a bushfire. All surveys and forecasts, projections and recommendations made in this assessment report and associated with this proposed dwelling are made in good faith on the basis of the information available to the fire protection consultant at the time of assessment. The achievement of the level of implementation of fire precautions will depend amongst other things on actions of the landowner or occupiers of the land, over which the fire protection consultant has no control. Notwithstanding anything contained within, the fire consultant/s or local government authority will not, except as the law may require, be liable for any loss or other consequences (whether or not due to negligence of the fire consultant/s and the local government authority, their servants or agents) arising out of the services rendered by the fire consultant/s or local government authority.

BIO DIVERSE SOLUTIONS

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1. Executive Summary

Ardess 1607 Pty Ltd commissioned Bio Diverse Solutions (Environmental Consultants) to prepare an Environmental Assessment Report (EAR) and Land Capability Assessment (LCA) to guide all future environmental management for the proposed subdivision of Lot 10 Chester Pass Road and Lot 521 Mercer Road, Albany WA.

This EAR and LCA describes the relevant environmental characteristics of the site and presents management and mitigation strategies in response to potential environmental impacts. These management and mitigation strategies aim to minimise the potential impact on the environmental values within the site.

The Local Structure Plan (LSP) has been developed to guide the subdivision and development of the Subject Site (Appendix A). The LSP for the site proposes an extension of the adjacent light industrial area, a residential zone which includes are range of residential densities, a primary school and three POS areas. The proposed light industrial area will require on-site effluent disposal, where as the residential area will be developed once reticulated sewerage has been established in the area. This EAR and LCA identifies the measures proposed to mitigate and manage the environmental features of the site, and focuses on the natural areas to be retained within the LSP.

The Subject Site was found to have no significant environmental constraints. A geotechnical investigation conducted by Great Southern Geotechnics (2017) under late winter conditions did not encounter groundwater to depth of 2.3m across the site. Soil type across the majority of the site was found to be sandy gravel over sandy clay with low permeability and high PRI. A small area in the southern central portion of the site was found to have silty sand over gravelly sand with a low PRI. There is no significant waterways, wetlands or groundwater resources within the Subject Site or within the vicinity of the Subject Site.

The vegetation across the Subject Site and surrounding areas is consistent with rural farmland, with the majority of the site and surrounds comprising of heavily grazed pasture dominated by pasture grass species. There are two areas of remnant vegetation within the Subject Site. A broad scale vegetation survey of these two areas was conducted with the strip of vegetation running parallel with the northern boundary of the site (approximately 12 ha in size) found to comprise of Low Open Jarrah/Marri/Sheoak Forest in good condition and the small area of remnant vegetation in the south-east corner comprising of mixed Eucalypt Forest in a degraded condition.

A BAL Contour Plan was prepared by Bio Diverse Solutions to identify the bushfire risks associated with the site (Appendix D) and guide the Structure Plan development. The Subject Site was assessed as having internal areas of Grassland Type G consistent with rural farmland, low fuel/non- vegetated areas (associated with the industrial area, tracks/roads and buildings) and an area of Forest Type A (being the strip of remnant vegetation in the north). External bushfire risks are mostly associated with the Forest Type A (CoA Reserve) directly to the east and south-east of the Subject Site and Forest Type A and Woodland Type B along the Mercer Road Reserve. BAL contouring across the Subject Site has allocated BAL 29 or less shall apply to any buildings within the lots. All future buildings (through subdivision designs) can achieve an APZ area associated with a BAL allocation of BAL 29, BAL 19 or BAL 12.5. A detailed Bushfire Management Plan has not been prepared for the site. The publicly released Bushfire Prone Area Mapping (DFES, 2017) shows that the majority of the Subject Site is located within a Bushfire Prone Area (situated within 100m of >1 ha of bushfire prone vegetation). Where “High risk” or “Vulnerable land uses” (Primary school), as defined by SPP 3.7 are proposed, detailed Bushfire Management Plans are to be prepared.

A Land Capability Assessment (LCA) of the site was conducted in accordance with the State Planning Commission’s (1989) Land Capability Assessment for Local Rural Strategies (note these definitions are as per this policy for the purposes of this report and not any other planning instrument/policy). The overall capability of the Subject Site supporting the Urban Development land use was rated as highly capable for Mapping Unit 1 and very highly capable for Mapping Unit 2. The overall capability of the Subject Site supporting the Light

Rural Industrial (as per WAPC, 1989) land use is rated as highly capable for Mapping Unit 1. Mapping Unit 2 was not encountered at the location of the proposed Light Rural Industrial land use. The degree of limitations for both Urban Development and Light Rural Industry for Mapping Unit 1 and Mapping Unit 2 is low to very low.

This EAR and LCA report provides details of the ASS, Water, Waste Water, Flora, Fauna and Fire Management strategies proposed to be implemented across the site as it is developed to ensure adequate protection of environmental, life, property and biodiversity assets.

The proposed LSP recognises the importance of the key environmental and landscape attributes of the area, and incorporates these in an urban form, that creates an environmentally responsive urban development that meets the EPA and City of Albany's environmental requirements. Consequently, the environmental outcomes of the proposed LSP are considerable and include:

- Providing an improvement in groundwater and surface water quality through residential and industrial development and implementation of water sensitive urban design and best stormwater drainage management practices.
- Revegetation using native species (where currently there is very little native species and diversity) in areas of POS to promote fauna habitat and flora diversity. Landscaped urban areas to promote biodiversity using native plants.
- Maintaining areas of remnant vegetation and limiting access points through these areas to the subdivision to prevent adverse impacts particularly for transient fauna.
- The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017).
- As Light industrial land use is proposed in the west of the Structure Plan, a detailed Bushfire Management Plan will be required to guide developers if any industry is defined as "High Risk".
- A detailed Bushfire Management Plan jointly endorsed by DFES and CoA will be required for any Primary School proposed in the Structure Plan area, at the Development Application stage. A Bushfire Emergency Evacuation Plan (BEEP) will be required at Development Approval Stages.
- The proposed light industrial area is deemed appropriate for effluent disposal and meets the state's minimum requirements for on-site sewage disposal systems as outlined in the *Draft Government Sewerage Policy* (Department of Planning, 2016). Where on-site sewage disposal is to be provided by a secondary treatment system, the WAPC will require a notification on title pursuant Section 70A of the *Transfer of Land Act 1893* (as amended) advising that an on-site secondary treatment sewage disposal system and unencumbered area to which treated sewage is to be distributed are required.
- Provide vegetated buffer and / or other management techniques between industrial areas to sensitive land uses (such as residential) in accordance with the EPA's (2015) Draft Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses.*

2. Introduction

Ardess 1607 Pty Ltd commissioned Bio Diverse Solutions (Environmental Consultants) to prepare an Environmental Assessment Report (EAR) and Land Capability Assessment (LCA) to guide all future environmental management for the proposed subdivision of Lot 10 Chester Pass Road and Lot 521 Mercer Road, Walmsley WA.

This EAR and LCA describes the relevant environmental characteristics of the site and presents management and mitigation strategies in response to potential environmental impacts. These management and mitigation strategies aim to minimise the potential impact on the environmental values within the site.

2.1. Location

Lot 10 Chester Pass Road and Lot 521 Mercer Road, Walmsley WA (herein referred to as the Subject Site) is 178ha and located approximately 6km north of the Albany CBD. The Subject Site is bound by Chester Pass Road to the west, Mercer Road to the south, Terry Road to the north and a City of Albany (CoA) reserve to the east. The location of the Subject Site is shown on Figure 1.

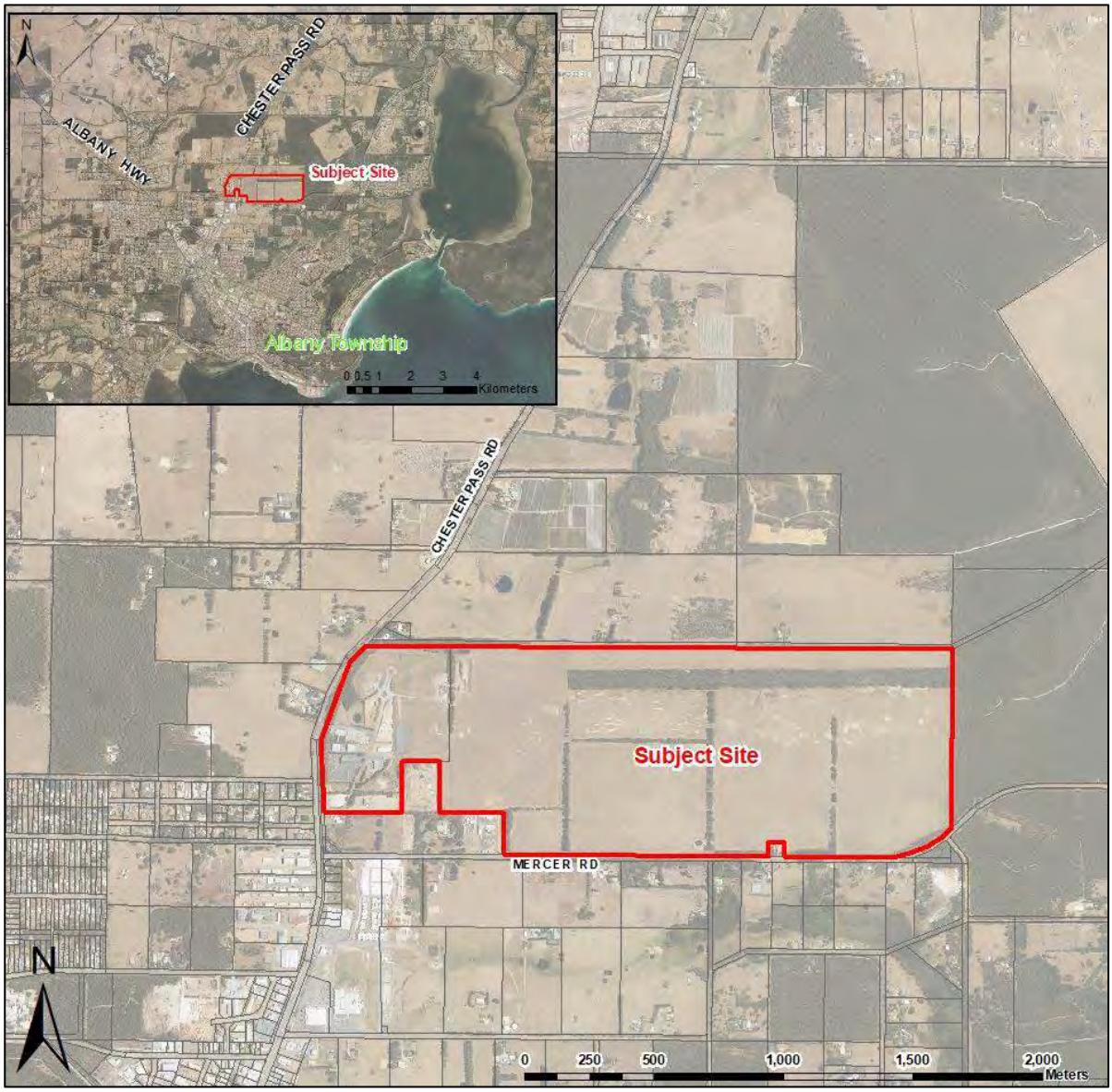

Figure 1: Location Plan

2.2. Local Structure Plan

The Local Structure Plan (LSP) has been developed to guide the subdivision and development of the Subject Site, the Draft LSP for the site has been included as Appendix A.

The proposed LSP includes the following land uses:

- Residential (R30-R60);
- Residential (R20-R30);
- Residential (R15-R25);
- Primary School Site;
- Public Open Space (POS); and
- Light Industrial.

There is no current staging plan for the LSP however the initial stage/s of the subdivision will include the extension of the existing light industrial area within the Subject Site (Ardess Industrial Estate) further to the north and east. There is currently no reticulated sewerage at the location of the Subject Site and as such the lots within the proposed Light Industrial Area will require on-site sewerage disposal and a minimum lot size of 1ha consistent with guidelines set out in the Draft Government Sewerage Policy (Gov. of WA, 2016).

Subsequent stage/s of the subdivision will include the development of the central and eastern portion of the site into a residential zone, including a Primary School and two areas of POS. Residential densities within the residential zone will range from R15 to R60. The residential zone of the subdivision will only be feasible and environmentally sustainable once reticulated sewerage has been established in the area. Therefore, there will be no on-site sewerage disposal within this area.

This EAR and LCA identifies the measures proposed to mitigate and manage the environmental features of the site, and focuses on the natural areas to be retained within the LSP.

2.3. Statutory Framework

Development within the site is required to comply with relevant environmental legislation, policy and guidelines. This document and the recommendations contained within are aligned to the following key state and Commonwealth legislation and regulations;

- *Environmental Protection Act 1986*;
- *Environmental and Protection and Biodiversity Conservation Act 1999 (EPBC Act);*
- *Environment Protection and Biodiversity Conservation Regulations 2000*;
- *Conservation and Land Management Act 1984;*
- *Conservation and Land Management Regulations 2002;*
- *Environmental Protection (Noise) Regulations 1997;*
- *State Legislation Aboriginal Heritage Act 1972;*
- *Heritage of Western Australia Act 1950;*
- *Land Administration Act 1997;*
- *Planning and Development Act 2005;*
- *Rights in Water and Irrigation Act 1914;*
- *Contaminated Sites Act 2003;*
- *Wildlife Conservation Act 1950;*
- Draft Government Sewerage Policy – Consultation Draft 2016;
- DER Acid Sulphate Soils Assessment Guidelines;
- Western Australian State Planning Policy (SPP) 3.7; and
- Guidelines for Planning in Bushfire Prone Areas 2017.

2.4. Suitably Qualified Environmental Consultants

This EAR and LCA has been prepared by suitable qualified personnel from Bio Diverse Solutions. The three qualified personnel responsible for delivery of this assessment include; Chiquita Burges (Senior Hydrologist/Environmental Consultant), Bianca Theyer (Conservation and Wildlife Biologist/Environmental Consultant) and Kathryn Kinnear (Level 2 BPAD Accredited 30794 Bushfire Consultant).

Chiquita Burges

The existing environment and general environmental management section of this report has been prepared by Chiquita Burges. Chiquita has the following Tertiary Qualifications:

- B.Sc. Natural Resource Management; and
- Graduate Certificate in Hydrogeology

Chiquita has over 8 years of experience working as a hydrologist and senior hydrologist, her experience includes preparation of local and urban water management strategies, surface water and groundwater monitoring programs and hydrogeological reports. Tasks undertaken by Chiquita include report writing, mapping, field work including installation and monitoring of groundwater bores, modelling of stormwater and groundwater and liaising with clients, sub-consultants and approving agencies. Since joining Bio Diverse Solutions in early 2017 Chiquita has diversified her skills and knowledge to include more general environmental consultancy work.

Bianca Theyer

The flora and fauna component of this assessment has been prepared by Bianca Theyer. Bianca has the following Tertiary Qualifications:

- B.Sc. Conservation and Wildlife Biology; and
- Honours Conservation Biology.

Bianca has experience in biodiversity management with direct experience including: biodiversity surveys, fauna surveys, monitoring and trapping programs (invertebrates, mammals, amphibians, and reptiles); flora surveys and vegetation assessments. Bianca has been responsible for several projects during her time at Bio Diverse Solutions, these include multiple flora (including threatened) and vegetation surveys; fauna habitat survey at Frenchman Bay, Albany; Environmental Assessment Reports for a proposed liquid waste facility, a pastured egg farm and a proposed gravel extraction project; Foreshore Management Plans for projects in South Moorlands, Bunbury and Frenchman Bay Albany; a Mosquito Management Plan for Meadowbrook Lifestyle Villages in Boyanup, and development of an Environmental Management Plan for a proposed Solar Station in Kalbarri.

Kathryn Kinnear

The bushfire assessment and management component of the assessment has been prepared by Kathryn Kinnear. Kathryn Kinnear currently has the following tertiary Qualifications:

- BAS Technology Studies & Environmental Management;
- Diploma Business Studies; and
- Graduate Diploma in Environmental Management.

Kathryn Kinnear is an accredited Level 2 Bushfire Practitioner (Accreditation No: BPAD30794) who has 10 years operational fire experience with the (formerly) DEC (1995-2005) and has the following accreditation in bushfire management:

- Incident Control Systems;
- Operations Officer;
- Prescribed Burning Operations;
- Fire and Incident Operations;
- Wildfire Suppression 1, 2 & 3;

- Structural Modules – Hydrants and hoses, Introduction to Structural Fires, and Fire extinguishers; and
- Ground Controller.

Kathryn Kinnear has also worked in environmental management for 20 years within that time she has worked on a vast range of environmental projects and has developed specialist skills in field operations, reporting and project management.

Bio Diverse Solutions are Silver Corporate Members of the Fire Protection Australia Association. Kathryn is a committee member of the WA Bushfire Working Group (FPAA) and is a suitably qualified Bushfire Practitioner to assess the bushfire risks and management strategies.

3. Existing Environment

3.1. Existing Land use

The Subject Site currently consists of multiple land uses; Lot 10 Chester Pass Road (Lot to the west) comprises of an industrial area and cleared land used to keep current and old farm machinery and sand/gravel piles. The industrial area comprises of sheds, office building, car parks, an internal road network and cleared areas for future development. Businesses within the industrial area include; Albany Freight Lines, Designer Dirt (landscaping supplies) and Ardess Nursery.

Lot 521 Mercer Road (Lot to the east) encompasses the majority of the Subject Site and comprises of predominantly cleared rural land used for grazing cattle. There are no existing dwellings on Lot 521 Mercer Road, there are two small to medium sized sheds (one used to store hay and farm machinery and the other an old shearing shed), a set of cattle yards and a strip of remnant vegetation in the north-east of the Subject Site. Land use within the Subject Site is shown on Photographs 1 to 4.

Photograph 1 – View of cleared rural land within Lot 521 Mercer Road.

Photograph 2 – View of old farm machinery within Lot 10 Chester Pass Road.

Photograph 3 – View of hay and machinery shed located in the north of Lot 521 Mercer Road.

Photograph 4 – View of internal road and roundabout within industrial area in Lot 10 Chester Pass Road.

3.2. Surrounding land uses

The Subject Site is surrounded by rural properties to the north, west and south and remnant vegetation (CoA reserve) to the east. To the south-west of the Subject Site along Chester Pass Road and adjacent to the western most section of Mercer Road is Albany's light industrial area which includes a range of businesses and a lifestyle village and on the western side of Chester Pass Road is a residential area. The surrounding areas are shown on Photographs 5 to 8.

Photograph 5 – View of Albany Business Centre along Chester Pass Road to the south-west of Subject Site.

Photograph 6 – View of rural property to the north of Subject Site.

Photograph 7 – View of City of Albany holding facilities along Mercer Road to the south of Subject Site.

Photograph 8 – View of remnant vegetation directly east of the Subject Site.

3.3. Climate

The Albany area is characterised by a Mediterranean climate with warm dry summers and cool wet winters. Rainfall data is from the nearby Bureau of Meteorology (BoM) Albany Station (Site No. 9500).

The long-term average annual rainfall is 929 mm (1877 to 2016). This average has decreased between 2000 to present, to an average annual rainfall of 879 mm, reflecting a 5% reduction compared to the long-term average, consistent with a general trend in the South West of WA. The total rainfall distribution has also altered, with a reduction of average winter monthly rainfall, but no significant reduction in average summer monthly rainfall.

The average annual pan evaporation for the Albany area is approximately 1397 mm (Luke *et al,* 1988).

3.4. Topography

Topography over the Subject Site is undulating ranging from a high point of 51m AHD in the central northern portion of the site to a low point of 22m AHD in the southern central portion of the site. There is a ridge that runs from the central northern portion of the site to the south-west corner with topography decreasing in a radial manner from the ridge. Topographic contours (1 metre contours are shown on Figure 2).

The effective slopes (measured as per AS3959-2009) for the Subject Site are flat/upslope to low ranging from 0 to 5 degrees. The effective slopes for the Subject Site and surrounding areas are shown in the BAL Contour Plan Report included as Appendix D.

3.5. Acid Sulphate Soils

Acid sulphate soils (ASS) are naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). When undisturbed below the water table, these soils are benign and not acidic (potential acid sulphate soils). However, if the soils are drained, excavated or exposed by lowering of the water table, the sulphides will react with oxygen to form sulphuric acid (EPA 2008). Acid Sulphate Soil (ASS) Risk Mapping (Figure 2) indicates the Subject Site does not sit within any known areas of ASS.

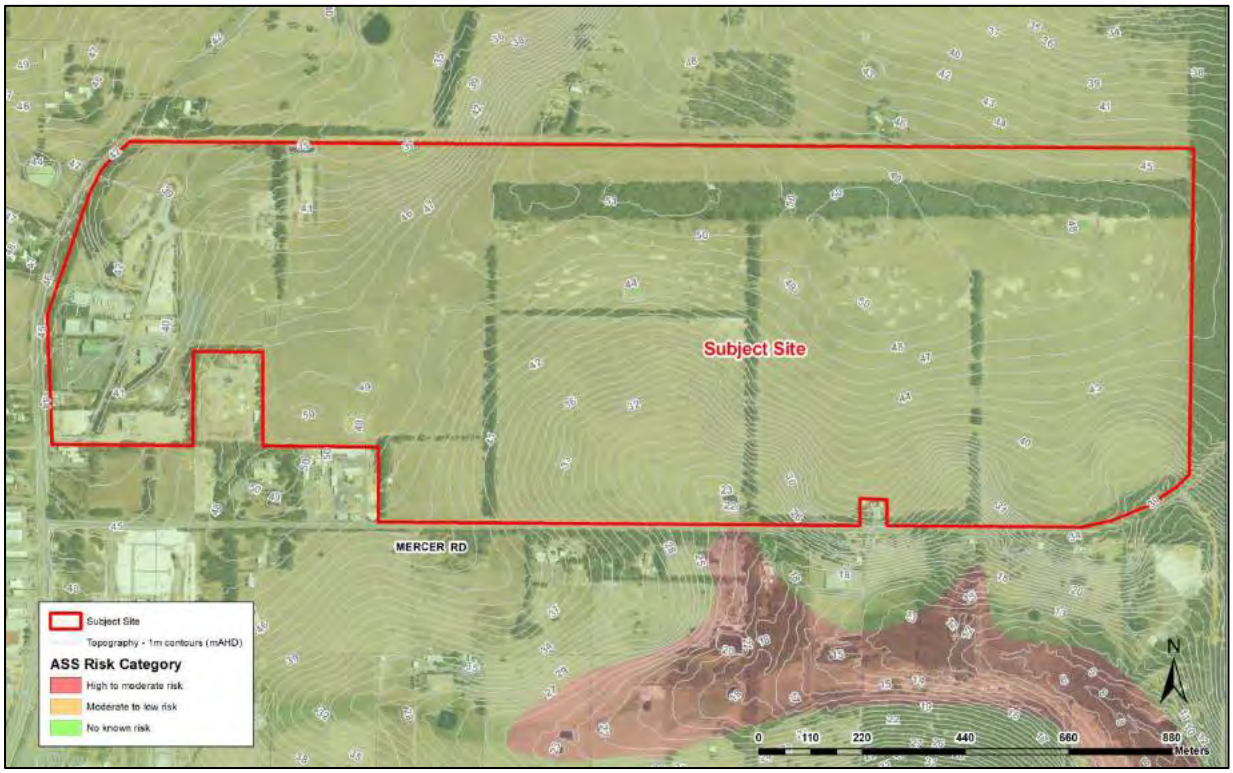

Figure 2: Topography and ASS Risk Mapping

3.6. Geology and Soils

Regolith of WA (Department of Mining, 2009) mapping indicates that soils across the Subject Site are classified as sandplain, mainly Aeolian and include some residual deposits.

A Geotechnical Investigation was conducted on the 29th of August 2017 by Great Southern Geotechnics under later winter conditions, the Geotechnical Investigation is included as Appendix B. The investigation included both soil analysis and measuring of water table. The soil testing was conducted to assess the suitability of the site for the proposed development including onsite effluent disposal for the extension of the industrial area.

Ten boreholes were constructed within the Subject Site to a depth of 2.3 metres and left open for a minimum of 1hr to identify water table present. The location of the boreholes are shown on Figure 3, lithological logs of the boreholes are shown in Appendix B.

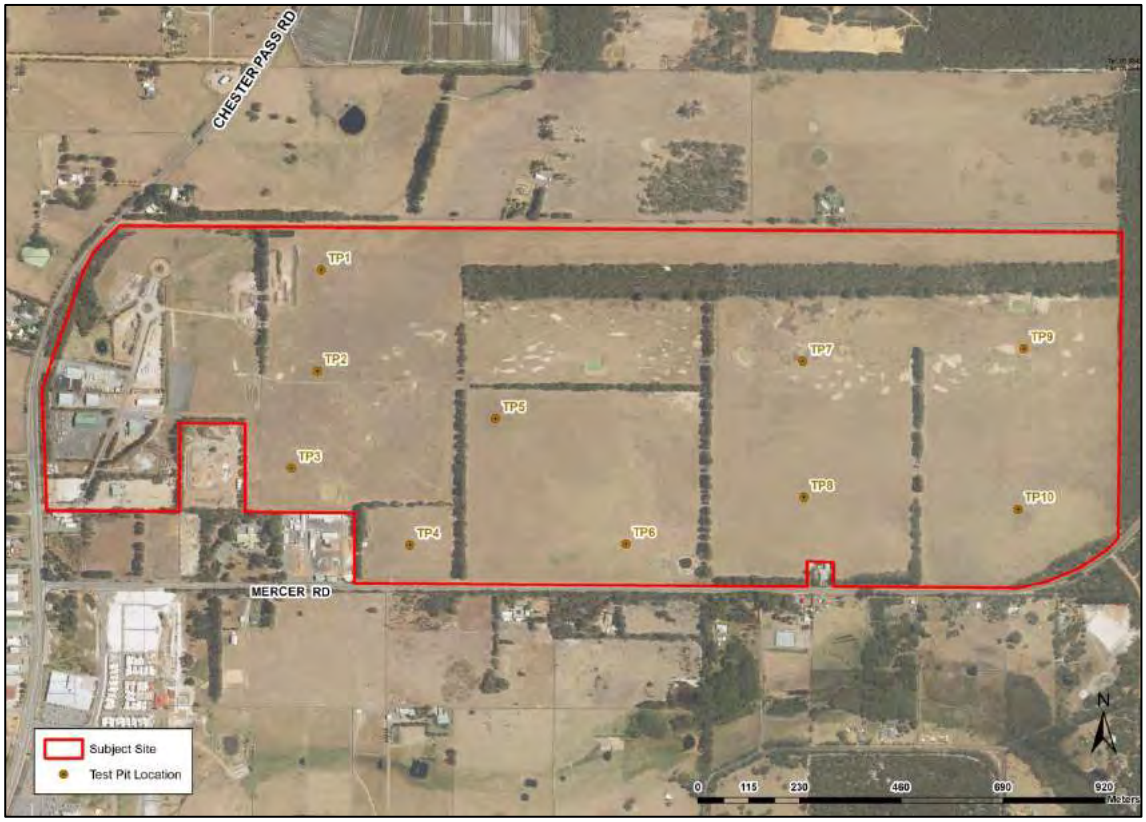

Figure 3: Borehole Locations

Soil Type

Soil testing showed that soils across the site comprised predominately of a silty sand topsoil, over sandy gravel (with a layer depth varying from 200 - 700mm), over sandy clay to the depth of the hole. This soil profile was encountered at each borehole location except TP6 and TP10. The soil profile at TP6 comprised of a silty sand topsoil, over silty sand (200 - 700mm depth), over gravelly sand (700 to 1500mm depth), over sandy gravel (1500 - 2300mm depth). The soil profile at TP10 comprised of a silty sand topsoil, over silty sand (200 - 400mm), over sandy clay (400 – 2300mm) (Great Southern Geotechnics, 2017).

Permeability

Permeability testing was conducted on TP3 (400 – 1100mm BGL) and TP10 (400 – 2300mm BGL) by Liquid Labs WA as part of the Geotechnical Investigation. TP3 recorded a permeability of 0.0035 m/day whilst TP10 recorded a permeability of 0.0015 m/day (refer to Liquid Labs WA Laboratory testing in Appendix B). Permeability at both TP3 and TP10 is considered to be extremely low this is consistent with the soil type (sandy clay) encountered at these locations.

Phosphorous Retention Index

Phosphorous retention Index (PRI) is the ability of soils to absorb nutrients and heavy metals within the soil (i.e. Soil microbe disinfecting ability). Soils with a PRI less than 1 have a very poor ability to retain nutrients and heavy metals, whilst soils with a PRI of >5 having a high ability to retain nutrients and heavy metals. PRI testing was conducted by CSBP Laboratory on soil samples from TP1, TP3, TP6 and TP10. The PRI results are shown in Table 1 and Appendix C.

Table 1: Phosphorus Retention Index Results

Borehole	Depth (mm)	Soil Type	Phosphorus Retention Index
TP1	200-900	Sand with gravel	2414.5
TP3	400-1100	Sandy clay	2387.4
TP6	200-700	Silty sand	0.8
TP10	400-2300	Sandy clay	608.0

PRI results across the site varied consistent with soil type. The sandy clays found across the majority of the site (as seen at TP3 and TP10) were found to have a very high PRI and therefore a very high ability to fix nutrients and heavy metals. The sandy gravel found at TP1 also had an extremely high PRI, particularly for a sand, whereas the light grey sand found at TP6 had a low PRI and therefore a low ability of fixing nutrients and heavy metals.

3.7. Surface Water Hydrology

There are no major naturally existing drainage networks or water bodies within the Subject Site. There is one minor waterway situated in the north-western extent of Lot 10. This area will need to be managed sensitively in relation to stormwater planning within the site. Surface water generally runs off the central and eastern portions of the site in a southerly and south-easterly direction towards Mercer Road. The western portion of the site generally drains in a north westerly direction towards Terry Road and Chester Pass Road.

Hydrographic Sub-catchments (DoW, 2008) show the Subject Site to be within two surface water sub-catchments; with the northern and western portion of the site discharging to Willyung Creek to the north of the Subject Site and the central and southern portion of the site discharging to Yakamia Creek to the south of the site. Both the Willyung Creek and Yakamia Creek sub-catchments form part of the Oyster Harbour/Kalgan/King Catchment ultimately discharging to Oyster Harbour.

There are several man-made dams across the site, which are surface water fed and used for livestock drinking water. The majority of the Subject Site drains towards a dam in the central southern portion of the site, whilst the eastern rural areas drain to a large dam located in the north-east corner of Lot 521 Mercer Road.

3.8. Groundwater Hydrology and Hydrogeology

Australian Geoscience Mapping and Department of Water 250K Hydrogeological mapping places the Subject Site within the; '*Tertiary - Cainozoic - Phanerozoic (TPw) period: Plantagenet Group - siltstone, spongolite; minor sandstone, peat, and conglomerate.'* The aquifer is a *'sedimentary aquifer with intergranular porosity – extensive aquifers, major groundwater resources.*' (DoW, 2015).

A Geotechnical Investigation was conducted on the 29th of August 2017 by Great Southern Geotechnics under late winter conditions. The investigation included both soil analysis and measuring of water table. Ten boreholes were constructed within the Subject Site to a depth of 2.3 metres, the location of the boreholes is shown on Figure 3. Groundwater was not observed in any of the boreholes indicating there is no likely groundwater present beneath the Subject Site to a depth of 2.3 metres. The Geotechnical Investigation (Great Southern Geotechnics, 2017) was undertaken in accordance with Australian Standards and has been included as Appendix B.

The subject site is not located within a Public Drinking Water Source Protection Area (DoW 2001).

3.9. Wetlands

There are no significant wetlands within or within the vicinity of the Subject Site.

3.10. Sewerage Sensitive Area

The Subject Site is located in a Sewerage Sensitive Area according to the Department of Planning's Sewerage Sensitive Area Mapping (DoP, 2017). The draft Government Sewerage Policy (2016) describes Sewerage Sensitive Areas, as areas; '*within 10 kilometres of Wilson Inlet, Torbay Inlet, Manarup Lagoon, Lake Powell, Princess Royal Harbour and Oyster Harbour'.*

3.11. Flora and Vegetation

The Subject Site lies within the Jarrah Forest IBRA bioregion. Hearn et al (2002) describes the bioregion as; '*Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Wandoo - Marri woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands.'*

The vegetation has been mapped on a broad scale by J.S. Beard (Shepherd et al 2002) in the 1970's, where a system was devised for state-wide mapping and vegetation classification based on geographic, geological, soil, climate structure, life form and vegetation characteristics (Sandiford and Barrett 2010). A GIS search of J.S. Beards (DEC, 2005) vegetation classification places the Subject Site within one System and Vegetation Association (Source DEC Pre-European Vegetation GIS dataset, 2005):

- **System Association Name:** Albany.
- **Vegetation Association Number:** 3.
- **Vegetation Description:** Low forest; jarrah, *Eucalyptus staeri* & *Allocasuarina fraseriana.*

The Albany Regional Vegetation Survey (ARVS) undertaken by Sandiford and Barret in 2010 identified the vegetation within the Subject Site as belonging to the Jarrah/Marri/Sheoak Laterite Forest unit. This unit is described as occurring on well drained shallow loamy/sandy soil with outcropping laterite (Sandiford and Barret, 2010). Key defining features of this vegetation type are a canopy of *Eucalyptus marginata* and *Allocasuarina fraseriana* over a relatively open and diverse understorey. The understorey is dominated by *Bossiaea linophylla, Agonis theiformis* and *Xanthosia rotundifolia. Banksia grandis* is often present within this vegetation type as a tall shrub. Common identifying species of the open sedge component of this vegetation type are *Tetraria octandra, Tetraria capillaris, Desmocladus fasciculatus* and *Anarthria prolifera* (Sandiford and Barret, 2010). Furthermore, this vegetation type has been assessed as having a modified condition (Thackway and Leslie, 2006) (equivalent to "good to very good" on the Keighrey (1994) Condition Scale) whereby the native vegetation community structure, composition and regenerative capacity is intact, but is perturbed by land use / land management practices (Thackway and Lesslie 2006). ARVS Mapping within the Subject Site and its vicinity is shown on Figure 4.

A search of publicly available databases through WA Atlas, Nature Map, and EPBC Protected Matter Search Tool indicates that no threatened, priority or declared rare flora is present on the site, or within the surrounding Nature Reserves and remnant vegetation.

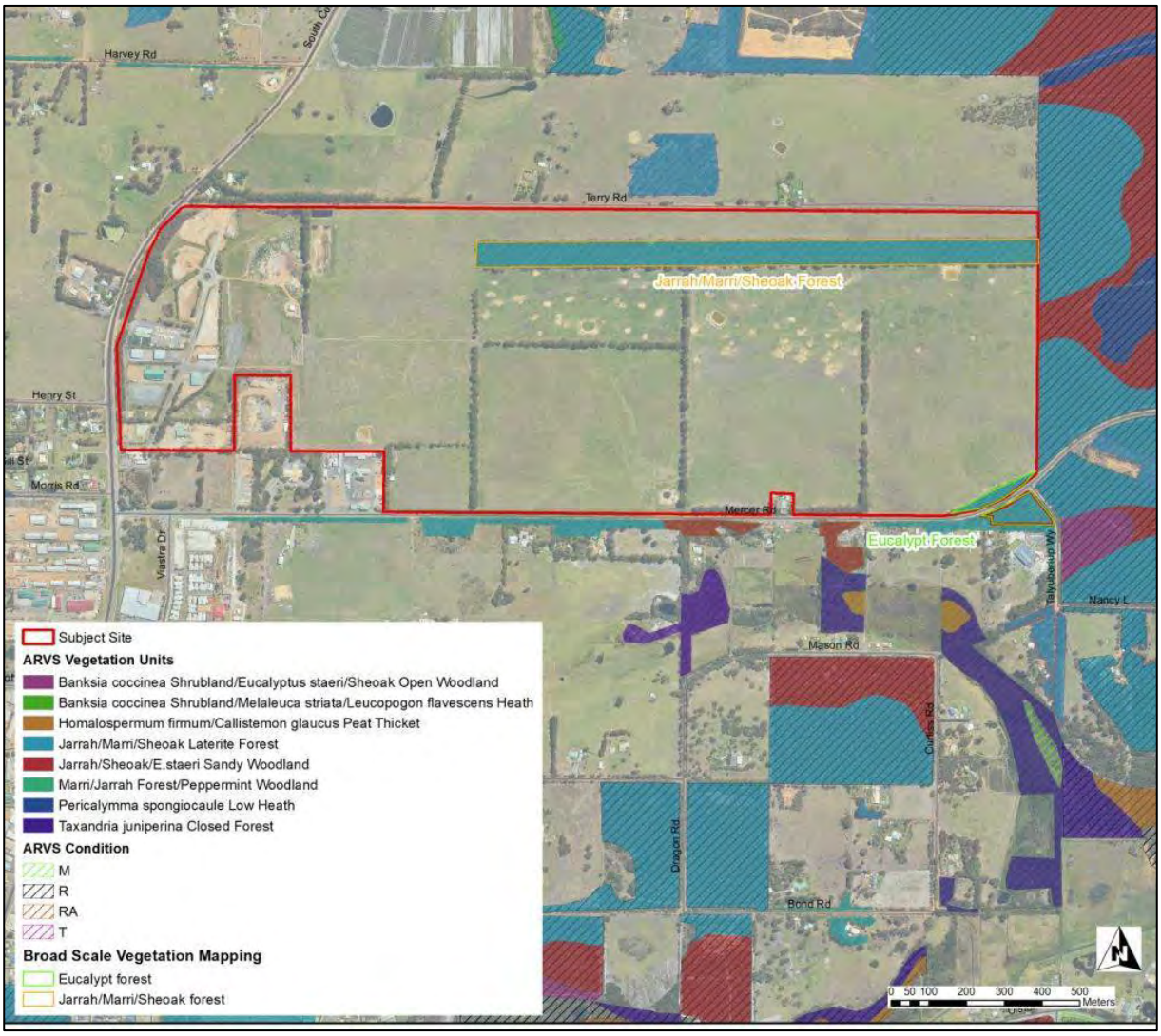

Figure 4: ARVS & Broad Scale Vegetation Survey Mapping

3.12. Vegetation Survey

The vegetation across the Subject Site and surrounding areas is consistent with rural farmland, with the majority of the site and surrounds comprising of heavily grazed pasture dominated by pasture grass species. There are two areas of remnant vegetation within the Subject Site, a strip of vegetation running parallel with the northern boundary of the site (approximately 12 ha) and a small area in the south-eastern corner of the site on either side of Mercer Road.

As part of this EAR a broad scale vegetation survey was conducted on the 29 August 2017 on the two areas of remnant vegetation. Two vegetation types were identified; the strip of vegetation in the north was identified as Jarrah/Marri Sheoak Forest and the vegetation in the south-east corner was identified as Eucalypt Forest. Broad scale Vegetation Mapping is shown on Figure 4. As per the Draft Structure Plan the internal remnant vegetation is to be retained as Public Open Space (POS).

Jarrah/Marri/Sheoak Forest

This area was previously described as being Jarrah/Marri/Sheoak Laterite Forest by Sandiford and Barrett (2010). The species identified during this survey are consistent with the ARVS vegetation type. The overstorey composition consisted of *Eucalyptus marginata, Allocasuarina fraseriana, Corymbia calophylla* and occasional patches of *Eucalyptus cornuta* and *Banksia grandis.* Midstorey species identified were *Agonis flexuosa, Bossiaea linophylla, Beaufortia decussata, Hakea amplexicaulis, Persoonia longifolia, Leucopogon verticillatus, Xanthorrhoea platyphylla, Bossiaea dentata, Hakea ruscifolia, Xanthosia rotundifolia, Tetratheca setigera, Sphaerolobium alatum (?), Hovea chorizemifolia, Hibbertia sp.,* and *Pimelea sp.* Understorey species

identified included natives such as *Chamaescilla corymbosa var. corymbosa, Dampiera sp., Lomandra sp.,* and *Conostylis sp.,* as well as weed species such as **Cirsium sp., *Olaxis sp., *Cenchrus clandestinus, and *Hypochaeris sp.* (* Denotes weed species). Based on the species composition observed during the survey this vegetation type is still consistent with ARVS.

The condition of this strip of vegetation varied throughout its extent with condition improving closer to the fenced remnant vegetation to the east. The western half of the strip was quite open, with very few midstorey species and a high proportion of sedges and grasses with areas of bare ground. This is likely due to grazing pressures from cattle. There was evidence of cattle activity throughout this area with cattle tracks, hoof prints and cow dung detected. There were areas where midstorey and understorey vegetation increased with fewer signs of disturbance present. Vegetation in this unit is considered to be in very good condition as there are obvious signs of disturbance to the vegetation structure from cattle grazing, weeds and human disturbances (Keighrey, 1994). Photographs 9 to 12 show images of Jarrah/Marri/Sheoak Forest within Subject Site.

Photograph 9 to 12 – View of Jarrah/Marri/Sheoak Forest within Subject Site

Eucalypt Forest

This area of vegetation was mapped in the ARVS as Jarrah/Marri/Sheoak Laterite Forest, however during this survey few species associated with this vegetation type were identified, there were also a high proportion of weed species were identified. The overstorey composition consists of *E. marginata*, *Eucalyptus gomphocephala, A. fraseriana, C. calophylla, Eucalyptus megacarpa, *Acacia longifolia, *Acacia dealbata, Eucalyptus sp.,* and **Pinus radiata* (* Denotes weed species). The midstorey composition was far less diverse than the northern strip of vegetation. Species identified included *Callistemon sp., Beaufortia decussata, Leucopogon verticillatus, Leucopogon sp., Pimelea sp., Hibbertia sp., Adenanthos cuneatus, Hemiandra pungens,* and *Chamelaucium ciliatum*. There were very few understorey species present, with most of the area covered with plant litter, of the groundcover/understorey species present these were weed species such as Kikuyu and *Watsonia sp*.

Vegetation condition within this area is considered to be degraded as the basic vegetation structure has been severely impacted by multiple disturbances such as aggressive weed species and clearing activities (Keighrey, 1994). Evidence of clearing was observed during this survey as several trees and larger shrubs had been cut down. Photographs 13 to 16 show images of Eucalypt Forest within Subject Site.

Photograph 13 to 16 – View of Eucalypt Forest within Subject Site.

3.13. Fauna

The majority of the site has been historically and extensively cleared and as a consequence significant fauna habitat has been removed. Opportunistic Fauna sightings were recorded during the Broad Scale Vegetation Survey on the two areas of remnant vegetation within the Subject Site.

3.13.1. Opportunistic Fauna Sightings

During the Broad Scale Vegetation Survey of the strip of remnant vegetation in the north of the Subject Site various birds were observed and heard within the Jarrah/Marri/Sheoak Forest such as Red-Capped Parrot (*Purpureicephalus spurius*), Galah (*Eolophus roseicapillus*), Willie Wagtail (*Rhipidura leucophrys*), New Holland Honeyeater (*Phylidonyris novaehollandiae*), Yellow rumped Thornbill (*Acanthiza chrysorrhoa*), Western Gerygone (*Gerygone fusca*), Rufous Whistler (*Pachycephala rufiventris*) and Magpie (*Cracticus tibicen*). A flock of 6-10 Forest Red-tailed Black Cockatoos (*Calyptorhynchus banksii naso*) were observed feeding in the adjacent remnant vegetation to the east of the Subject Site. A potential Quenda (*Isoodon obesulus fusciventer*) runnel was identified within the understorey of the Jarrah/Marri/Sheoak Forest (Photograph 17). Western Grey Kangaroos (*Macropus fuliginosus*) were also observed.

Photograph 17 – Potential Quenda Runnel within Subject Site remnant vegetation.

3.14. Contaminated Sites

A review of the DER's Contaminated Sites Database determined there are no registered contaminated sites within the Subject Site. However, prior to subdivision further investigations may be required to confirm there is no potential contamination on the site.

3.15. Heritage

A search of the Department of Aboriginal Affair's Aboriginal Heritage Inquiry System was conducted and no matches were recorded for the Subject Site or within the vicinity of the Subject Site.

A search of the Heritage Council's inHerit database and the City of Albany's Municipal Heritage Inventory (City of Albany 2000) was conducted with no matches found for the Subject Site or its surroundings.

3.16. Bushfire Risks and Bushfire Assessment

The publicly released Bushfire Prone Area Mapping (DFES, 2017) shows that the majority of the Subject Site is located within a Bushfire Prone Area (situated within 100m of >1 ha of bushfire prone vegetation). Bushfire Prone Area Mapping is shown on Figure 5.

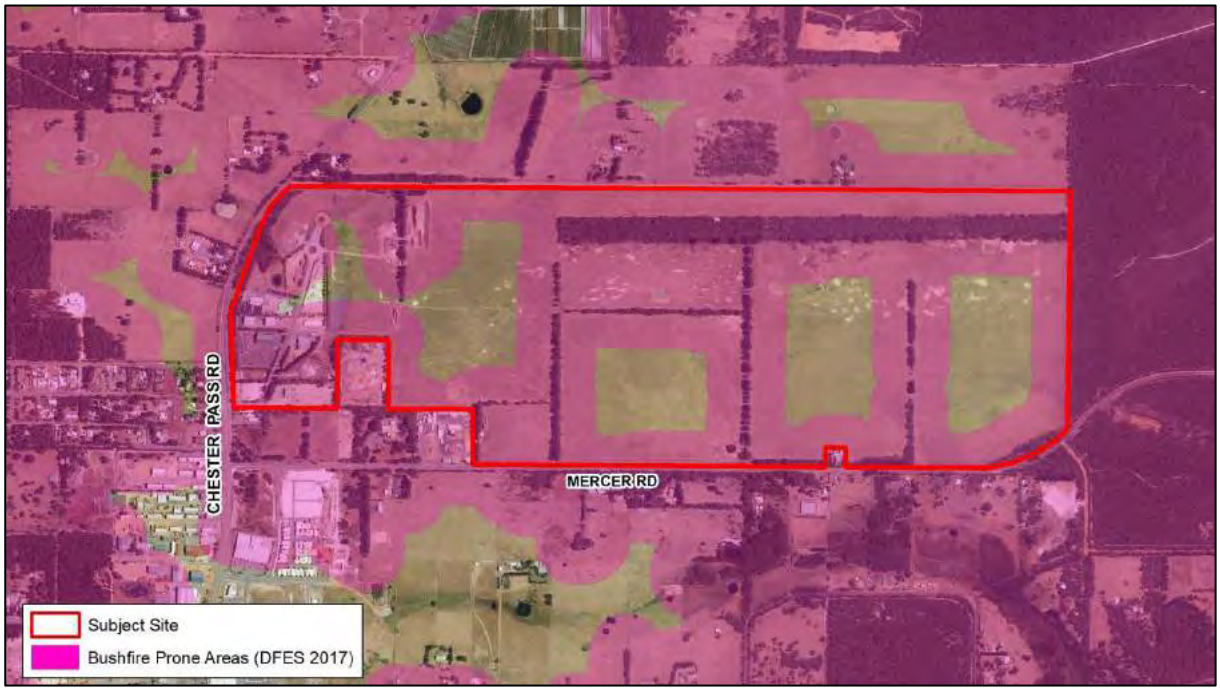

Figure 5: Bushfire Prone Area Mapping

A BAL Contour plan has been prepared for the site by Level 2 Bushfire Practitioner K. Kinnear (BPAD 30794). The BAL Contour Plan has been included as Appendix D. All vegetation within 150m of the site boundary/ proposed development was classified in accordance with Clause 2.3 and Exclusions as per Clause 2.2.3.2 of AS 3959-2009. Each distinguishable vegetation plot with the potential to determine the Bushfire Attack Level is identified in the BAL Contour document. Each plot is representative of the Vegetation Classification to AS3959-2009 Table 2.3 and shown on the Vegetation Classification Mapping (Appendix D).

The Subject Site was assessed as having internal areas of Grassland Type G consistent with rural farmland, low fuel/non- vegetated areas (associated with the industrial area, tracks/roads and buildings) and an area of Forest Type A (being the strip of remnant vegetation in the north). External bushfire risks are mostly associated with the Forest Type A (CoA reserve) directly to the east and south-east of the Subject Site and Forest Type A and Woodland Type B along Mercer Road (Bio Diverse Solutions, Appendix D).

The Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) outlines bushfire protection criteria which subdivision and development proposals are assessed for compliance. The bushfire protection criteria

(Appendix 4, WAPC, 2017) are performance based criteria utilised to assess bushfire risk management measures and they outline four elements, being:

- Element 1: Location
- Element 2: Siting and Design of Development;
- Element 3: Vehicle Access; and
- Element 4: Water.

(WAPC, 2017)

The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017). The proposal will be assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4.

Acceptable Solution A1- Location

It is recommended to guide the development of the LSP that the minimum separation apply to achieve BAL 29 or less on the future dwellings (as shown on the BAL Contour Plan):

- 21-27m Forest Type A;
- 14-17m Woodland Type B;
- 13-15m Scrub Type D; and
- 8-9m Grassland Type G.

This will ensure that Acceptable Solution 1 is achieved by setbacks to BAL 29 applied through the design and layout of the road reserves and (if required) building setbacks.

Acceptable Solution A2 – Siting and design

All buildings within the Structure plan shall have an Asset Protection Zone (APZ) area associated with BAL 29 or less. Setbacks for dwellings associated with the BAL Contours can be applied through the road design from external and internal bushfire risks. Future landscaped areas (internal shall below fuel in nature and maintained areas. The internal POS area in the north shall remain as native vegetation and the internal road design will ensure BAL 29 or less prevails over the proposed dwellings.

Any future plantings in POS areas (excepting the northern POS) are to be to a APZ standard as per WAPC requirements. The developer will be responsible for implementing revegetation standards as per APZ standards. New lot owners are to conform to any planting on their lot for revegetation, screening or windbreaks to APZ standards.

Staged construction is to ensure that separation distances to residential areas are maintained, as a guide 100m from any residential building should be maintained as low fuel areas (i.e. maintained by the Developer) to ensure that BAL does not apply from current land management practises to the proposed residential areas.

Acceptable Solution A3 – Vehicular Access

The internal road layout should ensure that every lot has the ability to exit the Structure Plan in two separate directions to a minimum of two destinations. Cul-de-sacs and battle axes are not recommended. The minimum technical requirements for public roads are shown in Table 9.

Table 9: Vehicular Access Technical Requirements (WAPC, 2017)

Technical requirements	Public Road
Minimum trafficable surface (m)	*6
Horizontal clearance (m)	6
Vertical clearance (m)	4.5
Maximum grades	1 in 10
Minimum weight capacity (t)	15
Maximum crossfall	1 in 33
Curves minimum inner radius (m)	8.5
Maximum Length	N/A

Fire Service Access and Emergency Access Way will be along the internal road network and will not be required separately. Staged development should include road network construction to ensure that no one-way or dead-end streets occur. Firebreaks are to be maintained on the parent lot according to CoA Fire Management Notice (annually updated). Compliance to these issues will ensure the Acceptable Solution A3 (1-8) can be achieved.

Acceptable Solution A4 – Water Supply

The development will be provided with reticulated scheme water in accordance with the specifications of the relevant water supply authority (Water Corporation WA (WCWA)) and DFES requirements. This will be detailed in the detailed engineering drawings and be subject to approval from WCWA and DFES at subdivision condition stages, meeting the Acceptable Solution. Fire hydrant (street) outlets are required, these must be installed to WCWA standards installed in accordance with the *Water Corporation's No 63 Water Reticulation Standard* and are to be identified by standard pole and/or road markings and installed by the Developer.

The Structure Plan is deemed compliant to this Acceptable Solution 4.1.

Overall Fire Management for the site

BAL contouring across the Subject Site has allocated BAL 29 or less to apply to any buildings and can be guided by the Structure Plan design. Setbacks from bushfire risks is to be maintained through road reserves and building setbacks. The inherent bushfire risks for the site is the internal strip of vegetation in the north and the remnant vegetation contained in CoA reserve to the east. Minimum setbacks to achieve BAL 29 in these areas is 21m (northern strip of remnant vegetation) and 27m (eastern CoA reserve). All future buildings can achieve an APZ area associated with a BAL allocation of BAL 29, BAL 19 or BAL 12.5.

Vehicle access standards can be achieved through the Structure Plan design. The minimum technical requirements for Public Roads is to meet Table 9. No Battle axes are proposed and FSA will be along the public road network. One Cul-de-sac is proposed near the intersection of Range and Terry Road, as the CoA seek to minimise new intersections to Range Road and the eastern extents of Terry Road. Where the cul-de-sac is present, an EAW is shown connecting to Range Road ensuring compliance to Element A3.3 of Acceptable Solution A3. Reticulated water will be provided water in accordance with the specifications of the relevant water supply authority WCWA and DFES requirements, meeting A4.1.

A detailed Bushfire Management Plan will be required if any industry is defined as "High Risk" or to support a future Development Application for the Primary School. Additionally, a detailed Bushfire Management Plan may be required to support the staged development of the subdivision.

High Risk Land use and Vulnerable Land Uses

The LSP contemplates potential "High Risk" land use (light industry) and "Vulnerable Land Use" as per the definitions of SPP 3.7. As defined by the Guidelines for Planning in Bushfire Prone areas Vers1.2 (2017):

"High-risk land uses may include, but are not limited to: service stations, landfill sites, bulk storage of hazardous materials, fuel depots and certain heavy industries as well as military bases, power generating land uses, saw-mills, highways and railways, among other uses meeting the definition.

Proposals for non-residential, high-risk land uses in bushfire prone areas are to comply with policy measure 6.6 which requires a Bushfire Management Plan jointly endorsed by the local government and the Department of Fire and Emergency Services. This may include establishing an appropriate Asset Protection Zone or Hazard Separation Zone, and should be supported by a risk management plan that addresses bushfire risk management measures for any flammable on-site hazards."

As Light industrial land use is proposed in the west of the Structure Plan, a detailed Bushfire Management Plan will be required to guide developers if any industry is defined as "High risk".

Policy measure 6.6 of SPP 3.7 applies to vulnerable land uses, and refers specifically to subdivision and development applications. However, if a scheme amendment or structure plan identifies a site for a vulnerable land use, then the policy requirements should be addressed. Typically, vulnerable land uses are those where persons may be less able to respond in a bushfire emergency. A detailed Bushfire Management Plan jointly endorsed by DFES and CoA will be required for any Primary School proposed in the Structure Plan area at the Development Application stage. A Bushfire Emergency Evacuation Plan (BEEP) will be required at Development Approval Stages.

4. Land Capability Assessment

Land capability is the ability of the land to sustain a specified land use without resulting in significant onsite or offsite degradation or damage to land resources. The Land Capability Assessment of the Subject Site is completed in accordance with the State Planning Commission's (1989) Land Capability Assessment for Local Rural Strategies. The assessment is a three-stage process and includes:

Stage 1 – Land Use Requirements

- Specify and define the proposed land use;
- Determine the specific land use requirements of that use;
- List the relevant land qualities to fulfil the land use requirements; and
- List the relevant land characteristics which determine each land quality.

Stage 2 – Land Resource Survey

- Divide the study area into mapping units which have a measurable difference in the land characteristics listed above and may be expected to influence the land quality attributes and land capabilities.

Stage 3 – Land Capability Analysis

- For each mapping unit rate each individual land quality; and
- For each mapping unit determine its overall capability to sustain the land use by comparing its land quality ratings in the capability rating table.

The WAPC (1989) utilises a five-class system of assessing Land Capability, these five classes rate the degree of physical limitations associated with land use and management needed for these. The land capability classes are shown in Table 2.

Table 2: Land Capability Classes

Capability Class	Degree of Limitation	General Description
I	Very low	Areas with a very high capability for the proposed activity or use. Very few physical limitations to the specified use are present or else they are easily overcome. Risk of land degradation under the proposed use is negligible.
II	Low	Areas with a high capability for the proposed activity or use. Some physical limitations to the use do occur affecting either its productive use or the hazard of land degradation. These limitations can however, be overcome through careful planning.
III	Moderate	Areas with a fair capability for the proposed activity or use. Moderate physical limitations to the land use do occur which will significantly affect its productive use or result in moderate risk of land degradation unless careful planning and conservation measures are undertaken.
IV	High	Areas with a low capability for the proposed activity or use. There is a high degree of physical limitations which are either not easily overcome by standard development techniques or which result in a high risk of land degradation without extensive conservation requirements.
V	Very High	Areas with a very poor capability for the proposed activity or use and the severity of physical imitations is such that its use is usually prohibitive in terms of either development costs or the associated risk of land degradation.

4.1. Land Use Requirements

There are two land uses proposed for the Subject Site as defined by the State Planning Commission (1989) Urban Development and Light Rural Industry (note these definitions are as per this policy for the purposes of this report and not any other planning instrument/policy). The location of the two proposed land uses is shown on the LSP in Appendix A, with "Urban Development" shown as "Residential" and "Light Rural Industry" shown as "Light Industry".

4.1.1. Urban Development

The WAPC Land Capability Assessment for Rural Strategies Guideline defines Urban Development areas as follows;

'Urban use consists of mostly residential development, but includes the use of land for extensive building complexes (such as shopping centres and offices). Urban development is an intensive form of land use which requires a high level of servicing and site disturbance.

Services include sealed and kerbed roads and carparks, storm water drainage and underground services (including reticulated water, gas and telephone connections) to cater for single housing allotments in the order of 500-700m^2 but also up to 2000 m^2.

The Water Authority's Country Sewerage Policy indicates that deep sewerage should be provided where it is already provided within the town, or where soil, land and environmental factors specifically indicate it should be provided. Deep sewerage may not need to be provided if there are no environmental or public health problems arising from the operation of on-site septic tanks.'

The WAPC Land Capability Assessment for Rural Strategies Guideline identifies land use requirements for Urban Development areas as follows;

- Availability of extensive flat to gently sloping areas (preferably 0-2% but up to 8%);
- Deep well drained soils which are easy to excavate and provide a stable foundation for building;
- Disposal of liquid effluent via a treatment plant or from onsite septic tanks should not result in pollution of surface water bodies or groundwater resources;
- Urban stormwater is often highly polluted (high in BOD, nutrients, heavy metals and hydrocarbons) and may need to be treated to prevent point source pollution at the disposal site; and
- Urban development results in increased stormwater runoff which may raise the level of the unconfined water table or result in soil instability where steep slopes occur. The land should therefore not be subject to slumping/ landslips, water logging or water erosion.

Table 3 outlines the land qualities to fulfil the Urban Development land use requirements. The land characteristics for each land quality are shown in the guideline document (WAPC 1989).

Table 3: Land Qualities to fulfil Urban Development Land Use Requirements

Land Qualities	**Rating**				
Ease of excavation, x	Very high	High	Moderate	Low	Very Low
Foundation stability, b	Very high	High	Moderate	Low	Very Low
Water logging hazard, i	Low		Moderate	High	Very high
Water erosion hazard, e	Low		Moderate	High	Very high
Soil salinity, y	Very Low	Low	Moderate	High	
Soil absorption ability, a	High	Moderate	Low	Very Low	
Wind erosion hazard, w			Low	Moderate	High-Very high
Bushfire hazard, z	Very Low	Low	Moderate	High	Very high
Wave erosion hazard, u					High – Very high
Flood hazard, f	Very low				High -Very high
Water pollution hazard, s			Low	Moderate	High
Water availability, g	High			Moderate	Low
Overall capability rating	**I**	**II**	**III**	**IV**	**V**

4.1.2. Light Rural Industry

The WAPC Land Capability Assessment for Rural Strategies Guideline defines Light Rural Industry areas as follows;

'This land use comprises mixed industrial uses (such as light industry, agriculture support industries) often with showroom/warehouse developments along major roads on the periphery of towns. These industries are generally controllable. The activities are mostly undertaken in warehouses or factories, while the external area, being used for traffic circulation, storage and display purposes, is generally cleared of all vegetation and compacted or sealed. Lot sizes may vary considerably but are often about 2000 m^2. These areas may be deep sewered (especially if the town is sewered) but this is generally not a requirement. A reticulated water supply is provided to each lot.'

The WAPC Land Capability Assessment for Rural Strategies Guideline identifies land use requirements for Light Rural Industrial areas as follows:

- Availability of extensive flat to gently sloping areas (0 - 8%);
- Deep to moderately deep well drained soils which are easy to excavate and provide a stable foundation for building. Moderately well drained soils with a slight susceptibility to waterlogging may be tolerated;
- The land should not be susceptible to flooding; and
- Disposal of septic effluent or other waste waters should not result in water pollution.

Table 4 outlines the land qualities to fulfil the Light Rural Industry land use requirements. The land characteristics for each land quality are shown in the guideline document (WAPC 1989).

Table 4: Land Qualities to fulfil Light Rural Industry Land Use Requirements

Land Qualities	**Rating**				
Ease of excavation, x	Very high-high		Moderate	Low	Very Low
Foundation stability, b	Very high-high		Moderate	Low	Very Low
Water logging hazard, i	Low	Moderate	High	Very High	
Water erosion hazard, e	Low	Moderate	High	Very High	
Soil absorption ability, a	High	Moderate	Low	Very Low	
Flood hazard, f	Nil		High		Very high
Water pollution hazard,s	Very low	Low	Moderate	High	
Water availability, g	High		Moderate		Low
Overall capability rating	**I**	**II**	**III**	**IV**	**V**

4.2. Land Resource Survey

The land characteristics have been analysed to determine mapping units at the Subject Site for assessing land capability. The mapping units were determined using the following land characteristics:

- Soils, including: soil type, texture, depth, PRI and permeability;
- Slope;
- Depth to groundwater;
- Land use; and
- Vegetation type.

The two distinguishable Mapping Units are defined in Table 5.

Table 5: Mapping Units

Map Unit	Characteristics within the Subject Site
Map Unit 1	Silty sand topsoil over sandy gravel over sandy clay or silty sand topsoil over sandy clay. Soils have low permeability. Soils have high PRI. Groundwater > 2.3m BGL. Slope <0 to 5%. Predominately cleared land with pasture grasses. Rural land use.
Map Unit 2	Silty sand topsoil over gravelly sand over sandy gravel. Soils have low PRI. Groundwater > 2.3m BGL. Slope <0 to 5%. Predominately cleared land with pasture grasses. Rural land use.

The mapping units for the Subject Site are shown on Figure 6.

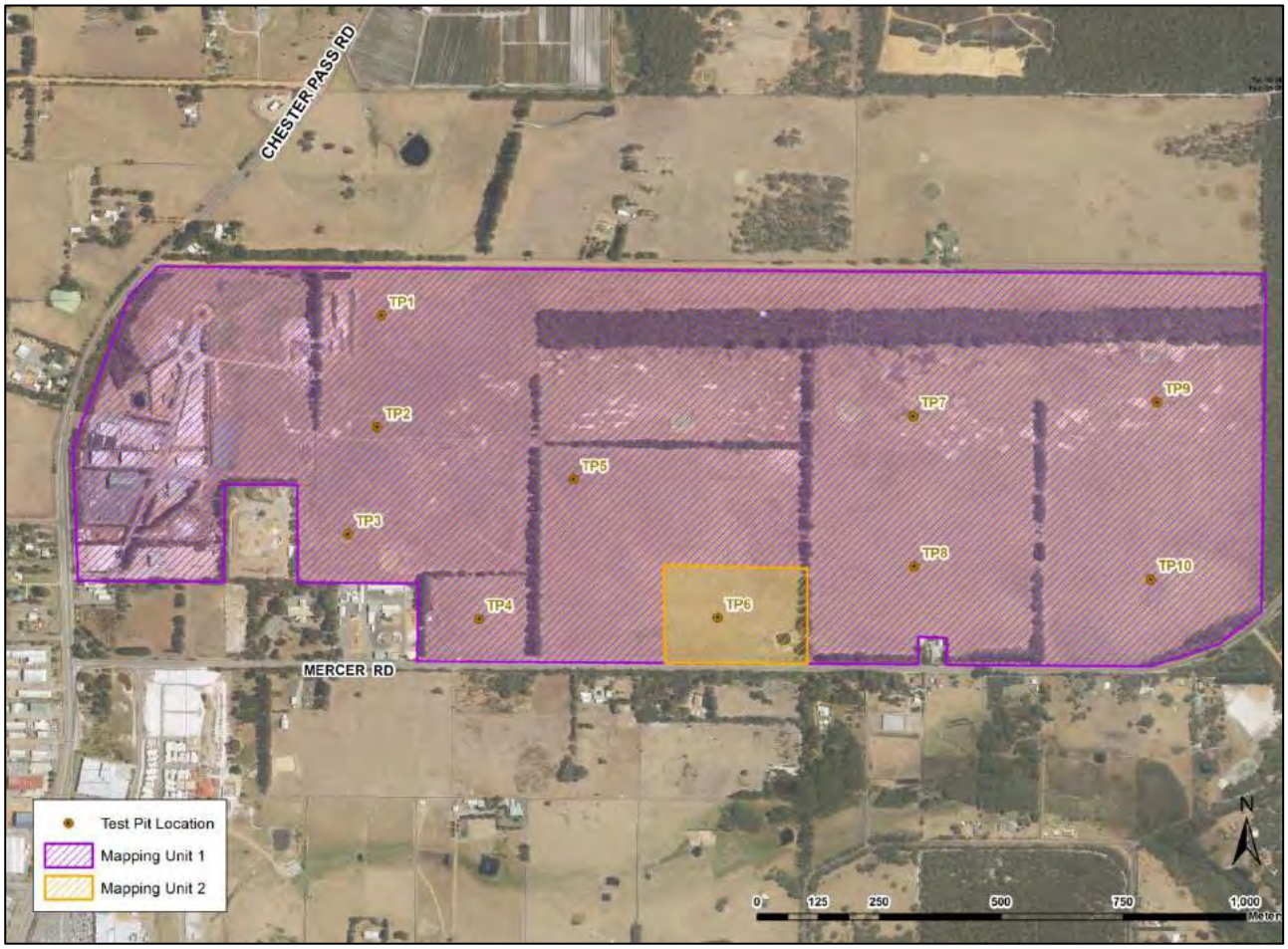

Figure 6: Land Capability Mapping Units

4.3. Land Capability Analysis

4.3.1. Urban Development

The land capability assessment for the Urban Development portion of the Subject Site is presented in Table 6. Two mapping units (Mapping Unit 1 and 2) are present in the location of the proposed Urban Development.

Table 6: Land Capability Assessment for Urban Development

Land Qualities	Mapping Unit 1	Mapping Unit 2
Ease of excavation, x	High	Very high
Foundation stability, b	High	Very high
Water logging hazard, i	Moderate	Low
Water erosion hazard, e	Low	Low
Soil salinity, y	Very Low	Very Low
Soil absorption ability, a	Moderate	Very Low
Wind erosion hazard, w	Low	Low
Bushfire hazard, z	Moderate	Moderate
Wave erosion hazard, u	Nil	Nil
Flood hazard, f	Nil	Nil
Water pollution hazard, s	Low	Moderate
Water availability, g	High (scheme water)	High (scheme water)
Overall capability rating	**II**	**IV**

The overall capability of the Subject Site supporting the Urban Development land use is rated as highly capable for Mapping Unit 1 and low capability for Mapping Unit 2 (refer to Table 2 for full description of capability rating).

4.3.2. Light Rural Industry

The land capability assessment for the Light Rural Industry portion of the Subject Site is presented in Table 7. Only Mapping Unit 1 is present in the location of the proposed Light Rural Industrial area.

Table 7: Light Rural Industry Land Capability Rating

Land Qualities	Mapping Unit 1
Ease of excavation, x	High
Foundation stability, b	High
Water logging hazard, i	Moderate
Water erosion hazard, e	Low
Soil absorption ability, a	Moderate
Flood hazard, f	Nil
Water pollution hazard, s	Low
Water availability, g	High (scheme water)
Overall capability rating	**II**

The overall capability of the Subject Site supporting the Light Rural Industry land use is rated as highly capable (refer to Table 2 for full description of capability rating).

5. Potential Environmental Impacts and Management Measures

5.1. Acid Sulphate Soils

Acid Sulphate Soils (ASS) are stable when left undisturbed, but when they are exposed to air, during excavation or dewatering, this can set off a reaction resulting in acidity (sulfuric acid) being produced. The potential impacts relate to the potential for oxidation of excavated or in situ ASS generating acidic conditions, and possibly releasing metals into groundwater or surface water catchments. ASS mapping indicates the Subject Site is not situated on any known Acid Sulphate Soils (Figure 2). There is however a section of high to moderate risk of ASS occurring within 3m of natural soil surface to the south of the Subject Site on Mercer Road.

The final fill levels and excavation requirements of the proposed subdivision will determine if an ASS and Dewatering Management Plan (ASSDMP) is required to be prepared prior to subdivision. If required, the ASSDMP will be prepared to satisfy the DER and will outline the soil management measures, the groundwater and dewatering effluent monitoring measures and the contingency management measures required to minimise any environmental impacts.

5.2. Water Management

Findings outlined in Sections 3.7 and 3.8 indicate there are limited water management risks associated with development of the Subject Land. Based on the investigations, there is no requirement to undertake pre-development groundwater monitoring. Overall, the soil types enable stormwater infiltration at source.

The water management objectives are to maintain the quantity of surface water and groundwater so that existing and potential environmental values are protected and to ensure that the quality of water emissions (surface and ground) do not adversely affect environmental values or the health, welfare and amenity of people and land uses, and meets statutory requirements and acceptable standards.

A number of management/design measures will be implemented to reduce the impact of the proposed development on surface water and groundwater flows, levels and quality, the function and environmental values of the site, or its interconnected areas. Management measures relevant to construction and the development will be identified in a Local Water Management Strategy (LWMS).

The LWMS details the integrated water management strategies to facilitate future urban water management planning. The LWMS will achieve integrated water management through the following design objectives:

- Effectively manage the risk to human life, property damage and environmental degradation from water contamination, flooding and waterlogging.
- Maintain and if possible improve water quality (surface and groundwater) within the development in relation to pre-development water quality.
- Reduce potable water consumption within both public and private spaces using practical and cost-effective measures.
- Promote infiltration of surface water on site to minimise the risk of further water quality degradation in the Catchment.
- Implement best management practices in regards to stormwater management.
- Incorporate where possible, low maintenance, cost-effective landscaping and stormwater treatment systems.

The LWMS will incorporate the following structural Best Management Practices (BMPs) to address water quantity and quality for the LSP:

- A conceptual drainage strategy demonstrating that the land is capable of retaining the 100 ARI event, while providing an indicative location of stormwater detention.

- Structural and non-structural controls will be used to improve stormwater quality, as compared to a development that does not actively manage stormwater.
- Rainfall from the 1 year 1-hour ARI (Annual Recurrence Interval) events will be retained and infiltrated as close to the source as possible.
- All residential lots will confine run-off from roofs and paving within the property boundary.
- Large rainfall events (10 ARI to 100 ARI) will be conveyed and retained through a network of roads, drainage reserves and POS within each catchment.
- It is anticipated that there will be no impacts from stormwater run-off to downstream ecosystems.

It is expected that development of the site will have a positive impact on groundwater and stormwater quality through BMPs and the treatment of stormwater prior to infiltration. Based on the site assessment and the management measures proposed, it is not expected that any changes to groundwater flows, levels or quality will have an adverse impact on the function and environmental values of the site.

5.3. Waste Water Management

The Subject Site is situated in a Sewerage Sensitive Area that does not have access to deep or reticulated sewerage. It is proposed the initial stage/s of the subdivision will involve the extension of the Light Industrial Area (similar to the existing Industrial Area) and on-site effluent disposal will be required for this area. All residential subdivision will be connected to reticulated sewerage.

The draft Government Sewerage Policy (DoP, 2016) outlines that on-site effluent disposal may be considered for non-residential subdivision that:

a) Are remote from existing or proposed sewerage schemes and the proposed development cannot be connected to reticulated sewerage;

b) Utilise secondary treatment systems with nutrient removal if in a sewage sensitive area or a public drinking water source area; and

c) Where the proponent has demonstrated, to the satisfaction of the Western Australian Planning Commission on the advice of the Department of Health and the Department of Water that there is sufficient capacity to treat and dispose of sewage and contain associated buffers on-site. Consideration will be given to the maximum hydraulic load that can be contained within the lot and the potential impacts on waterways and wetlands.

The minimum lot size for non-residential lots is determined on a case-by-case basis. Residential lots with on-site effluent disposal in sewerage sensitive areas must be at least 1 hectare in size (DoP, 2016).

The proposed industrial area as shown on the LSP was assessed against the requirements for lots with on-site effluent disposal as outlined in the draft Government Sewerage Policy (DoP, 2016). The requirements and assessment to each requirement is shown in Table 8.

Table 8: Assessment to On-site Effluent Disposal Lot Requirements

Lot Requirement (DoP, 2016)	Assessment to Requirement
Adequate separation from groundwater – the discharge point of the on-site sewage disposal system should be at least 1.2 to 1.5 metres, depending on soil type, in sewage sensitive areas.	Groundwater was not encountered to 2.3 metres depth (Great Southern Geotechnics, 2017).
An on-site sewage disposal system should not be located within 30 metres of a private bore used for household/drinking water purposes.	There are no private bores registered within the Subject Site or with in the vicinity of the proposed Industrial Area (DoW Water Register, 2017).

Table 8 continued over page.

Lot Requirement (DoP, 2016)	Assessment to Requirement
An on-site sewage disposal system should not be located within 100 metres of a waterway.	No waterways located within the Subject Site or within 100m of the proposed Industrial Area (Site inspection conducted 29/8/2017)
An on-site sewage disposal system should not be located within 100m of a significant wetland.	No significant wetlands located within the Subject Site or within the vicinity of proposed Industrial Area (DEC and CoA 2017 database search)
An on-site sewage disposal system should not be located within 100 metres of a surface or subsurface drainage system that discharges directly into a downstream waterway or waterbody.	No surface or subsurface drainage systems located within the Subject Site or within 100m of the proposed Industrial Area (Site inspection conducted 29/8/2017 and DoW database search)
An on-site sewage disposal system should not be located within any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event.	Given the relatively higher topography in the area and gradual slopes of the land inundation in the location of the proposed Industrial area is unlikely.

The assessment found that the proposed light industrial area is appropriate for effluent disposal and meets the stated minimum requirements for on-site sewage disposal systems as outlined in the *Draft Government Sewerage Policy* (Department of Planning, 2016). In addition, the low permeability and high PRI of the soils in the location of the proposed industrial area will allow for slow draining assisting the process of being fixed by soil microbes.

As the industrial area is in a sewerage sensitive area a secondary waste water treatment system with nutrient removal should be used. The provision of on-site sewage disposal systems including calculation of land application area shall be in accordance with minimum site requirements contained in Schedule 3 of the draft Government Sewerage Policy (DoP, 2016) and must be approved for use in Western Australia by the Department of Health. The Local Planning Scheme requirements for the current Light Industrial area require 'dry industry' and 'alternative treatment effluent disposal systems'.

Where on-site sewage disposal is to be provided by a secondary treatment system, the WAPC will require a notification on title pursuant to Section 70A of the *Transfer of Land Act 1893* (as amended) advising that an on-site secondary treatment sewage disposal system and unencumbered area to which treated sewage is to be distributed are required.

5.4. Flora and Vegetation

The aim of the flora and vegetation management strategy is to maintain the abundance, diversity, geographic distribution and productivity of flora at the species and ecosystem levels through the avoidance or management of adverse impacts and through improvement in knowledge.

The site's historical use for agriculture and grazing has degraded the vegetation on site and reduced the native vegetation cover to a strip of remnant vegetation in the north of the site and a small area in the south-east corner of the site. Consequently, it is anticipated that the proposed development would have very little impact on native vegetation. All efforts should be made to conserve existing native vegetation. There is support however to clear, as required, replanted vegetation which is Bluegums given they are generally unsuitable in an urban area.

The following management measures have been developed and incorporated into the LSP to reduce the likelihood of impacts to vegetation and flora. These measures have been developed with the aim of retaining the key existing biological values of the site:

- Remnant vegetation will be retained within the vegetation strip in the north of the Subject Site and in the south-east corner of the site (inclusion within POS will provide the most effective way of managing the conservation values of the native vegetation).
- Access crossings within the vegetation strip will be limited to facilitate retention and natural regeneration of vegetation.
- Use of native vegetation species in areas of POS and revegetation areas to maintain local biodiversity.

5.5. Fauna

The aim of the fauna management strategy is to maintain the abundance, diversity, geographic distribution and productivity of native fauna at the species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

As the majority of the site has been historically cleared and as a result, fauna habitat has largely been removed. The only potentially significant fauna habitat on site is within the two areas of remnant vegetation.

The following management measures have been developed and incorporated into the LSP to reduce the likelihood of impacts to native fauna:

- Regional fauna corridor will be retained through maintaining the strip of remnant vegetation in the north of the Subject Site and the vegetation in the south-east corner.
- Use of native vegetation species in areas of POS to promote habitat for native fauna species.

5.6. Fire Management

The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017). The proposal has been assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4, as per the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017).

The Subject Site was assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4. Please refer to the summary table below.

Table 9: Bushfire protection criteria applicable to the site

Element	Acceptable Solution	Applicable or not Yes/No	Meets Acceptable Solution
Element 1 – Location	A1.1 Development Location	Yes	Compliant BAL 29 or less applied to lots
Element 2 – Siting and Design	A2.1 Asset Protection Zone	Yes	Compliant, APZ in BAL 29 or less N/A
Element 3 – Vehicular Access	A3.1 Two Access Routes A3.2 Public Road A3.3 Cul-de-sacs A3.4 Battle axes A3.5 Private driveways A3.6 Emergency Access Ways A3.7 Fire Service Access Ways A3.8 Firebreaks	Yes Yes Yes N/A Yes Yes N/A Yes	Compliant two access to 2 destinations Compliant Compliant with EAW N/A Compliant Compliant N/A Compliant on parent lot
Element 4 – Water	A4.1 Reticulated areas A4.2 Non-reticulated areas A4.3 Individual lots in non-reticulated areas	Yes N/A N/A	Compliant N/A N/A

5.7. Light Industrial Area and Associated Buffers

The EPA Draft Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses* (EPA, 2015) provides generic separation distances from particular industries to sensitive land uses. Sensitive land uses are land uses applied to places where people live or regularly spend time and which are therefore sensitive to emissions from industry.

The EPA's hierarchy for the management of emissions is:

- Avoid or minimise the creation and discharge of emissions through design and operation of the facility;
- Ensure environmental impacts from emissions are acceptable and meet the relevant regulations and health criteria at the boundary of the site; and
- Implement separation distances to ensure that any residual emissions and unintended emissions do not impact adversely on sensitive land uses.

The generic separation distances are based on the consideration of typical emissions that may affect the amenity of nearby sensitive land uses. These include:

- Gaseous and particulate emissions;
- Noise;
- Dust; and
- Odour.

The only 'Sensitive Land Use' within the vicinity of the proposed Light Industrial area is the proposed Residential area. According to the EPA (2015) the general minimum vegetated setback of 200m is required to private residences, however the *Guidance Number 3 Separation Distances between Industrial and Sensitive Land Uses* - Appendix 1 (EPA, 2015) must be consulted for the industry types proposed within the development area and their associated separation to distance to sensitive land use prior to development.

6. Management Commitments and Conclusions

The proposed LSP recognises the importance of the key environmental and landscape attributes of the area, and incorporates these in an urban form, that creates an environmentally responsive urban development that meets the EPA and City of Albany's environmental requirements. Consequently, the environmental outcomes of the proposed LSP are considerable and include:

- Providing an improvement in groundwater and surface water quality through residential and industrial development and implementation of water sensitive urban design and best stormwater drainage management practices.
- Revegetation using native species (where currently there is very little native species and diversity) in areas of POS to promote fauna habitat and flora diversity. Landscaped urban areas to promote biodiversity using native plants.
- Maintaining areas of remnant vegetation and limiting access points through these areas to the subdivision to prevent adverse impacts particularly for transient fauna.
- The Local Structure Plan is required to meet the "Acceptable Solutions" of each Element of the bushfire mitigation measures (WAPC, 2017).
- As Light industrial land use is proposed in the west of the Structure Plan, a detailed Bushfire Management Plan will be required to guide developers if any industry is defined as "High Risk".
- A detailed Bushfire Management Plan jointly endorsed by DFES and CoA will be required for any Primary School proposed in the Structure Plan area at the Development Application stage. A Bushfire Emergency Evacuation Plan (BEEP) will be required at Development Approval Stages.
- The proposed light industrial area is deemed appropriate for effluent disposal and meets the state's minimum requirements for on-site sewage disposal systems as outlined in the *Draft Government Sewerage Policy* (Department of Planning, 2016). Where on-site sewage disposal is to be provided by a secondary treatment system, the WAPC will require a notification on title pursuant Section 70A of the *Transfer of Land Act 1893* (as amended) advising that an on-site secondary treatment sewage disposal system and unencumbered area to which treated sewage is to be distributed are required.
- Provide vegetated buffer and/or other management techniques between industrial areas to sensitive land uses (such as residential) in accordance with the EPA's (2015) Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses.*

7. References

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Appendices

Appendix A – Draft Local Structure Plan (Edge Planning & Property, 2017)

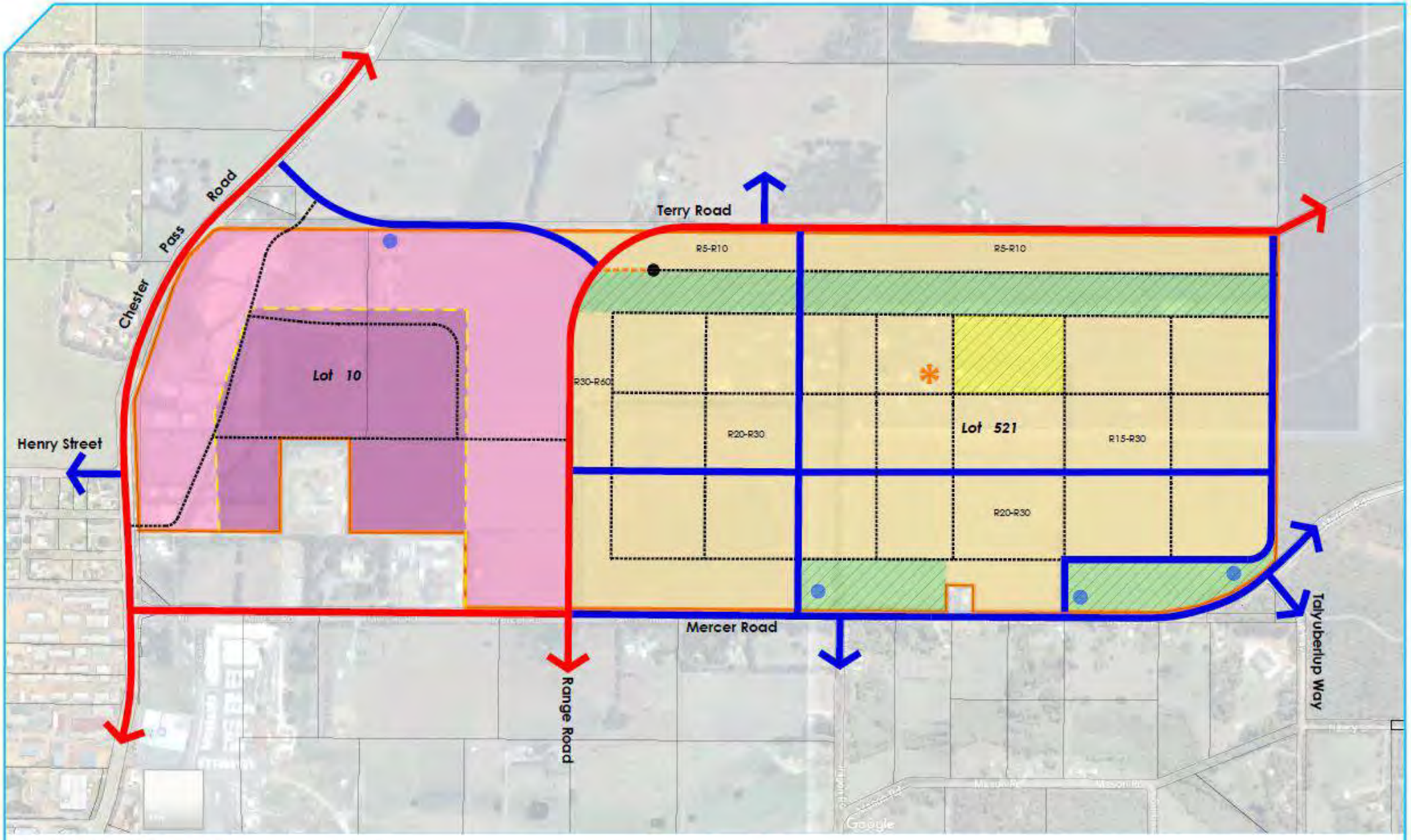
Appendix B – Geotechnical Investigation (Great Southern Geotechnics, 2017)

Appendix C – Phosphorous Retention Index Test Results (CSBP Laboratory, 2017)

Appendix D – BAL Contour Plan (Bio Diverse Solutions, 2017)

Appendix A

Draft Local Structure Plan (Edge Planning & Property, 2017)



LOCAL STRUCTURE PLAN

Lot 10 Chester Pass Road and
Lot 521 Mercer Road
Walmsley

LEGEND

- Local Structure Plan Boundary
- Integrator Arterial Road
- Neighbourhood Connector Road
- Local Road
- Parks and Recreation
- Public Use - School
- Residential
- Drainage
- Light Industry Precinct A
- Light Industry Precinct B
- Community Purpose Site
- 200m Buffer to Sensitive Uses
- Emergency Access Way

REV	DESCRIPTION	YYMMDD
D	ADD EMERGENCY A. WAY.	171116
C	MINOR MODIFICATIONS	171025
B	MINOR MODIFICATIONS	171022
A	LOCAL STRUCTURE PLAN	171012

DRAWING NUMBER EP 170620-06 REV D SCALE 1:7500 SHEET A3

edge PLANNING & PROPERTY

Appendix B

Geotechnical Investigation (Great Southern Geotechnics, 2017)

VERSION 1

Report No 104/1

SEPTEMBER 17, 2017

GEOTECHNICAL INVESTIGATION

BIO DIVERSE SOLUTIONS

LOT 10 CHESTER PASS RD & LOT 521 MERCER RD, MILPARA WA 6330

PRESENTED BY: M.COFFEY

GREAT SOUTHERN GEOTECHNICS
5A 209 CHESTER PASS RD, ALBANY WA

ACN: 613 485 644 ABN: 77 613 485 644
Info@gsgeotechnics.com

1.0 INTRODUCTION

As authorised by Kathryn Kinnear of Bio Diverse Solu s, a site inves n for the proposed development of Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA 6330 was preformed on the 29th of August, 2017.

2.0 GENERAL

This purpose of the inves on was to determine the following:

- Surface site cond ons
- Subsurface soil pro es & characteris s
- Depth of ground water tables .

3.0 SITE INVESTIGATION

The site is approximately 5.0kms North of the Albany CBD and is located on the Northern side of Mercer Road spanning over 2kms West to East.

Established trees border the fence lines of grassy paddocks and natural bushland can be found adjacent to the eastern boundary.

Site cond ons and Test pit lo s were recorded and are shown in Appendix 2

The eld inves a consisted of ten test pits excavated on-site to depths of up to 2.3m using a Kubota KX41-3V Mini Excavator with a 300mm wide Hydraulic open ight auger achment.

All soil layers encountered were visually assessed and classi on-site

The subsurface soil pro s are shown on the Test pit logs located in Appendix 1

IMPORTANT NOTE: We have endeavoured to locate the test pits so that they are representa e of the subsurface materials across the site. However, soil cond ons may change dram lly over short distances and our inves ns may not locate all soil var s across the site.

This report and associated documenta was undertaken for the spec urpose described in the report and shall not be relied on for other purposes. This report was prepared solely for the use by Bio Diverse Solu s and any reliance assumed by other par s on this report shall be at such par s own risk.

Great Southern GEOTECHNICS

Explanatory Notes

COLOURS

BLACK - BROWN (bk)	BLUE (bl)	ORANGE (or)
BROWN (br)	BLUE – GREEN (bl/gr)	RED (rd)
GREY – BROWN (gy/br)	GREEN (gr)	RED – BROWN (rd/br)
GREY (gy)	YELLOW (yl)	PINK (pk)
BLUE – GREY (bl/gy)	YELLOW – BROWN (yl/br)	PURPLE (pr)

MOISTURE CONDITION OF SOIL

TERM	DESCRIPTION
Dry	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere and free water forms on hands when handling.

PARTICLE SHAPES

ANGULAR	SUB-ANGULAR	SUB-ROUNDED	ROUNDED

PARTICLE SIZES

BOULDERS	COBBLES	COARSE GRAVEL	MEDIUM GRAVEL	FINE GRAVEL	COARSE SAND	MEDIUM SAND	FINE SAND	SILT	CLAY
>200mm	63-200mm	20-63mm	6-20mm	2.36-6mm	0.6-2.36mm	0.2-0.6mm	0.075-0.2mm	0.002-0.075mm	<0.002mm

GRAIN SIZE

SOIL TYPE (ABBREV.)	CLAY (CL)	SILT (SI)	← SAND (SA) →		← GRAVEL (GR) →			COBBLES (CO)
SIZE	< 2µm	2–75µm	Fine 0.075-0.2mm	Medium 0.2-0.6mm	Coarse 0.6-2.36mm	Fine 2.36-6mm	Medium 6-20mm	Coarse 20-63mm	63-200mm
SHAPE & TEXTURE	Shiny	Dull	← angular or subangular or subrounded or rounded →						
FIELD GUIDE	Not visible under 10x	Visible under 10x	Visible by eye	Visible at < 1m	Visible at < 3m	Visible at < 5m	Road gravel	Rail ballast	Beaching

Great Southern GEOTECHNICS

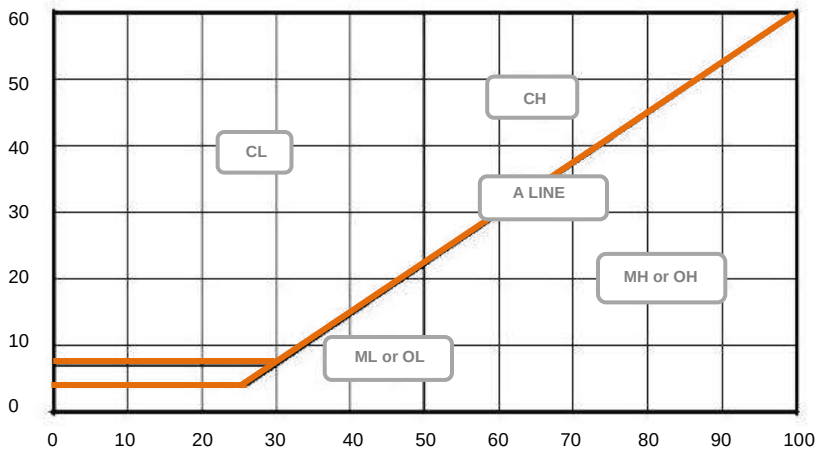
CLASSIFICATION CHART

Explanatory Notes

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60mm and basing fractions on estimated mass)					GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% of material less than 63 mm is larger than 0.075 mm	GRAVELS More than 50% of coarse fraction is larger than 2.36mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		GW	Well graded gravels, gravel-sand mixtures, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		GP	Poorly Graded gravels and gravel-sand mixtures, little or no fines, uniform gravels
		GRAVELS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength		GM	Silty gravels, gravel-sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction is smaller than 2.36mm	CLEAN SANDS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		SW	Well graded sands, gravelly sands, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength '		SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands
		SANDS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength		SM	Silty sands, sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2mm					
	SILTS AND CLAYS Liquid limit less than 50	DRY STRENGTH	DILATANCY	TOUGHNESS		
		None to low	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity. Silts of low to medium Liquid Limit.
		Medium to high	None to very slow	Medium	CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		Low to medium	Slow	Low	OL	Organic silts and organic silt-clays of low to medium plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Low to medium	Slow to none	Low to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, silts of high Liquid Limit.
		High to very high	None	High	CH	Inorganic clays of high plasticity.
		Medium to high	None to very slow	Low to medium	OH	Organic clays of high plasticity
HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture				Pt	Peat and other highly organic soils

PLASTICITY CHART

For laboratory classification of fine grained soils



Great Southern GEOTECHNICS

Explanatory Notes

PLASTICITY

DESCRIPTIVE TERM	OF LOW PLASTICITY	OF MEDIUM PLASTICITY	OF HIGH PLASTICITY
Range Of Liquid Limit (%)	≤ 35	> 35 ≤ 50	> 50

DESCRIPTION OF ORGANIC OR ARTIFICIAL MATERIALS

PREFERRED TERMS	SECONDARY DESCRIPTION
Organic Matter	Fibrous Peat/ Charcoal/ Wood Fragments/ Roots (greater than approximately 2mm diameter)/ Root Fibres (less than approximately 2mm diameter)
Waste Fill	Domestic Refuse/ Oil/ Bitumen/ Brickbats/ Concrete Rubble/ Fibrous Plaster/ Wood Pieces/ Wood Shavings/ Sawdust/ Iron Filings/ Drums/ Steel Bars/ Steel Scrap/ Bottles/ Broken Glass/ Leather

CONSISTENCY - Cohesive soils

TERM	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD
Symbol	VS	S	F	St	VSt	H
Undrained Shear Strength (kPa)	< 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
SPT (N) Blowcount	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Field Guide	Exudes between the fingers when squeezed	Can be moulded by light finger pressure	Can be moulded by strong finger pressure	Cannot be moulded by fingers. Can be indented by thumb nail	Can be indented by thumb nail	Can be indented with difficulty with thumb nail

CONSISTENCY - Non-cohesive soils

TERM	VERY LOOSE	LOOSE	MEDIUM DENSE	DENSE	VERY DENSE	COMPACT
Symbol	VL	L	MD	D	VD	CO
SPT (N) Blowcount	0 - 4	4 - 10	10 - 30	30 - 50	50 - 100	> 50/150 mm
Density Index (%)	< 15	15 - 35	35 - 65	65 - 85	85 - 95	> 95
Field Guide	Ravels	Shovels easily	Shovelling very difficult	Pick required	Pick difficult	Cannot be picked

MINOR COMPONENTS

TERM	TRACE	WITH
% Minor Component Field Guide	Coarse grained soils: < 5% Fine grained soils: <15% Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary components	Coarse grained soils: 5 – 12% Fine grained soils: 15 – 30% Presence easily detectable by feel or eye, soil properties little different to general properties of primary component

Great Southern GEOTECHNICS

Explanatory Notes

GEOLOGICAL ORIGIN

	TYPE	DETAILS
TRANSPORTED SOILS	Aeolian Soils	Deposited by wind
	Alluvial Soils	Deposited by streams and rivers
	Colluvial Soils	Deposited on slopes
	Lacustrine Soils	Deposited by lakes
	Marine Soils	Deposited in ocean, bays, beaches and estuaries
FILL MATERIALS	Soil Fill	Describe soil type, UCS symbol and add 'FILL'
	Rock Fill	Rock type, degree of weathering, and word 'FILL'.
	Domestic Fill	Percent soil or rock, whether pretrucible or not.
	Industrial Fill	Percent soil, whether contaminated, particle size & type of waste product, i.e. brick, concrete, metal

STRENGTH OF ROCK MATERIAL

TERM	SYMBOL	IS(50)	(MPA)	FIELD GUIDE TO STRENGTH
Extremely Low	EL	≤0.03		Easily remoulded by hand to a material with soil properties.
Very Low	VL	>0.03	≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxle sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
Low	L	>0.1	≤0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	>0.3	≤1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
High	H	>1	≤3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	>3	≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	>10		Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water.
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. Rock may be highly discoloured, usually be ironstaining. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

Appendix 1

Test Pit Logs

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 1 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580601 6128901
Test Pit No.:	**TP1** Sample No. **17G288**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 900	700	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	D-VD				
		Fine to medium grained sand.						
900 - 2300	1400	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	S / F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 2 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580560 6128698
Test Pit No.:	**TP2** Sample No. **17G289**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
100 - 300	200	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	W	L				
		Fine to medium grained sand.						
300 - 700	400	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	S				
700 - 2300	1600	**Sandy CLAY:** Low to medium plasticity, Grey mottled orange/red. Fine to medium grained sand.	M	S-F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 3 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580597 6128498
Test Pit No.:	**TP3** Sample No. **17G290**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						Water table not encountered		
0 -150	150	**(Topsoil) SAND with silt:** Dark grey/brown, fine to medium grained. Roots & root fibres.	M	L				
150 - 400	250	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	D-MD				
		Medium to coarse grained sub-angular to angular sand.						
400 - 1100	700	**Sandy CLAY:** Low to medium plasticity, Brown/orange. Fine to medium grained sand.	M	S-F				✓
1100 - 2300	1200	**Sandy CLAY:** Low to medium plasticity, Red mottled grey/brown. Fine to medium grained sand.	M	S-F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 4 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580829 6128337
Test Pit No.:	**TP4** Sample No. **17G291**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 550	350	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	D-VD				
		Cobbles up to 100mm. Fine to medium grained sand.						
550 - 900	350	**Sandy CLAY:** Low to medium plasticity, Light brown mottled red/orange.	M	S-F				
		Fine to medium grained sand.						
900 - 2300	1400	**Sandy CLAY:** Low to medium plasticity, Grey mottled red/brown. Fine to medium grained sand.	M	F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 5 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 580977 6128666
Test Pit No.:	**TP5** Sample No. **17G292**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey/brown, fine to medium grained. Roots & root fibres.	M	L		1200mm below existing ground level		
200 - 500	300	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	MD				
		Fine to medium grained sand.						
500 - 1000	500	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	VD				
		Cobbles & Boulders up to 200mm. Fine to medium grained sand.						
1000 - 1200	200	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	F				
1200 - 2300	1100	**Sandy CLAY:** Low to medium plasticity, Red mottled grey. Fine to medium grained sand.	M	F				

Comments:

Water table measured 1200mm below existing ground level 3hrs 55mins after achieving full depth of test pit.

Water noted seeping into test pit at 500mm below surface level.

Pit Terminated at:	✓ or ×	(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water

Water first Encountered

Moisture

D - Dry M - Moist W - Wet

General

N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 6 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 581324 6128351
Test Pit No.:	**TP6** Sample No. **17G293**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m) Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey/brown, fine to medium grained. Roots & root fibres.	M	L		1700mm below existing ground level		
200 - 400	200	**SAND with silt:** Grey, fine to medium grained.	M	L				
400 - 700	300	**SAND with silt:** Light grey, fine to medium grained.	M	L				
700 - 1500	800	**Gravelly SAND with silt:** Brown, fine to medium grained.	M	MD				
		Fine to medium grained, sub-rounded to sub-angular gravel.						
1500 - 2300	800	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	MD				
		Fine to medium grained sand.						

Comments:

Water table measured 1700mm below existing ground level 1hr 55mins after achieving full depth of test pit.

Pit Terminated at:	✓ or ×	(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water

Water first Encountered

Moisture

D - Dry M - Moist W - Wet

General

N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 7 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 581693 6128729
Test Pit No.:	**TP7** Sample No. **17G294**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		900mm below existing ground level		
200 - 800	600	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M-W	L-MD				
		Cobbles & boulders up to 200mm. Fine to medium grained sand.						
800 - 1200	400	**Sandy CLAY:** Low to medium plasticity, Brown/orange. Fine to medium grained sand.	M	S-F				
1200 - 2300	1100	**Sandy CLAY:** Low to medium plasticity, Red mottled grey. Fine to medium grained sand.	M	F				

Comments:

Water table measured 900mm below existing ground level 3hrs 55mins after achieving full depth of test pit.

Water noted seeping into test pit at 700mm below surface level.

Pit Terminated at:	✓ or ×	(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water

Water first Encountered

Moisture

D - Dry M - Moist W - Wet

General

N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS

Report No. **104/1** | Job No. **104** | Sheet 8 of 10

Client: Bio Diverse Solutions
Project: Proposed Light Industrial Area
Project No. n/a
Location: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA
Test Pit No.: **TP8** Sample No. **17G295**

Operator/Contractor: GSG
Equipment type: Kubota KX41-3V
Excavation Method : 300mm Auger
Position: 50 H 581720 6128505
Elevation:

Date Commenced: 29.08.2017
Date Completed: 29.08.2017

Logged By M.Coffey
Checked By: M.Coffey

Excavation Dimensions:
Depth 2.3 (m) Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 800	600	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	D-VD				
		Fine to medium grained sand.						
800 - 1000	200	**Sandy CLAY with gravel:** Low to medium plasticity**,** Light brown mottled red/orange.	M	F				
		Fine to medium grained sand. Fine to medium grained, angular to sub-angular gravel.						
1000 - 1900	900	**Sandy CLAY:** Low to medium plasticity, Red mottled light brown/orange.	M	F-VSt				
		Fine to medium grained sand. (VSt between depth 1700mm to 1900mm)						
1900 - 2300	400	**Sandy CLAY:** Low plasticity, orange mottled red/cream. Fine to medium grained sand.	M	S-F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength

Cohesive	Non-Cohesive
VS - Very Soft	VL - Very Loose
S - Soft	L - Loose
F - Firm	MD - Medium Dense
St - Stiff	D - Dense
VSt - Very Stiff	VD - Very Dense
H - Hard	CO - Compact

Rock
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Cementation
IN - Indurated
PC - Poorly Cemented
MC - moderately Cemented
WC - Well Cemented

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 9 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 582184 6128769
Test Pit No.:	**TP9** Sample No. **17G296**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 800	600	**Sandy GRAVEL:** Brown, fine to coarse grained, sub-rounded to sub-angular.	M	MD				
		Fine to medium grained sand.						
800 - 1100	300	**Sandy CLAY:** Low to medium plasticity**,** brown/orange. Fine to medium grained sand.	M	S-F				
1100 - 2300	1200	**Sandy CLAY:** Low to medium plasticity, Red mottled grey. Fine to medium grained sand.	M	F				

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

5a 209 Chester Pass Rd, Albany WA 6330
ACN: 613 485 644 ABN: 77 613 485 644

Test Pit Report

Email: Info@gsgeotechnics.com
Mobile: 040 790 3297

Great Southern GEOTECHNICS	Report No. **104/1**	Job No. **104**	Sheet 10 of 10

Client:	Bio Diverse Solutions	Operator/Contractor:	GSG
Project:	Proposed Light Industrial Area	Equipment type:	Kubota KX41-3V
Project No.	n/a	Excavation Method :	300mm Auger
Location:	Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA	Position:	50 H 582184 6128441
Test Pit No.:	**TP10** Sample No. **17G297**	Elevation:	

Date Commenced:	29.08.2017	Logged By	M.Coffey	Excavation Dimensions:	
Date Completed:	29.08.2017	Checked By:	M.Coffey	Depth 2.3 (m)	Width 0.3 (m)

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium grained. Roots & root fibres.	M	L		Water table not encountered		
200 - 400	200	**SAND with silt:** Grey/brown, fine to coarse grained sub-rounded to sub-angular.	M	L-MD				
		(Contains some cobbles up to 150mm)						
400 - 2300	1900	**Sandy CLAY:** Low to medium plasticity**,** Light brown/orange. Fine to medium grained sand.	M	L				✓
		(Contains pockets of yellow/cream fine to medium grained sand).						

Comments:

Pit Terminated at: ✓ or ×		(mm) below ground level
Target Depth	✓	2300
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Materials Consistency/Strength		Rock	Cementation
Cohesive	**Non-Cohesive**		
VS - Very Soft	VL - Very Loose	EL - Extremely Low	
S - Soft	L - Loose	VL - Very Low	IN - Indurated
F - Firm	MD - Medium Dense	L - Low	PC - Poorly Cemented
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	WC - Well Cemented
H - Hard	CO - Compact	VH - Very High	
		EH - Extremely High	

▼ Water
Water first Encountered

Moisture
D - Dry M - Moist W - Wet

General
N/A - Not Applicable
N/D - Not Determined

Appendix 2

Site Map & Test Pit Locations

The fieldwork was carried out on the 29th of August 2017 and comprised the following:
Ten test pits were excavated using a Kubota KX41-3V Mini Excavator with a 300mm wide Auger attachment to achieve depths of up to 2.3m to visually assess subsurface conditions and monitor any ground water present. Approximate Test Pit locations are shown on **Figure 2.**

Figure 1 - Site Location

Figure 2 - Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA 6330

Test Pit No. 1 Excavation

Test Pit No. 1 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP1**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 2 Excavation

Test Pit No. 2 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP2**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 3 Excavation

Test Pit No. 3 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP3**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 4 Excavation

Test Pit No. 4 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP4**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 5 Excavation

Test Pit No. 5 Spoil

Test Pit No. 6 Excavation

Test Pit No. 6 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP6**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 7 Excavation

Test Pit No. 7 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP7**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 8 Excavation

Test Pit No. 8 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP8**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 9 Excavation

Test Pit No. 9 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP9**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Test Pit No. 10 Excavation

Test Pit No. 10 Spoil

Great Southern GEOTECHNICS

Job No: 104 **Test Pit No:** **TP10**
Client: Bio Diverse Solutions
Project: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA

Appendix 3

Test Results

GREAT SOUTHERN GEOTECHNICS

5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgeotechnics.com

Dry Density / Moisture Content Relationship Test Report — Sheet 1 of 1

Report No. 104/1 **Job No.** 104

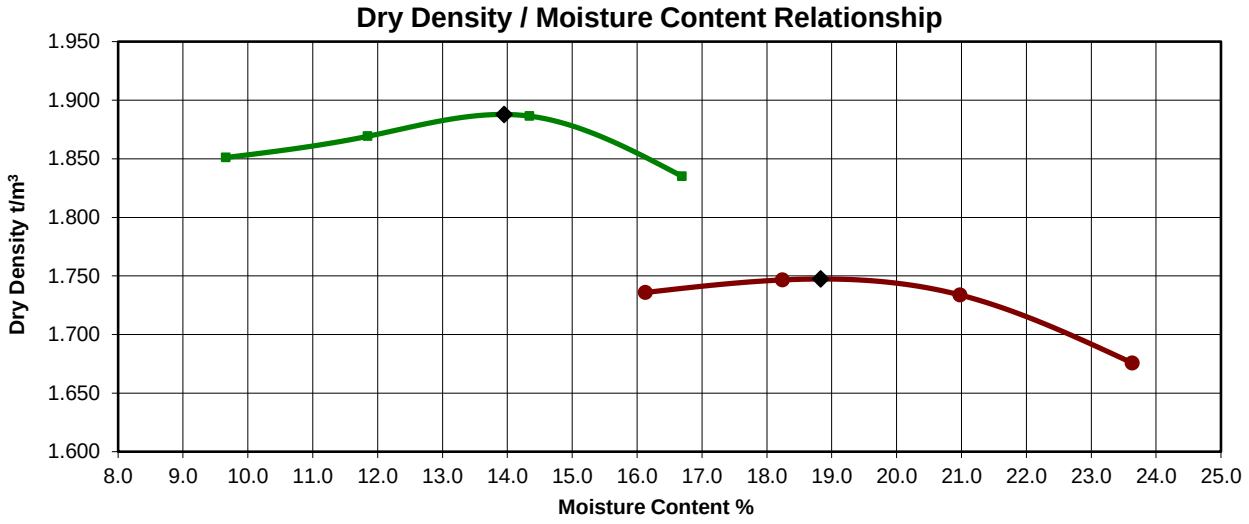
Client: Bio Diverse Solutions

Project: Proposed Light Industrial Area

Road: Lot 10 Chester Pass Rd & Lot 521 Mercer Rd, Milpara WA 6330

Section N/A

Sample No.	Sample Location	Field Description
17G298	Test Pit 3	Sandy CLAY
17G299	Test Pit 10	Sandy CLAY



Sample Number		17G298	17G299	
Depth		400mm - 1100mm	400mm to 2300mm	
Stabiliser Used				
Stabiliser Added %				
Curing Period	Water (Days)	Field	Field	
	Stabiliser (Hrs)			
Moisture Content Method used		AS 1289.2.1.1	AS 1289.2.1.1	
Sampling Method		AS 1289.1.2.1 Proc 6.5	AS 1289.1.2.1 Proc 6.5	
Date Sampled		29.08.2017	29.08.2017	
Date Received		29.08.2017	29.08.2017	
Date Tested		02.09.2017	02.09.2017	
Test Method		AS 1289.5.2.1	AS 1289.5.2.1	
Maximum Dry Density t/m^3		**1.75**	**1.89**	
Optimum Moisture Content %		**19.0**	**14.0**	
Adjusted Maximum Dry Density t/m3				
Adjusted Optimum Moisture Content %				
Percentage Retained %	37.5 mm	**0**	**0**	
Percentage Retained %	19.0 mm	**0**	**0**	

NATA WORLD RECOGNISED ACCREDITATION

Comments: N/a

Distribution: Laboratory File / Kathryn Kinnear

Approved Signatory:

Name: M.Coffey

Function: Laboratory Manager

Date: 17.09.2017

LIQUIDLABSWA
CONSTRUCTION MATERIALS TESTING LABORATORY
UNIT 4, 96 BRIGG ST, WELSHPOOL, WA 6106 LIQUIDLABSWA.COM.AU

Falling Head Permeability Report		**Test Method: AS 1289.6.7.2**	
Client:	Bio Diverse Solutions	**Ticket No:**	S812
Project:	Lot 10 Chester Pass Rd & Lot 521 Mercer Road	**Report No:**	LLS17/2133 _2
Location:	Milpara, WA 6339	**Sample No:**	LLS17/2133
Sample ID:	TP3 400-1100mm (17G298)	**Issue Date:**	14-September-2017

Sampling Procedure: Tested as Received

Laboratory Moisture Ratio (%)	100.5
Laboratory Density Ratio (%)	95.0
Compactive Effort	Modified
Surcharge (kPa)	3
% Retained on 19mm Sieve	0
Coefficient of Permeability (m / sec)	$4.1 \times 10^{(-8)}$

Client Address: 5a 209 Chester Pass Road, Albany WA 6330

Comments: MMDD and OMC Values supplied by Great Southern Geotechnics

NATA WORLD RECOGNISED ACCREDITATION

Accredited for Compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872

Approved Signature:
Name: Matt van Herk
Function: Laboratory Manager
Date: 14-September-2017

LIQUIDLABSWA
CONSTRUCTION MATERIALS TESTING LABORATORY
UNIT 4, 96 BRIGG ST, WELSHPOOL, WA 6106 LIQUIDLABSWA.COM.AU

Falling Head Permeability Report		**Test Method: AS 1289.6.7.2**	
Client:	Bio Diverse Solutions	**Ticket No:**	S812
Project:	Lot 10 Chester Pass Rd & Lot 521 Mercer Road	**Report No:**	LLS17/2134 _2
Location:	Milpara, WA 6339	**Sample No:**	LLS17/2134
Sample ID:	TP10 400-2300mm (17G299)	**Issue Date:**	14-September-2017

Sampling Procedure: Tested as Received

Laboratory Moisture Ratio (%)	98.5
Laboratory Density Ratio (%)	95.0
Compactive Effort	Modified
Surcharge (kPa)	3
% Retained on 19mm Sieve	0
Coefficient of Permeability (m / sec)	$1.8 \times 10^{(-8)}$

Client Address: 5a 209 Chester Pass Road, Albany WA 6330

Comments: MMDD and OMC Values supplied by Great Southern Geotechnics

NATA WORLD RECOGNISED ACCREDITATION

Accredited for Compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872

Approved Signature:
Name: Matt van Herk
Function: Laboratory Manager
Date: 14-September-2017

Appendix C

Phosphorous Retention Index Test Results (CSBP Laboratory, 2017)

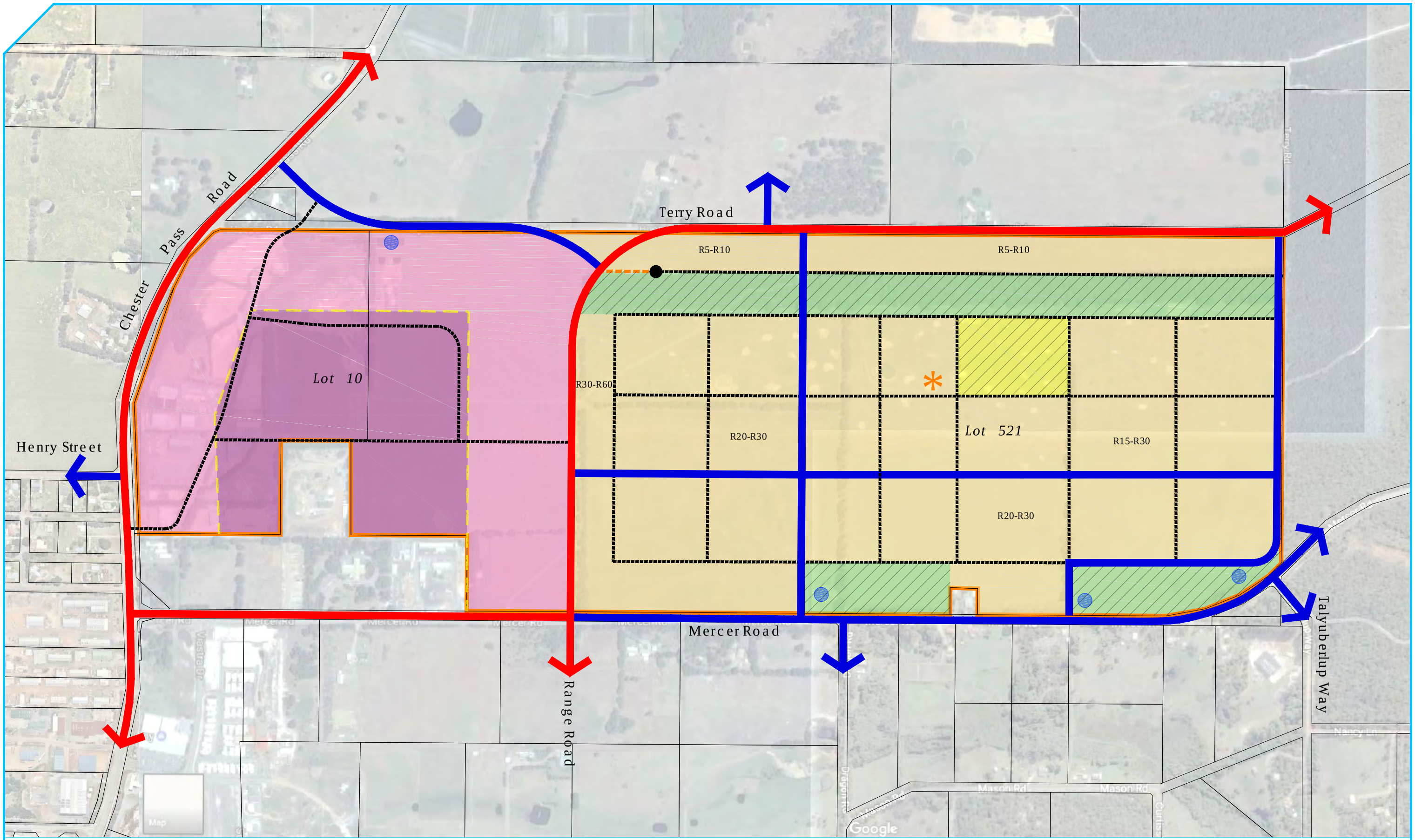
Customer Bio Diverse Solutions

Job Chiquita Burgers

Date Rec'd 1/09/2017

Lab Number	Name	Code	Customer	Depth	Phosphorus Retention Index
2ZS17085	Test Pit 3	01/09/17	Bio Diverse Solutions	40-110	2387.4
2ZS17086	Test Pit 6	01/09/17	Bio Diverse Solutions	20-70	0.8
2ZS17087	Test Pit 10	01/09/17	Bio Diverse Solutions	40-230	608.0
2ZS17088	Test Pit 1	01/09/17	Bio Diverse Solutions	20-90	2414.5

ATTACHMENT 4



LOCAL STRUCTURE PLAN
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

LEGEND

- Local Structure Plan Boundary
- Integrator Arterial Road
- Neighbourhood Connector Road
- Local Road
- Parks and Recreation
- Public Use - School
- Residential
- Drainage
- Light Industry Precinct A
- Light Industry Precinct B
- Community Purpose Site
- 200m Buffer to Sensitive Uses
- Emergency Access Way

REV	DESCRIPTION	YYMMDD
D	ADD EMERGENCY A. WAY.	171118
C	MINOR MODIFICATIONS	171023
B	MINOR MODIFICATIONS	171022
A	LOCAL STRUCTURE PLAN	171012

DRAWING NUMBER EP 170520 06 | REV D | SCALE 1:7500 | SHEET A3

NORTH

0 150 300m

Issued for design intent only.
All areas and dimensions are subject to detail design + survey.

edge PLANNING & PROPERTY

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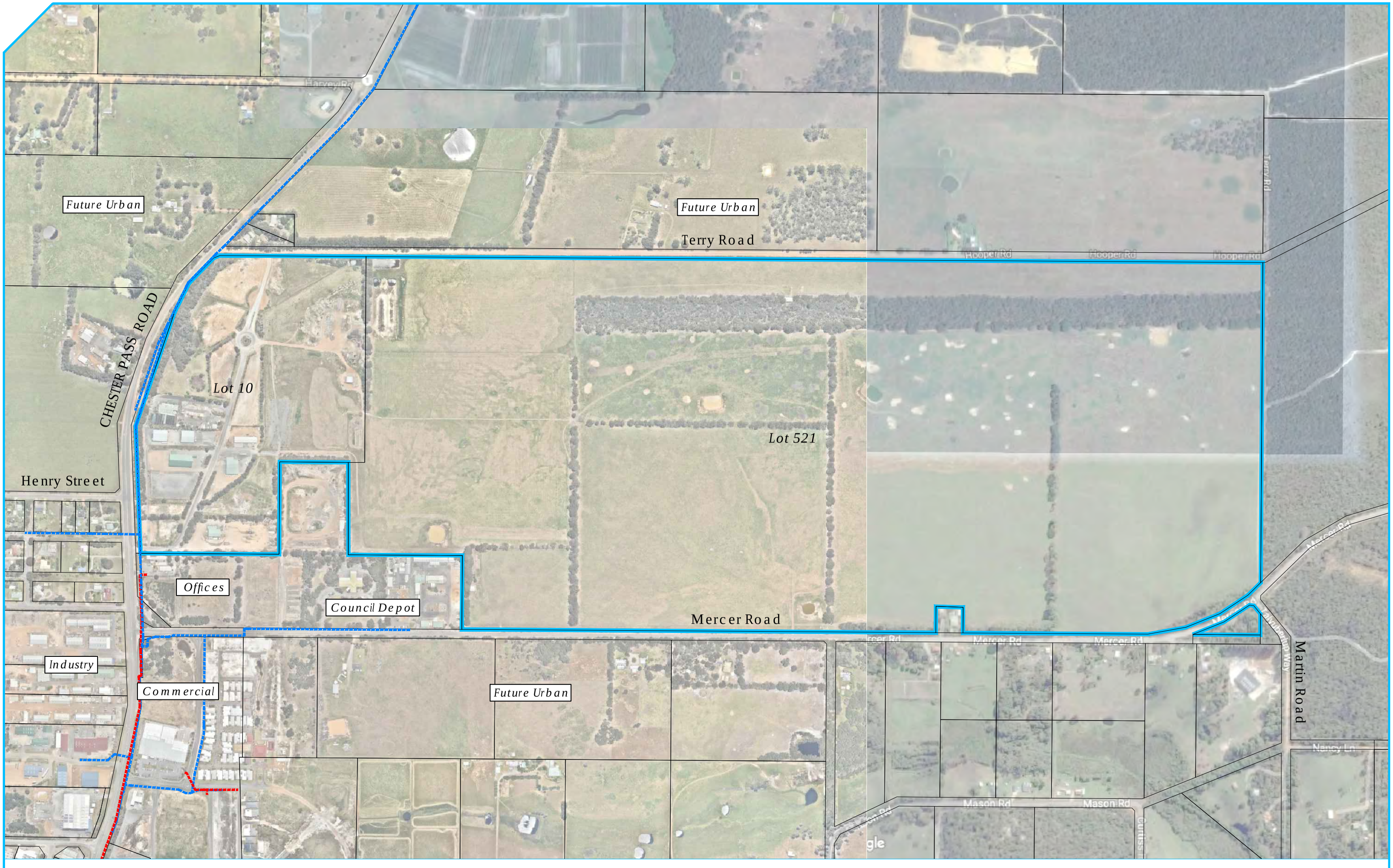
ALBANY WA 6330
E: steve@edgeplanning.com.au
M: 0409 107 336

ATTACHMENT 5



CONTEXT PLAN
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

Legend

- Structure Plan Boundary
- Existing Lot Boundary
- Existing u/ground Water Pipe
- Existing u/ground Sewer Pipe

SCALE 1:7500
SHEET A3

0 150 300m

NORTH

REV	DESCRIPTION	YYMMDD	DRAWN	APPRVD
A	CONTEXT PLAN	170522	SJ	ST

DRAWING NUMBER EP 170520 03 REV A

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ATTACHMENT 6

Terry Road

Chester Pass Road

Lot 10

Lot 521

Henry Street

Mercer Road

Talyuberlup Way

CONTEXT WATER INFORMATION
Lot 10 Chester Pass Road and
Lot 521 Mercer Road
Walmsley

LEGEND

- Subject Land
- Underground Water Pipe
- Seasonal Water Course / Living Stream
- Catchment Boundary
- Sub-catchment Boundary

- Moderate to High Risk Acid Sulphate Soils within 3m of Natural Soil Surface *(Department of Environmental Regulation 2015)*
- Waterlogging Risk 10-30% (Moderate - Very High Risk) *(Department of Agriculture and Food; Fisheries and Regional Development 2017)*
- Waterlogging Risk 50-70% (Moderate - Very High Risk) *(Department of Agriculture and Food; Fisheries and Regional Development 2017)*

REV	DESCRIPTION	YYMMDD
A	WATER INFORMATION	171121

NORTH

SCALE 1:7500
SHEET A3

0 150 300m

DRAWING NUMBER EP 170520 07
REV A

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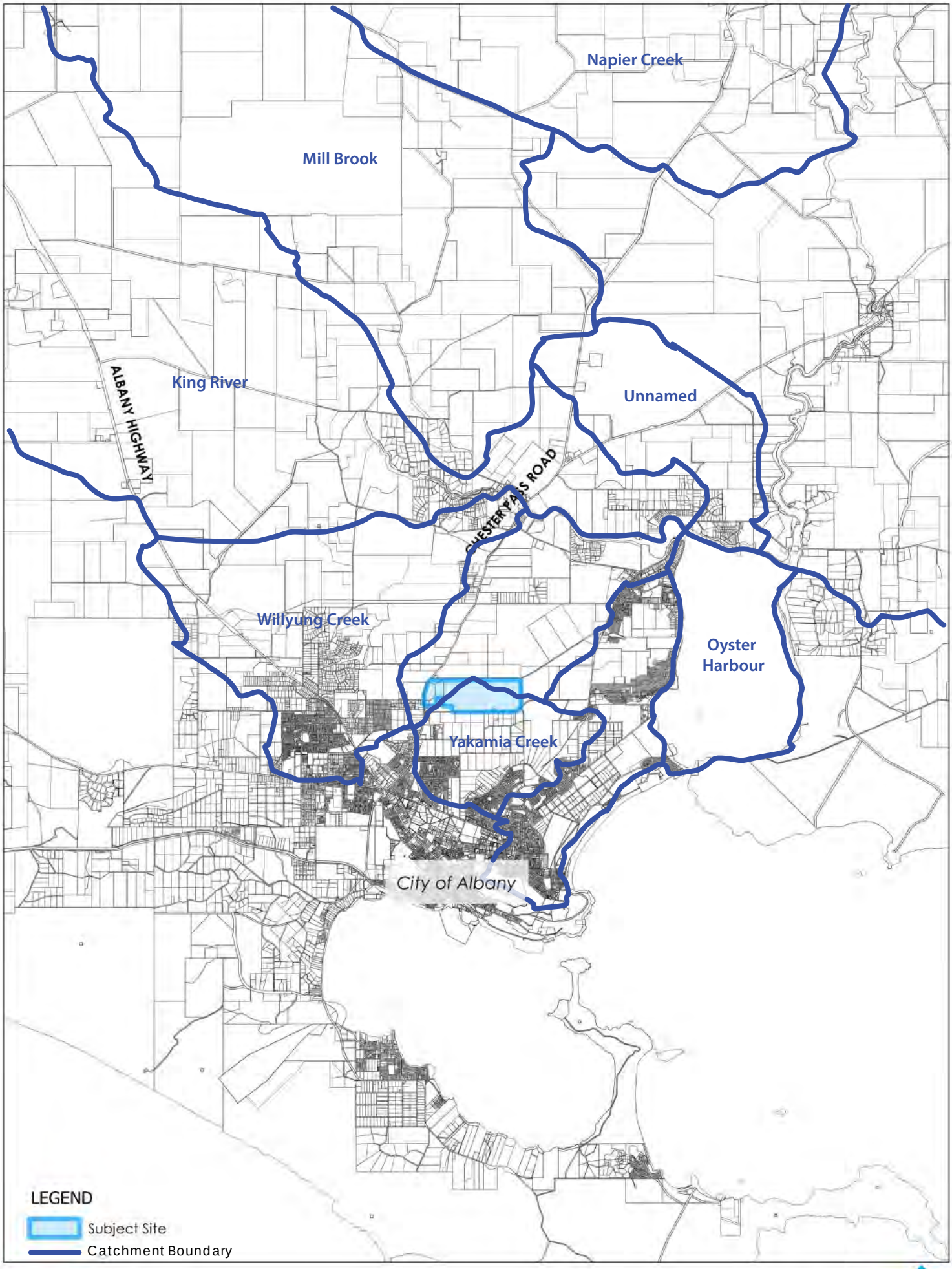
ATTACHMENT 7



LOCATION AND CATCHMENTS

Lot 10 Chester Pass Road and
Lot 521 Mercer Road
Walmsley

N

0 1 2 3 4 5 km

1:150,000

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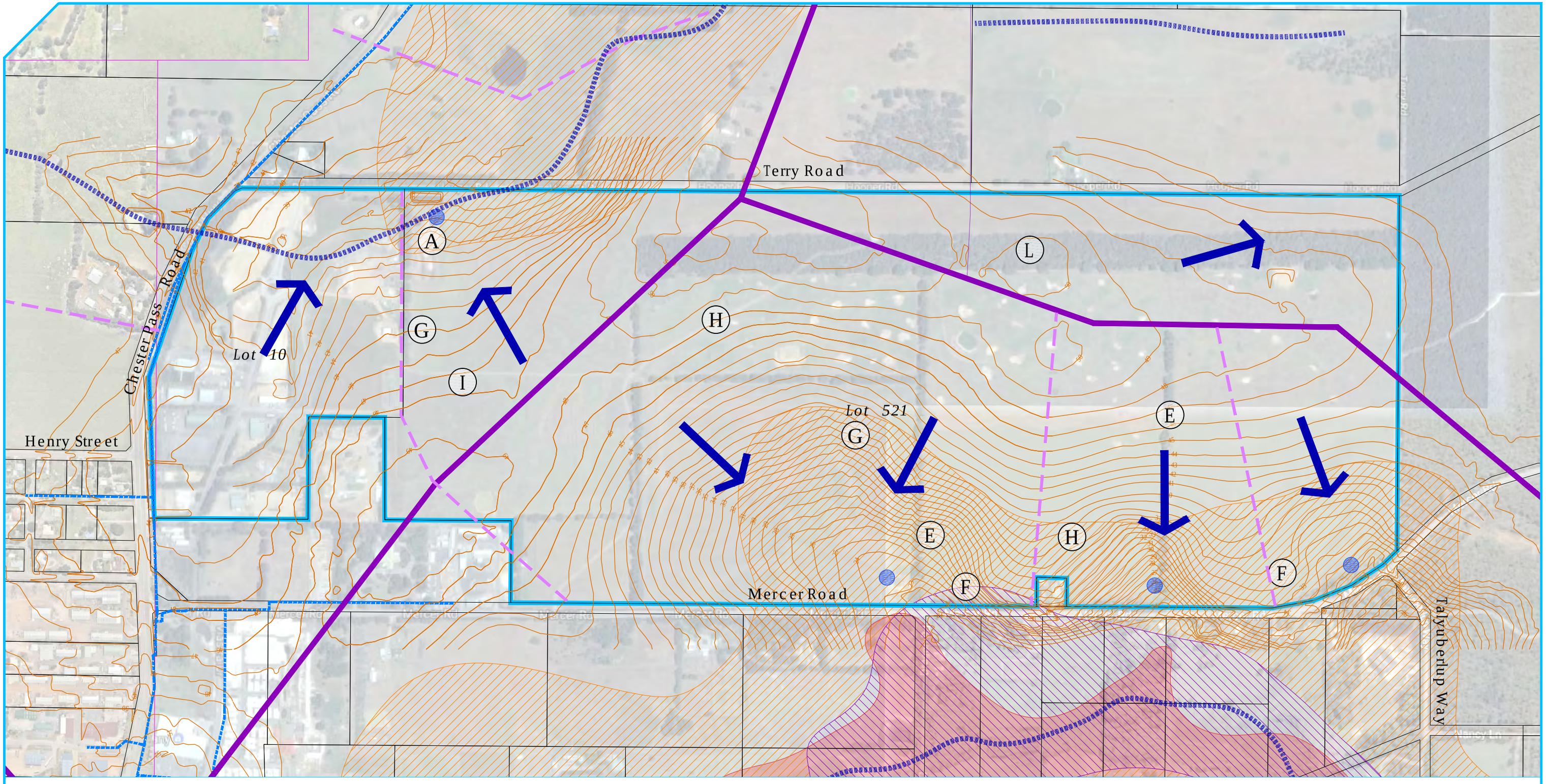
ATTACHMENT 8



(A) Undertake enhancement of the seasonal watercourse within the Structure Plan area to create a òliving streamó. Consider the preferred tenure and management of the seasonable watercourse at the subdivision stage.

(B) Adopt water sensitive urban design with post development flows to be as close as possible to the pre-development flow.

(C) Stormwater to be retained on lots for up to the 1 in 1 year, 1 hour ARI event. Support measures including rainwater tanks and soakwells.

(D) Stormwater run-off from roads to be designed to accommodate the 1 in 5 year ARI event through roadside bioretention swales with overflow in larger flood events directed to detention basins.

(E) Relevant roads to be designed to accommodate flood routes for a 1 in 100 ARI year event.

(F) At the detailed design stage, consider utilising stormwater for the irrigation of public open space and street trees.

(G) All lots to be connected to the reticulated water system.

(H) All residential lots to be connected to the reticulated sewerage system.

(I) Where industrial lots are 1 hectare or above, they will serviced with an approved method of effluent disposal.

(J) Buildings to be raised at least 0.3 metre above the ground level.

(K) Support an education strategy including the provision of information on Waterwise gardens and water-efficient appliances.

(L) Native vegetation to be conserved and incorporated into Public Open Space.

LEGEND

- Subject Land
- Contours
- Drainage Path
- Seasonal Water Course / Living Stream
- Indicative Detention Basin
- Catchment Boundary
- Sub-catchment Boundary
- Moderate to High Risk Acid Sulphate Soils within 3m of Natural Soil Surface *(Department of Environmental Regulation 2015)*
- Waterlogging Risk 10-30% (Moderate - Very High Risk) *(Department of Agriculture and Food; Fisheries and Regional Development 2017)*
- Waterlogging Risk 50-70% (Moderate - Very High Risk) *(Department of Agriculture and Food; Fisheries and Regional Development 2017)*

LOCAL WATER MANAGEMENT STRATEGY
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

SCALE 1:7500
SHEET A3

NORTH 0 150 300m

REV	DESCRIPTION	YYMMDD
B	ADD F, MOD TO NOTE L	171118
A	LWMS	171006

DRAWING NUMBER EP 170520 05 REV B

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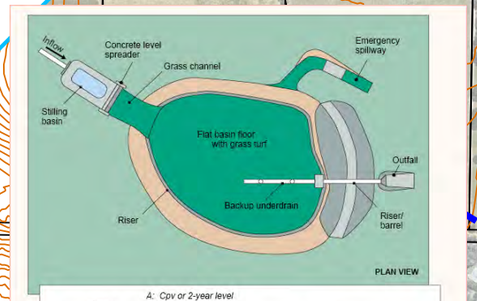
edge PLANNING & PROPERTY

APPENDIX 12



Typical Treatment/Storage Basin

Catchment Boundary

Sub-catchment Boundary

Sub-catchment Boundary

Terry Road

Sub-catchment Boundary

Catchment Boundary

Basin 5

Basin 1

Catchment 1
20.4ha

Catchment 5
24.9ha

CHESTER PASS ROAD

Lot 10

Existing
29.2ha

Catchment Boundary

Catchment 2
67.3ha

Lot 521

Sub-catchment Boundary

Catchment 3
21.4ha

Catchment 4
14.5ha

Henry Street

Basins
2A, 2B,
2C, 2D

Basin 3

Basin 4

Mercer Road

Proportional Contribution to downstream storage/treatment

All treatment zones & basins to have highflow bypasses

downstream erosion mitigation needed

Talyuberlup Road

Design Data

Basins	Catchment Area (ha)	Volume (20% AEP) (m3)	TWL Area (m2)	Site Area (m2)	2% Treatment Area (m2)
Basin 1	49.6	3808	4400	5720	6944
Basin 2 (A+B+C+D)	67.3	3900	4900	6370	6999
Basin 3	21.4	1192	2000	2600	2226
Basin 4	14.5	800	1500	1950	1508
Basin 5	24.9	1476	3937	5118	2590

Runoff Co-efficients	
Pre	0.15
Post	0.52

STORMWATER MANAGEMENT STRATEGY

REV B

SITE PLAN
Lot 10 Chester Pass Road
and Lot 521 Mercer Road
Walmsley

WOOD & GRIEVE ENGINEERS
NOW PART OF
Stantec

Legend

Existing Basins

Proposed Basins

Proposed Living Stream

Major Flows (1% AEP)

67.3ha Catchment Areas

SCALE 1:10,000
SHEET A3

0 200 400m

REV	DESCRIPTION	YYMMDD	DRAWN	APPRVD
A	CONTEXT PLAN	090403	SJ	ST

DRAWING NUMBER EP 170520 09 REV A

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APPENDIX 13

WOOD & GRIEVE ENGINEERS

Ardess-Walmsley Local Structure Plan

Transport Impact Assessment

Prepared for:

10 Year Developments Pty Ltd

Prepared by:

David Trotter

Project No. 39605

P:\39605\PROJECT DOCUMENTATION\TRANSPORTATION ENGINEERING\TRANSPORTATION REPORTS\TR-RE-005.DOCX

Date:
19 March 2019

Level 22, 570 Bourke Street, Melbourne VIC 3000
T: (03) 8554 7000 **E:** melbourne@wge.com.au **W:** www.wge.com.au

Revision

REVISION	DATE	COMMENT	PREPARED BY	APPROVED BY
A-Dr	02/11/18	DRAFT	David Trotter	James Brownlie
A	30/11/18	FINAL	David Trotter	James Brownlie
B	19/03/19	REVISED FINAL – INCORPORATING MRWA & COUNCIL COMMENTS	David Trotter	James Brownlie

_____

James Brownlie
For and on behalf of
Wood & Grieve Engineers

Contents

Executive Summary

The following outlines a Transport Impact Assessment (TIA) of the Ardess-Walmsley Local Structure Plan (LSP). The LSP encompasses the entirety of Lot 521, however, this report considers Lot 10 Chester Pass Road and the western section of Lot 521 Mercer Road in particular. Specifically, the development of the subject site as a light industry precinct and the impact of this development, including RAV's.

The report has been prepared to build upon and assess the difference between the current LSP proposal and that contemplated within a Transport Assessment (prepared by Opus, dated April 2016) as part of the Warrenup / Walmsley LSP. As such, an assessment of both the subject site (Lot 10 Chester Pass Road and the western section of Lot 521 Mercer Road) as well as the entire LSP area have been completed to provide a comparison with the previously prepared Opus assessment.

The LSP is anticipated to generate and add 2,451 and 2,528 vehicle movements to the external road network during the respective weekday AM and PM peak hours. This represents a decrease of 631 and 659 vehicle movements during the respective weekday AM and PM peak hours than that assessed within the Opus report. There will be more RAV's than that assessed within the Opus report, however, the surrounding roads and intersections have appropriate capacity to accommodate these movements, subject to the adoption of recommendations outlined within this report.

The traffic impact of the development proposal on the Chester Pass Road / Private Access Road intersection has been assessed using SIDRA INTERSECTION and is considered appropriate, including for additional RAV's, subject to the adoption of recommendations outlined within this report. The midblock capacities of the road network within the LSP are within acceptable limits, including allowance for RAV's, subject to the recommendations provided within this and the Opus reports.

Ultimately this report recommends the following additional recommendations, over and above those already presented within the Opus assessment:

- At the bend in the Private Access Road the following mitigating measures are recommended:
  - Trees on the inner radius of the bend in the Private Access Road be removed to allow for appropriate sight lines for oncoming traffic.
  - Provide additional shoulder width at the corner to allow for two opposing RAV's to pass each other simultaneously.
- Complete further analysis to confirm the likely future intersection treatment and timing / trigger point of the upgrade of the Chester Pass Road / Terry Road intersection and Chester Pass Road / Mercer Road intersections.
- Provide a right-turn entry and exit ban (through signage) to/from the Private Access Road via Chester Pass Road. The timing and implementation of these bans are subject to the development of the entire LSP area and subsequent increase in through traffic volumes on Chester Pass Road and provision of seagull style intersection treatments at surrounding intersections.

As outlined within the proceeding assessment and subject to adoption of the above recommendations, the traffic impacts of the development of the subject site (light industry precinct), including allowance for RAV's, are considered acceptable.

1. Development Proposal

1.1 Introduction

Wood & Grieve Engineers (WGE) have been commissioned by Ten Year Developments Pty Ltd to prepare a Transport Impact Assessment (TIA) as part of the Ardess-Walmsley Local Structure Plan (LSP). The LSP encompasses the entirety of Lot 521, however, this report considers Lot 10 Chester Pass Road and the western section of Lot 521 Mercer Road. The extents of the LSP as well as the surrounding lots are illustrated within Figure 1.1. It should be noted that an additional TIA will be prepared, pre-subdivision, for the balance of Lot 521 located to the east of Range Road.

This TIA is based upon the Local Structure Plan prepared by Edge Planning & Property, Drawing Number EP 17052006, Revision E, dated 15 May 2018, which is included within Appendix A.

The following outlines an assessment of the LSP in accordance with the recommended structure outlined within the Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines: Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans (August 2016).

The scope of the report was discussed within a meeting on Thursday 16 August 2018 between WGE, City of Albany, Main Roads WA (MRWA), The Applicant and Town Planner. Specifically, this report has been prepared to build upon and assess the difference between the current LSP proposal and that contemplated within a Transport Assessment (prepared by Opus, dated April 2016) as part of the Warrenup / Walmsley LSP. This report should be read in conjunction with the Opus report.

1.2 Structure Plan Proposal

This report has due consideration to the transport findings of the Opus report and builds upon these with respect to the LSP.

As discussed previously, this LSP incorporates Lot 10 Chester Pass Road and the western section of Lot 521 Mercer Road (refer to Figure 1.1 for context). Within this area, nominated as a light industry precinct, it is understood that this area could ultimately comprise in the order of 30 industrial lots. Based on the anticipated typology of these uses and advice provided by the project team, an industrial floor area of 500sq.m per lot has been assumed.

In order to provide context Table 1.1 has been prepared to summarise the assessed land uses and sizes.

LOT	USE	SIZE		
		OPUS REPORT [1]	THIS REPORT	DIFFERENCE
6	Residential	185 dwellings	185 dwellings	-
	Commercial	12,000 sq.m	12,000 sq.m	-
271	Residential	220 dwellings	220 dwellings	-
	Commercial	11,000 sq.m	11,000 sq.m	-
4925	Residential	285 dwellings	285 dwellings	-
5498	Residential	385 dwellings	385 dwellings	-
	Commercial	7,000 sq.m	7,000 sq.m	-
	Retail	2,000 sq.m (1,000 sq.m food and 1,000 sq.m non-food)	2,000 sq.m (1,000 sq.m food and 1,000 sq.m non-food)	-
10	Industrial	40,000sq.m	6,500 sq.m [2]	- 33,500 sq.m
521	Residential	1,480 dwellings [3]	1,251 dwellings [4]	- 229 dwellings
	Primary School	430 pupils	430 pupils	-
	Industrial	-	8,500 sq.m [5]	+ 8,500 sq.m
Total	**Residential**	**2,555 dwellings**	**2,326 dwellings**	**- 229 dwellings**
	Commercial	**18,000 sq.m**	**18,000 sq.m**	**-**

	Retail	**2,000 sq.m**	**2,000 sq.m**	**-**
	Primary School	**430 pupils**	**430 pupils**	**-**
	Industrial	**40,000 sq.m**	**15,000 sq.m**	**-25,000sq.m**

Table 1.1 – Development Schedule

[1] As per Opus Transport Assessment, dated April 2016. Industrial floor area assumed to be 50% of the site area.

[2] Total site are of approximately 26.5ha. Assumed to comprise 13 of the 30 total industrial lots. Assumed industrial floor area of 500sq.m per lot.

[3] Total site of Lot 152 is 152.62ha, excluding allowance for the Primary School, this roughly equates to a provision of 9.7 dwellings / ha[1].

[4] Assumes a residential land area of 129 ha, calculated as 152ha original site size minus 33ha of industrial area. Calculated as 9.7 dwellings / ha multiplied by the residential land area of 129 ha.

[5] Industrial site area approximately 33ha. Assumed to comprise 17 of the 30 total industrial lots. Assumed industrial floor area of 500sq.m per lot.

[1] It is understood that in reality that the 9.7 dwellings / ha includes public open space (POS) and includes remnant native vegetation proposed to be retained on Lot 521. Excluding POS and conserving remnant native vegetation, the estimated residential density is likely to be closer to 14 dwellings / ha. Notwithstanding, a density of 9.7 dwellings / ha has been adopted for this analysis.

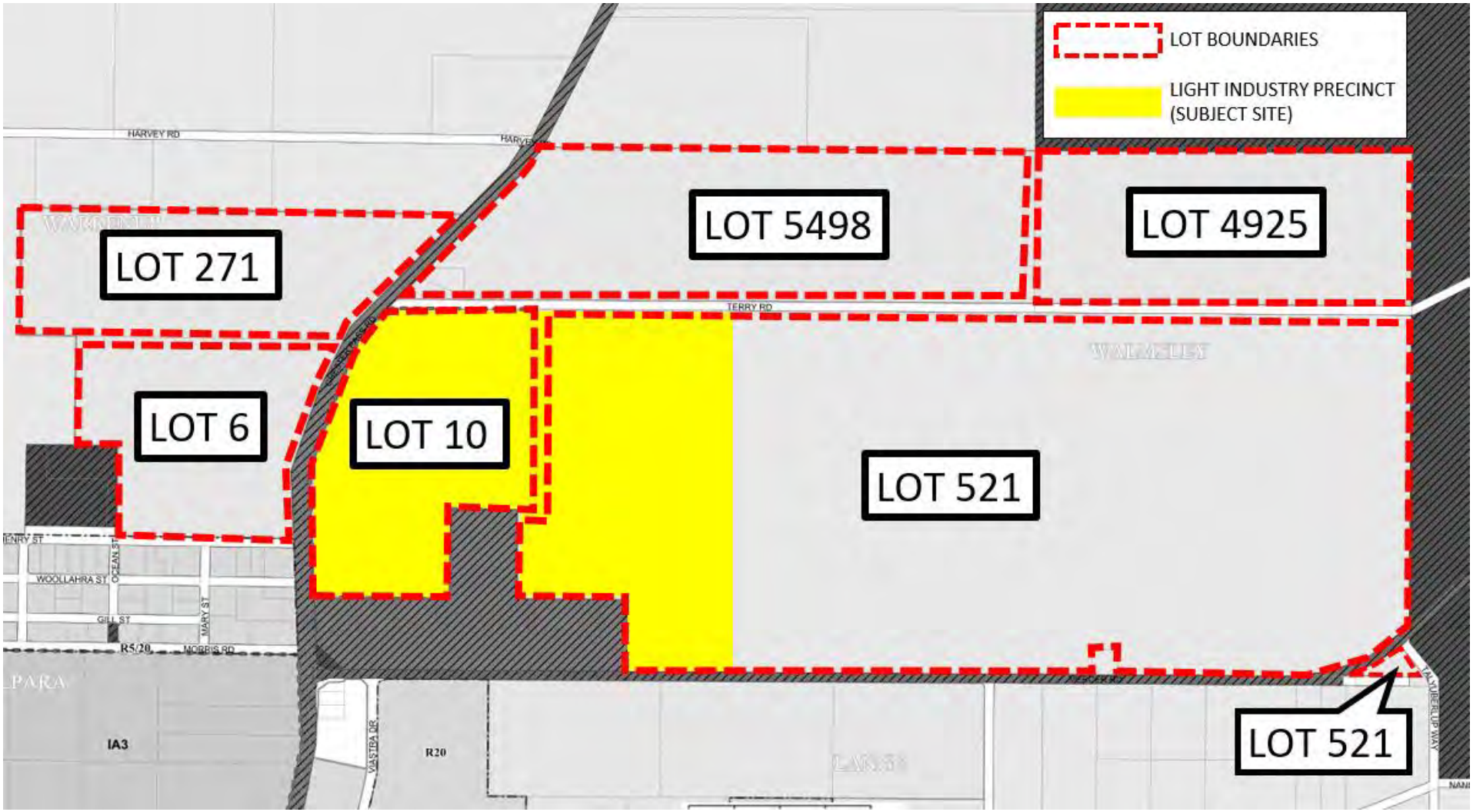
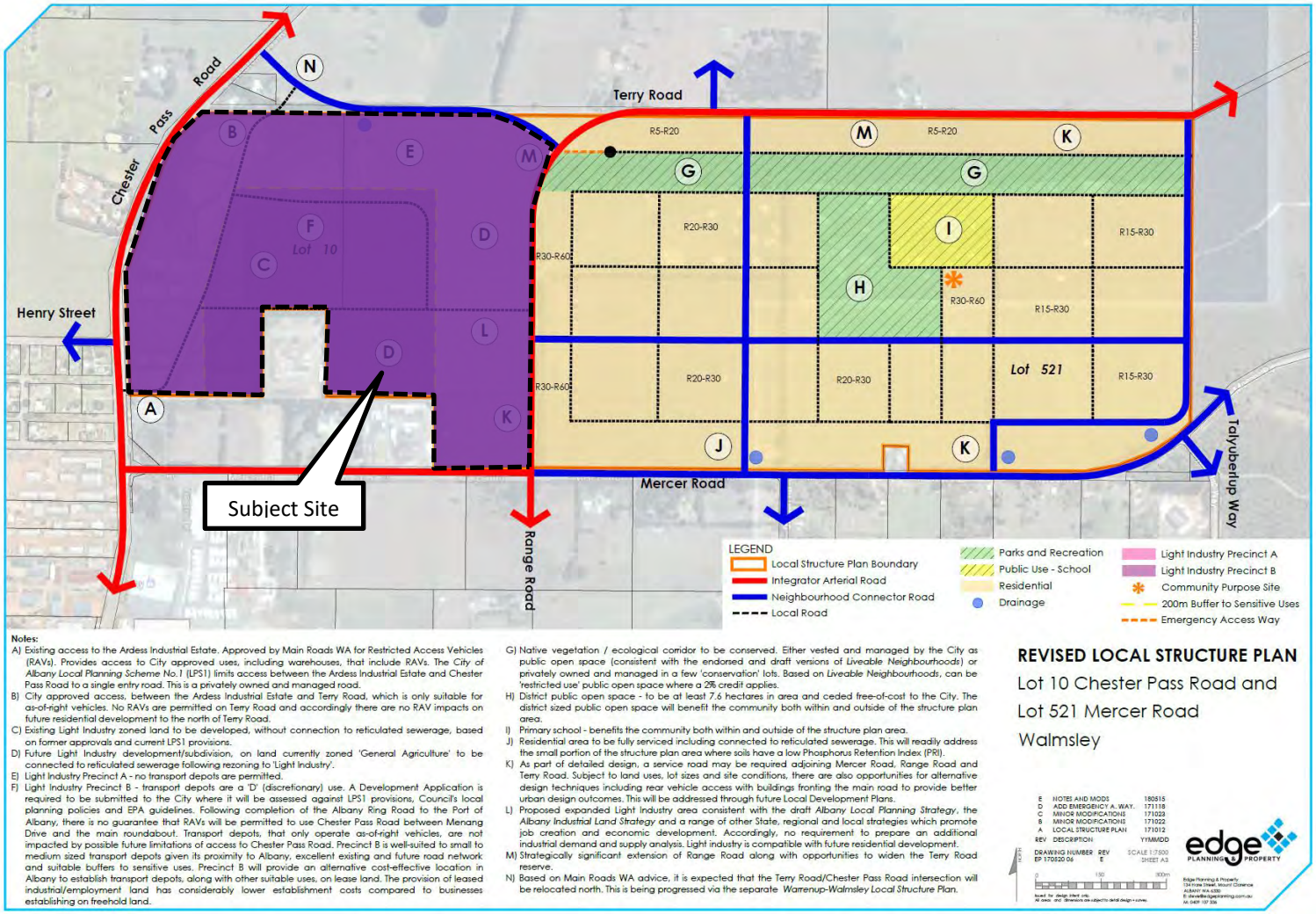


Figure 1.1: Site Context

(Source: Intra Maps – City of Albany)

1.3 Internal Road Network

The proposed internal road network is outlined within the Local Structure Plan, which is illustrated within Figure 1.2.



Notes:

A) Existing access to the Ardess Industrial Estate. Approved by Main Roads WA for Restricted Access Vehicles (RAVs). Provides access to City approved uses, including warehouses, that include RAVs. The *City of Albany Local Planning Scheme No.1* (LPS1) limits access between the Ardess Industrial Estate and Chester Pass Road to a single entry road. This is a privately owned and managed road.

B) City approved access, between the Ardess Industrial Estate and Terry Road, which is only suitable for as-of-right vehicles. No RAVs are permitted on Terry Road and accordingly there are no RAV impacts on future residential development to the north of Terry Road.

C) Existing Light Industry zoned land to be developed, without connection to reticulated sewerage, based on former approvals and current LPS1 provisions.

D) Future Light Industry development/subdivision, on land currently zoned 'General Agriculture' to be connected to reticulated sewerage following rezoning to 'Light Industry'.

E) Light Industry Precinct A - no transport depots are permitted.

F) Light Industry Precinct B - transport depots are a 'D' (discretionary) use. A Development Application is required to be submitted to the City where it will be assessed against LPS1 provisions, Council's local planning policies and EPA guidelines. Following completion of the Albany Ring Road to the Port of Albany, there is no guarantee that RAVs will be permitted to use Chester Pass Road between Menang Drive and the main roundabout. Transport depots, that only operate as-of-right vehicles, are not impacted by possible future limitations of access to Chester Pass Road. Precinct B is well-suited to small to medium sized transport depots given its proximity to Albany, excellent existing and future road network and suitable buffers to sensitive uses. Precinct B will provide an alternative cost-effective location in Albany to establish transport depots, along with other suitable uses, on lease land. The provision of leased industrial/employment land has considerably lower establishment costs compared to businesses establishing on freehold land.

G) Native vegetation / ecological corridor to be conserved. Either vested and managed by the City as public open space (consistent with the endorsed and draft versions of *Liveable Neighbourhoods*) or privately owned and managed in a few 'conservation' lots. Based on *Liveable Neighbourhoods*, can be 'restricted use' public open space where a 2% credit applies.

H) District public open space - to be at least 7.6 hectares in area and ceded free-of-cost to the City. The district sized public open space will benefit the community both within and outside of the structure plan area.

I) Primary school - benefits the community both within and outside of the structure plan area.

J) Residential area to be fully serviced including connected to reticulated sewerage. This will readily address the small portion of the structure plan area where soils have a low Phosphorus Retention Index (PRI).

K) As part of detailed design, a service road may be required adjoining Mercer Road, Range Road and Terry Road. Subject to land uses, lot sizes and site conditions, there are also opportunities for alternative design techniques including rear vehicle access with buildings fronting the main road to provide better urban design outcomes. This will be addressed through future Local Development Plans.

L) Proposed expanded Light Industry area consistent with the draft Albany *Local Planning Strategy*, the *Albany Industrial Land Strategy* and a range of other State, regional and local strategies which promote job creation and economic development. Accordingly, no requirement to prepare an additional industrial demand and supply analysis. Light industry is compatible with future residential development.

M) Strategically significant extension of Range Road along with opportunities to widen the Terry Road reserve.

N) Based on Main Roads WA advice, it is expected that the Terry Road/Chester Pass Road intersection will be relocated north. This is being progressed via the separate *Warrenup-Walmsley Local Structure Plan*.

Figure 1.2: Local Structure Plan

(Source: Edge Planning & Property)

1.4 Purpose

This transport impact assessment provides an assessment of both internal and external links within the proposed LSP road network. The purpose of this assessment is to build upon the transport assessment prepared by Opus and to identify the proposed changes from the transport impacts identified within that report.

This report has been prepared in accordance with the recommended structure outlined within the 'Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines: Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans (August 2016)'. Specifically, this report focusses upon the following:

- Existing site and transport conditions
- Proposed land use types/sizes
- Internal and external road network and connections
- Anticipated traffic generation and distribution
- Traffic impact and associated recommended mitigating roadworks and treatments.

2. Existing Conditions

2.1 Subject Site

The subject site incorporates Lot 10 Chester Pass Road and the western section of Lot 521 Mercer Road and is generally bound by Chester Pass Road (west), Terry Road (north) and the City of Albany Works Depot / Mercer Road (south). The subject site is located approximately 5km north of the Albany CBD.

The LSP area (subject site) currently comprises a transport depot, industrial uses and various unoccupied land parcels. Surrounding land uses primarily comprise industrial uses to the south (fronting or in the immediate vicinity of Chester Pass Road), residential uses to the west and rural / park uses to the north and east of the site. The notable exception to this is Chester Pass Mall and the Harvey Norman tenancy, which are located south of the subject site. These retail land uses are major traffic attractors within the vicinity of the subject site.

The location of the subject site and the surrounding environs is shown in Figure 2.1 with the land zoning shown in Figure 2.2.

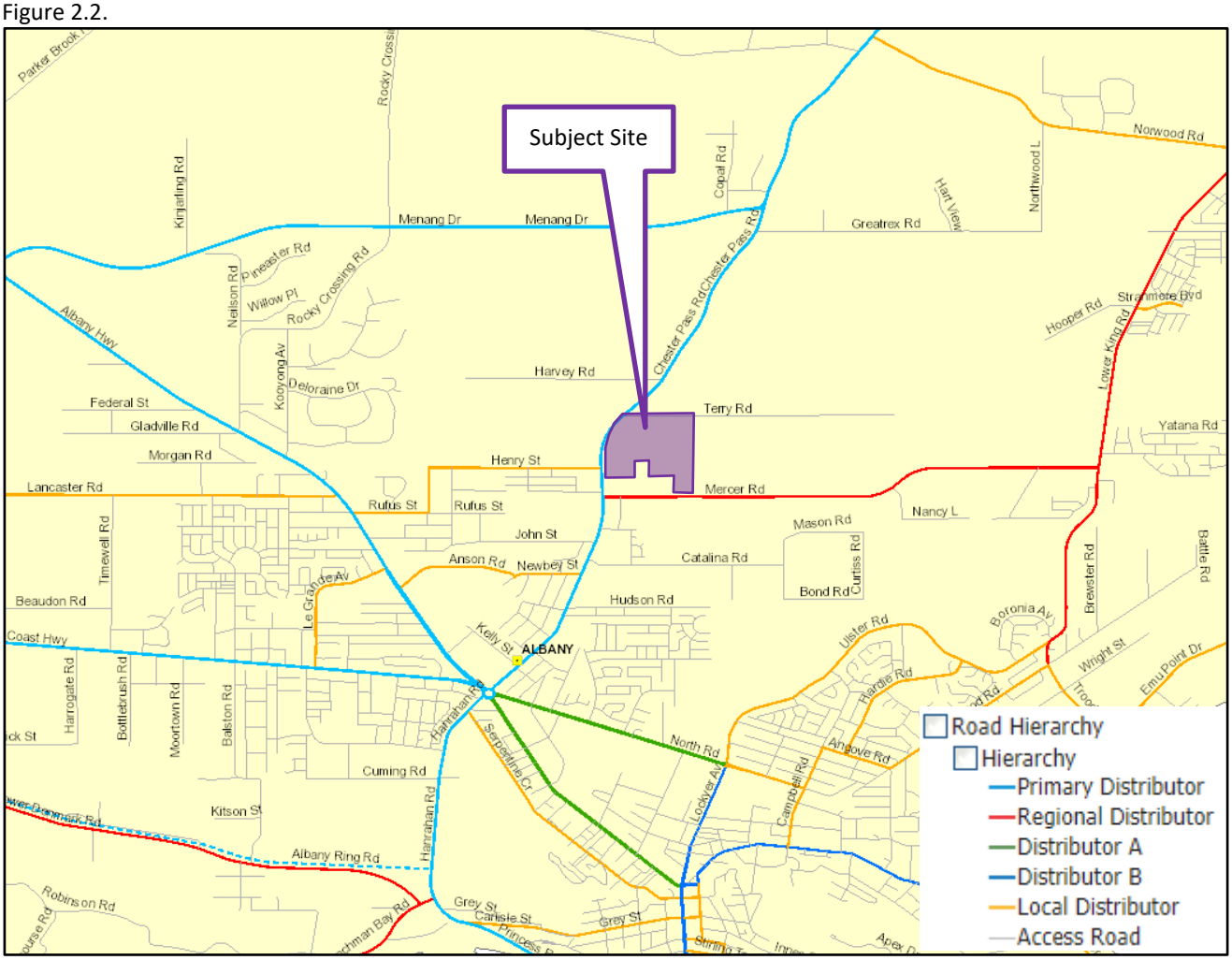


Figure 2.1: Surrounding Road Network & Environs

(Source: Main Roads WA)

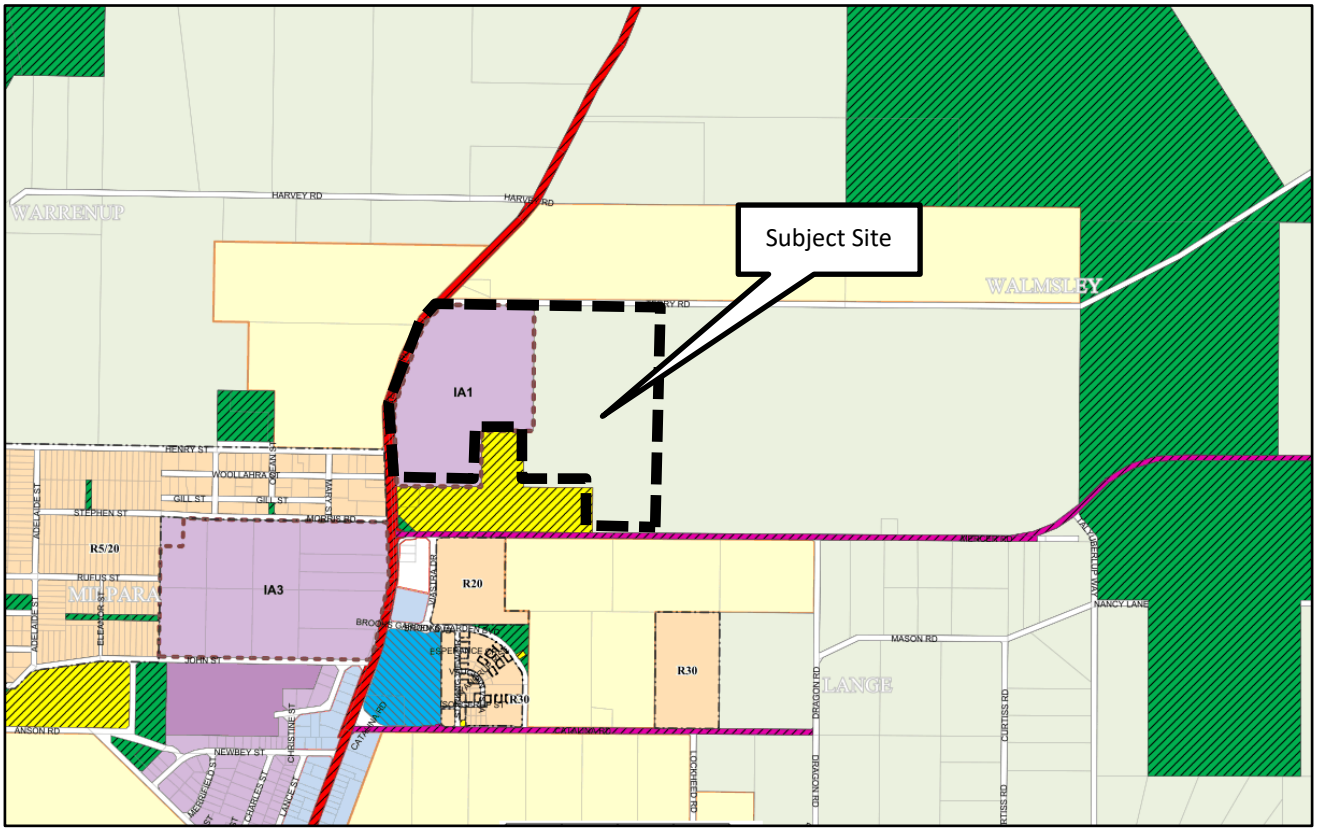


Figure 2.2: Land Zoning Map

(Source: IntraMaps)

2.2 Road Network

Chester Pass Road

Chester Pass Road functions as a primary distributor. It is generally aligned in a north-south direction and comprises two traffic lanes in each direction, separated by a painted median. The carriageway narrows to a single lane in each direction north of Henry Street.

Chester Pass Road is a permitted RAV (Restricted Access Vehicle) Network 7 route, allowing vehicles up to an including a prime mover, towing semi-trailer and b-double as well as a b-double towing a dog trailer (both up to 36.5m in length) to use the road.

Chester Pass Road carries in the order of 5,694 vehicles per day[2] and is shown within Figure 2.3.

[2] Main Roads WA Great Southern Traffic Digest 2009/10-2014/15, 2010/11 data (Location North of Mercer Road). The 2013/14 – 2018/19 Traffic Digest does not contain traffic data for this road segment, as such a 3% compound growth rate of 3% per year has been applied for 7 years to reflect anticipated 2017/18 traffic volumes.

Figure 2.3 – Chester Pass Road – Looking North

Mercer Road

Mercer Road functions as a Regional Distributor, generally aligned in an east-west direction and comprising a single traffic lane in each direction. Mercer Road provides a key road link between Chester Pass Road and Lower King Road.

Mercer Road carries in the order of 4,527 vehicles per day[3] and is shown within Figure 2.4.

Figure 2.4 – Mercer Road – Looking East

Terry Road

Terry Road functions as an Access Road and is aligned in an east-west direction. The road is unsealed and permits two-way traffic.

Terry Road carries in the order of 35 vehicles per day[4] and is shown within Figure 2.5.

[3] Weekday average of pneumatic tube counts completed by the City of Albany from 2 October 2018 to 18 October 2018.

[4] Weekday average of pneumatic tube counts completed by the City of Albany from 19 October 2018 to 7 November 2018.

Figure 2.5 – Terry Road – Looking East

Private Access Road

A private access road is provided to the 'Ardess Estate' with a direct connection to Chester Pass Road as well as Terry Road. Based on observations it is understood that the connection to Chester Pass Road has a significantly higher utilisation than that to Terry Road.

The Private Access Road provides a single traffic lane in each direction with future RAV (Restricted Access Vehicle) Network 7 route status being sought for the road. The future RAV Network 7 status being sought would permit vehicles up to an including an Oversize Road Train to use the road, noting that RAV's are not permitted on Terry Road.

The Private Access Road carries approximately 725 vehicles per day[5] in the vicinity of Chester Pass Road and is shown within Figure 2.6. It is further noted that 5.3% of these recorded vehicles were Restricted Access Vehicles (all categories).

Figure 2.6 – Private Access Road – Looking East

[5] Weekday average of pneumatic tube counts completed by the City of Albany from 1 October 2018 to 18 October 2018.

2.3 Sustainable Transport

There is limited public transport and bicycle/walking paths within the vicinity of the site. There are shared paths surrounding the Chester Pass Mall to the south of the site and along the eastern side of Chester Pass Road. The broader sustainable transport infrastructure surrounding the subject site is shown within Figure 2.7.

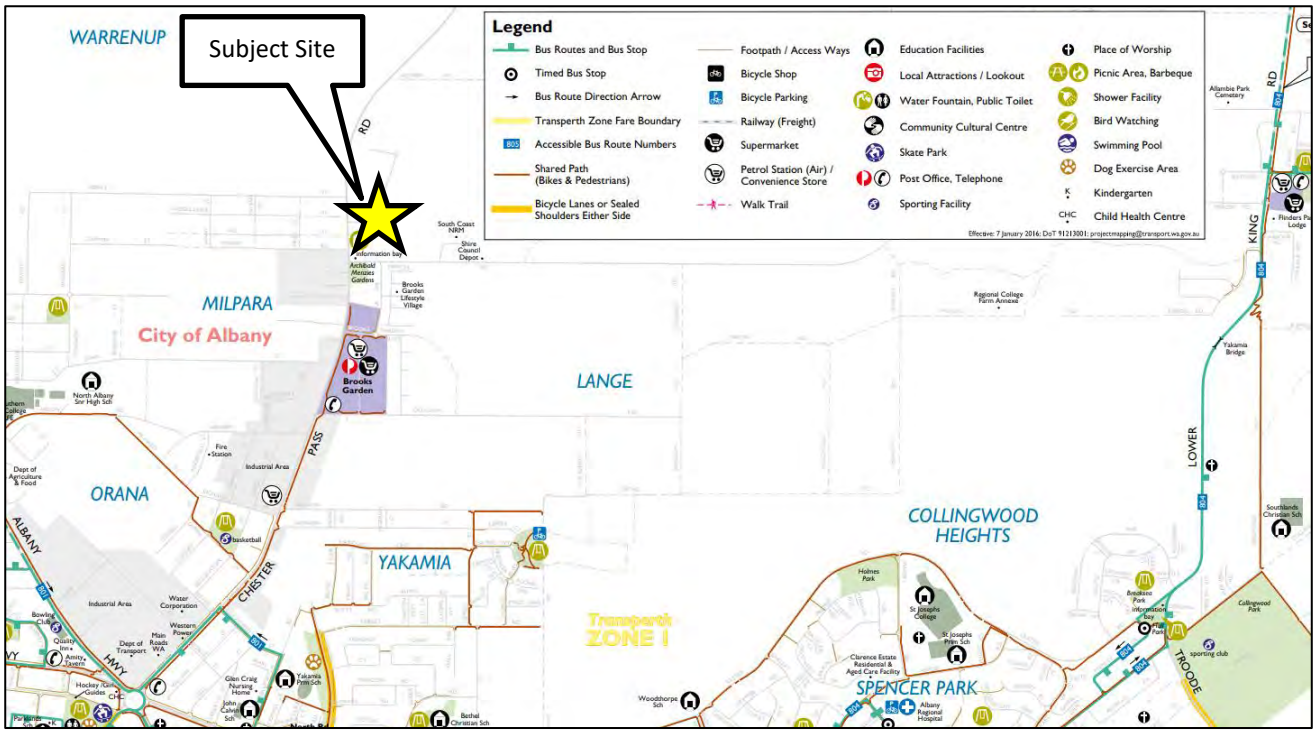


Figure 2.7 – Sustainable Transport Infrastructure

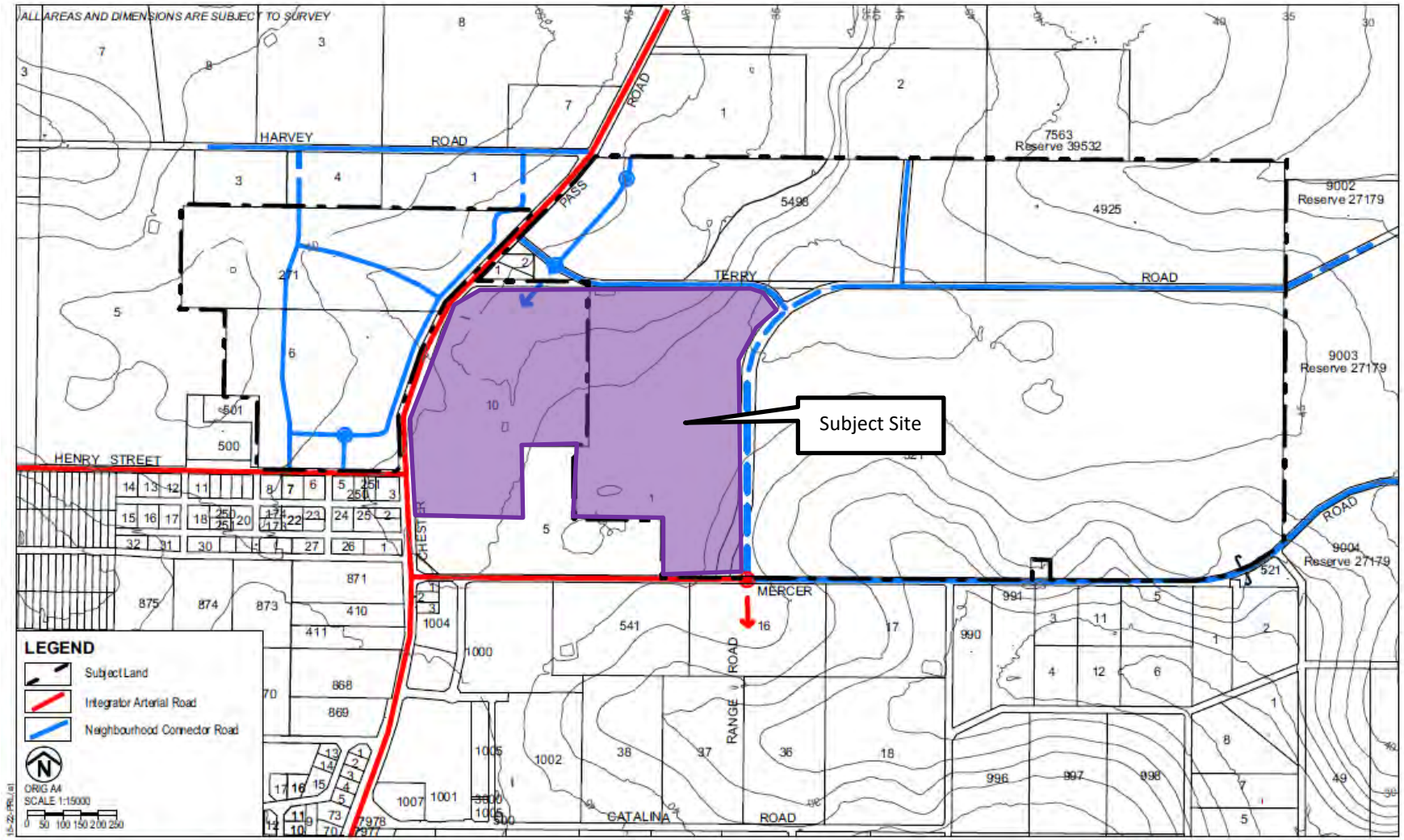
(Source: TravelSmart Map)

2.4 Warrenup / Walmsley Local Structure Plan

Ayton Baesjou Planning prepared the Warrenup / Walmsley Local Structure Plan. As discussed previously this LSP comprised a Transport Assessment, prepared by Opus, which provided the following key conclusions:

- Extension of the duplication of Chester Pass Road from Henry Street to Harvey Road;
- Provision for Chester Pass Road to be widened by 10 metres on either side.
- Retention of the Henry Street/Chester Pass Road and Chester Pass Road/Mercer Road intersections as opposed to linking Henry Street directly to Mercer Road with a four-way intersection or roundabout;
- No new points of access permitted onto Chester Pass Road with potential provision for seagull style T intersections at Henry Street and Harvey Road to allow right turning movements as well as from the realigned Terry Road intersection.
- An extension of Range Road to provide an alternative north-south route to Chester Pass Road;
- Limited access to/from Mercer Road to the east of Range Road;
- Provision of an internal service road on the western side of Chester Pass Road between Henry Street and Harvey Road to accommodate traffic serving the proposed future mixed use/commercial area;
- Provision for on and off-road cycle infrastructure within the site and opportunities to improve safety of cyclists on Chester Pass Road;
- Provision of footpaths from residential areas to school and future commercial/retail precincts, including a suitable connection across Chester Pass Road to access the Local Centre;
- Plan for provision of bus services and bus stops within the development.

Based on the Opus assessment a transport network plan was prepared which is illustrated within Figure 2.8.



AYTON BAESJOU PLANNING
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PRIMARY ROAD LAYOUT
Lots 4925 & 5498 Terry Road, Lot 521 Mercer Road
& Lots 1, 2, 6 & 271 Chester Pass Road
Warrenup/Walmsley, City of Albany

Figure 2.8 – Proposed Road Network - Warrenup / Walmsley Local Structure Plan

(Source: Figure 10 - Warrenup / Walmsley Local Structure Plan)

3. Traffic Considerations

3.1 Methodology

As described earlier within this report, this assessment builds upon the assessment already prepared by Opus as part of the Warrenup / Walmsley Local Structure Plan (LSP).

The following traffic assessment is generally based upon the assumptions and methodology outlined within the Opus report and has been prepared to provide updated traffic volumes, and hence findings, with respect to traffic considerations based on the revised land uses.

As noted within the Opus report any recommendations made may need to be revised following the development of the Yakamia/Lange Structure Plan as well as the finalisation of the Albany Transport Model by MRWA.

3.2 Land Use

The proposed land uses and their size as part of the Warrenup/Walmsley LSP along with the refinements set out in the Ardess/Walmsley LSP for Lot 10 and the western section of Lot 521 are nominated within Table 3.1.

LOT	USE	SIZE
6	Residential	185 dwellings
	Commercial	12,000 sq.m
271	Residential	220 dwellings
	Commercial	11,000 sq.m
4925	Residential	285 dwellings
5498	Residential	385 dwellings
	Commercial	7,000 sq.m
	Retail	2,000 sq.m (1,000 sq.m food and 1,000 sq.m non-food)
10	Industrial	6,500 sq.m [1]
521	Residential	1,251 dwellings [2]
	Primary School	430 pupils
	Industrial	8,500 sq.m [3]
Total	**Residential**	**2,326 dwellings**
	Commercial	**18,000 sq.m**
	Retail	**2,000 sq.m**
	Primary School	**430 pupils**
	Industrial	**15,000 sq.m**

[1] Total site area of approximately 26.5ha. Assumed to comprise 13 of the 30 total industrial lots. Assumed industrial floor area of 500sq.m per lot.
[2] Assumes a residential land area of 129 ha, calculated as 152ha original site size minus 33ha of industrial area. Calculated as 9.7 dwellings / ha multiplied by the residential land area of 129 ha[6].
[3] Industrial site area approximately 33ha. Assumed to comprise 17 of the 30 total industrial lots. Assumed industrial floor area of 500sq.m per lot.
Table 3.1 – Development Schedule

[6] It is understood that in reality that the 9.7 dwellings / ha includes public open space (POS) and includes remnant native vegetation proposed to be retained on Lot 521. Excluding POS and conserving remnant native vegetation, the estimated residential density is likely to be closer to 14 dwellings / ha. Notwithstanding, a density of 9.7 dwellings / ha has been adopted for this analysis.

3.3 Traffic Generation

Traffic generation rates are derived from the WAPC Transport Assessment guidelines for Developments: Volume 2 – Structure Plans as per the Opus report.

The Opus report assumes that 25% of traffic associated with non-residential uses is assumed to be internal to the LSP network. The Opus report separated this traffic out, however, ultimately added these volumes into calculations to provide an overtly conservative assessment.

For the purposes of this assessment a 25% reduction has been applied to non-residential traffic generation rates to allow for this internal traffic and to avoid 'double counting', that is, avoid counting internal movements within both residential and non-residential traffic generation rates).

As such, adopted traffic generation rates are nominated within Table 3.2 that include a 25% reduction for non-residential uses.

LAND USE	UNIT	AM PEAK HOUR TRIP RATE		PM PEAK HOUR TRIP RATE	
		IN	OUT	IN	OUT
Residential	Dwellings	0.15	0.45	0.38	0.23
School	Pupils	0.5	0.5	0.5	0.5
Commercial [1]	100sq.m GFA	1.2	0.3	0.3	1.2
Retail [1] [2]	100sq.m GFA	1.13	0.28	2.63	2.63
Industrial [1]	100sq.m GFA	0.6	0.15	0.15	0.6

*GFA = Gross Floor Area

[1] Traffic generation rates from the 'WAPC Transport Assessment guidelines for Developments: Volume 2 – Structure Plans' have been reduced by 25% to avoid 'double counting' as per outlined methodology.

[2] Retail includes food and non-food tenancies, with the former having a higher traffic generation rate. For the purposes of this assessment the midpoint has been selected with retail land uses within the LSP assumed to have a 50/50 split of food and non-food retail tenancies.

Table 3.2 – Traffic Generation Rates

3.3.1 Existing Conditions

WGE sourced traffic volume information for key surrounding roads from the following sources:

- **Chester Pass Road** - Main Roads WA Great Southern Traffic Digest 2009/10-2014/15, 2010/11 data (Location North of Mercer Road). A compound growth rate of 3% per year has been applied for 7 years to reflect anticipated 2017/18 traffic volumes. Assumed 8% peak-to-daily ratio and a 40/60 (AM) and 50/50 (PM) north/south directional split.
- **Mercer Road** - Weekday average of peak hour pneumatic tube counts completed by the City of Albany from 2 October 2018 to 18 October 2018. Assumed 50/50 east/west directional split.
- **Private Access Road** - Weekday average of peak hour pneumatic tube counts completed by the City of Albany from 1 October 2018 to 18 October 2018. Assumed 80/20 (AM) and 20/80 (PM) directional split.
- **Terry Road** – Weekday average of peak hour pneumatic tube counts completed by the City of Albany from 19 October 2018 to 7 November 2018. Assumed 80/20 (AM) and 20/80 (PM) directional split.

No existing traffic volume information is available for Henry Street and Harvey Road. The existing traffic volume has been assumed as zero, consistent with the Opus report. It is noted that negligible existing traffic is assumed within Harvey Road with Henry Street expected to have moderate existing traffic volumes given the number of abutting properties and surrounding road network.

Importantly it is noted that the assessment outlines within this report determines that less traffic is expected to utilise Henry Street and Harvey Road, compared with that outlined within the Opus report. As such, the absence of existing traffic data for Henry Street and Harvey Road is considered appropriate in the context of this report.

Based on these traffic counts the derived 2018 AM and PM existing peak hour traffic volumes are shown within Appendix B.

3.3.2 Base Case

The Base Case outlines a future scenario, which excludes the development proposal but includes future traffic growth in the area.

A compound growth factor of 3% has been added to the existing traffic volumes on Chester Pass Road and Mercer Road, but not the Private Access Road and Terry Road as traffic counts were completed in 2018. Traffic volumes have been factored to reflect a 2031 design year with the base case AM and PM peak hour traffic volumes shown in Appendix B. A 2031 design year was nominated within the Opus report as the development of the precinct may take 10-15 years.

3.4 Site Generated

3.4.1 Traffic Distributions

The following directional distribution distributions of traffic to/from the site have been assumed:

General

- 100% of site generated traffic, via Chester Pass Road, occurs to/from the south.
- 25% of traffic associated with non-residential uses assumed to be internal to the LSP network. For the purposes of this assessment a 25% reduction has been applied to non-residential traffic generation to allow for this internal traffic and to avoid 'double counting', that is, avoid counting internal movements which are considered within both residential and non-residential traffic generation rates.
- All traffic to/from the south via either Chester Pass Road or the Range Road extension.

Lots 6 & 271

- Chester Pass Road via Harvey Road – 50%
- Chester Pass Road via Henry Street – 50%

Lot 521

- Chester Pass Road via Mercer Road – 50%
- Range Road Extension – 50%

Lots 4925 & 5498

- Chester Pass Road via Terry Road – 50%
- Range Road Extension – 50%

Subject Site

- Chester Pass Road via Private Access Road – 65%
- Chester Pass Road via Terry Road – 10%
- Range Road Extension – 25%

3.4.2 Traffic Volumes

Site Generated

Based on the traffic generation rates outlined within Table 3.2; Table 3.3 has been prepared to show the anticipated site generated traffic volumes. These volumes are also illustrated within Appendix B.

LOCATION	LAND USE	SIZE	AM PEAK HOUR		PM PEAK HOUR	
			IN	OUT	IN	OUT
Subject Site	Industrial	15,000 sq.m	90 vph	23 vph	23 vph	90 vph
Lot 6	Residential	185 dwellings	37 vph	111 vph	93 vph	56 vph
	Commercial	12,000 sq.m	144 vph	36 vph	36 vph	144 vph
Lot 271	Residential	220 dwellings	44 vph	132 vph	110 vph	66 vph
	Commercial	11,000 sq.m	132 vph	33 vph	33 vph	132 vph
Lots 6 & 271 (Sub-Total)			357 vph	312 vph	272 vph	398 vph
Lot 521	Residential	1,251 dwellings	250 vph	751 vph	626 vph	375 vph

Lot 4925	Residential	285 dwellings	57 vph	171 vph	143 vph	86 vph
Lot 5498	Residential	385 dwellings	77 vph	231 vph	193 vph	116 vph
	Commercial	7,000 sq.m	84 vph	21 vph	21 vph	84 vph
	Retail	2,000 sq.m	23 vph	6 vph	53 vph	53 vph
Lots 4925 & 5498 (Sub-Total)			241 vph	429 vph	409 vph	338 vph
Total			**938 vph**	**1,514 vph**	**1,328 vph**	**1,200 vph**
Lot 521	Primary School [1]	430 pupils	215 vph	215 vph	215 vph	215 vph

*vph = vehicles per hour

[1] All traffic assumed to be internal to the road network.

Table 3.3 – Traffic Generation

Traffic Volume Comparison

Table 3.4 has been prepared to provide a comparison of the site generated traffic volumes on the external road network that are assessed within this and the Opus assessment.

	AM PEAK HOUR			PM PEAK HOUR		
ASSESSMENT [1]	**IN**	**OUT**	**TOTAL**	**IN**	**OUT**	**TOTAL**
WGE	938 vph	1514 vph	2,451 vph	1,328 vph	1,200 vph	2,528 vph
Opus	1,341 vph	1,741 vph	3,082 vph	1,549 vph	1,638 vph	3,187 vph
Difference	**-403 vph**	**-227 vph**	**-631 vph**	**-221 vph**	**-438 vph**	**-659 vph**

[1] Excludes all traffic associated with the Primary School.

Table 3.4 – Traffic Generation Comparison

As shown within Table 3.4 the revised LSP proposal is anticipated to generate some 631 and 659 fewer vehicle movements to the external road network than that assessed within the previously prepared Opus assessment. This reduction in anticipated traffic volumes is based upon the following:

- Reduction in the assumed floor area of the 'industrial area'.
- Reduction in the number of dwellings within Lot 521 (WGE), nominated as Lot 392 (Opus).
- WGE assessment does not include internal traffic volumes within the external traffic generation and distribution and applies a 25% reduction in non-residential traffic generation to account for this and to avoid 'double counting'. This double counting is included within the Opus assessment, with the exception of the primary school traffic, which is not included within the external analysis for either assessment.

3.5 Post Development

Post development traffic volumes have been derived by adding the site generated traffic volumes to the base case traffic volumes. The post development AM and PM peak hour traffic volumes, for both this assessment and the Opus assessment are shown within Appendix B.

Based on this, Figure 3.1 and Figure 3.2 have been prepared to provide a comparison of the volumes outlined within this report (WGE) and the Opus assessment.

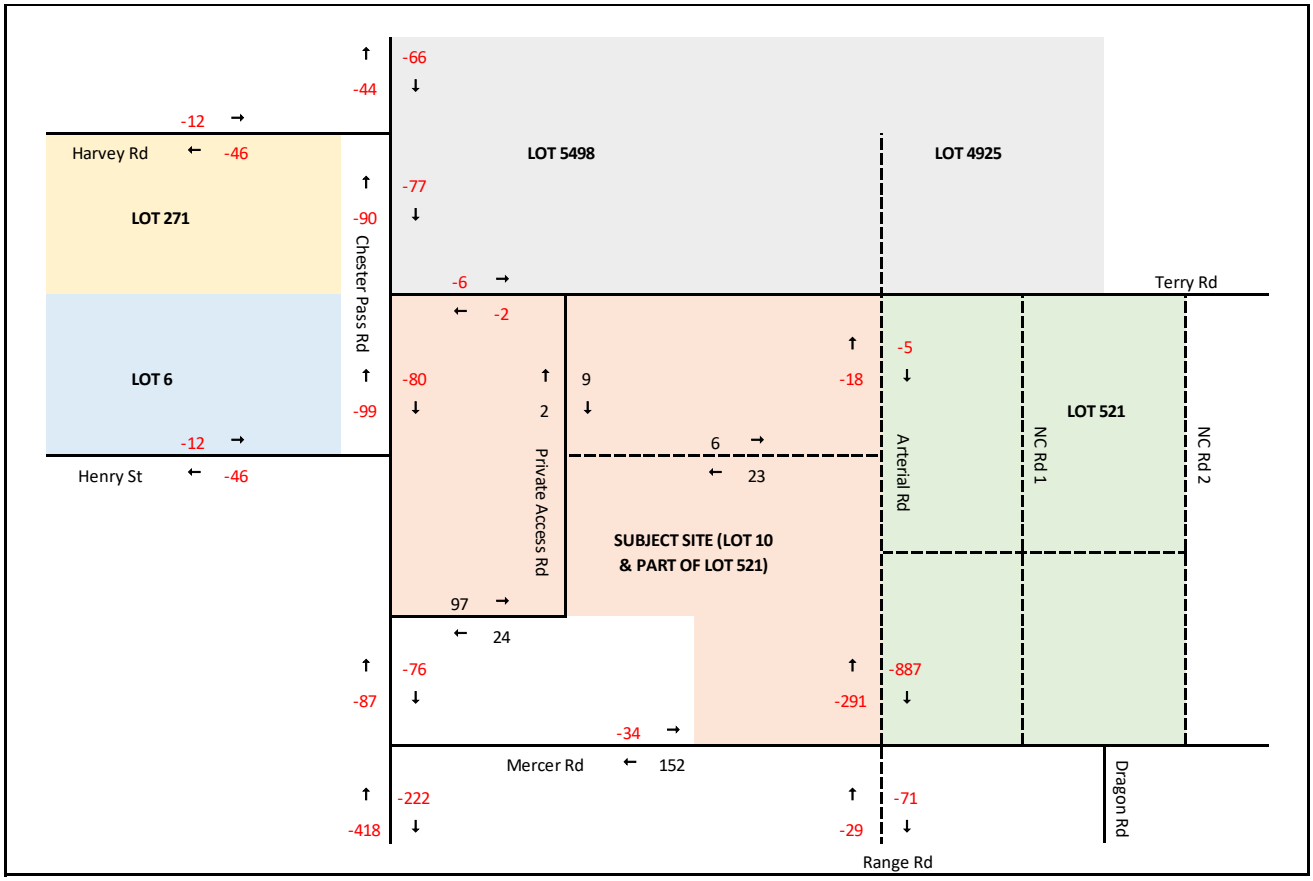


Figure 3.1 – Post Development Traffic Volumes Comparison – Weekday AM Peak Hour

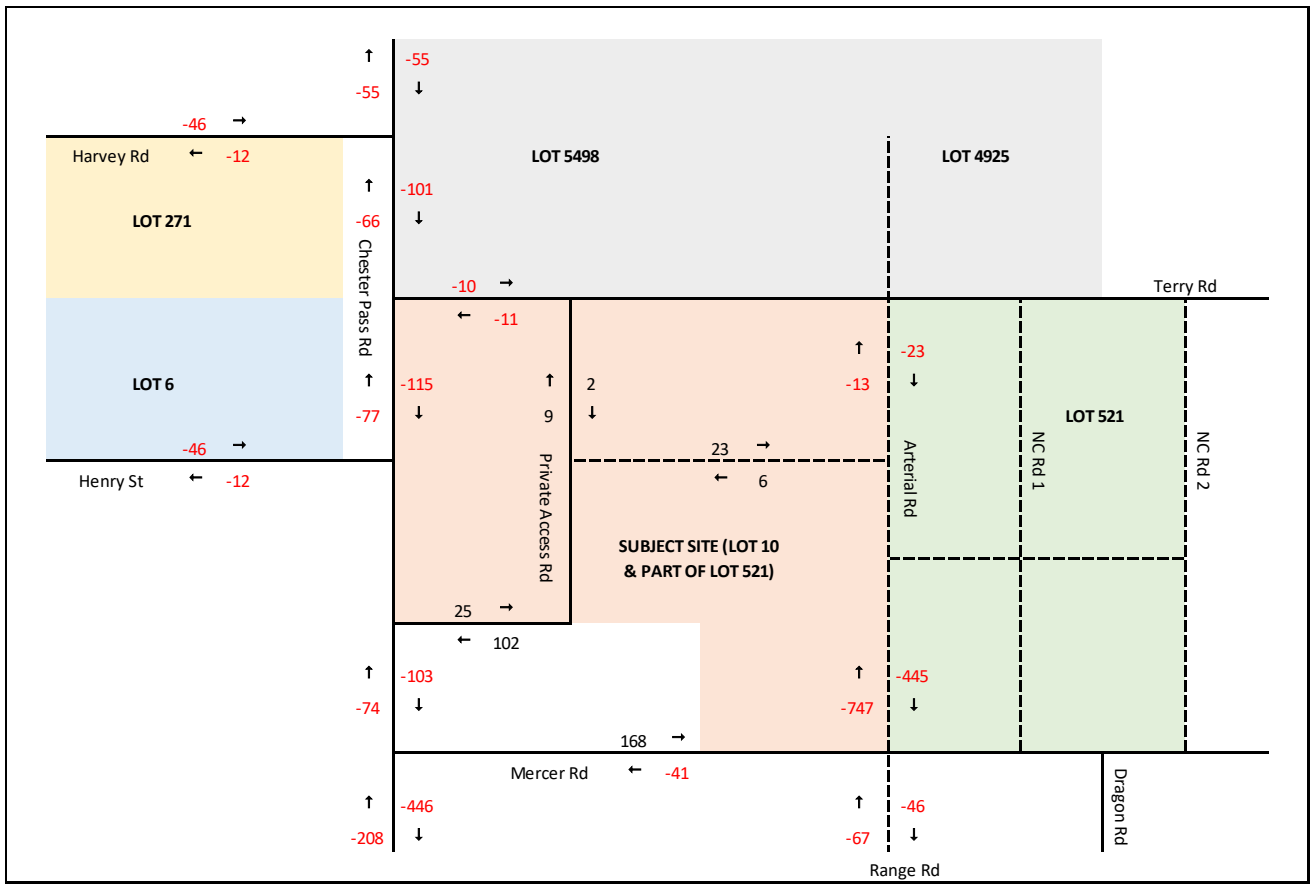


Figure 3.2 – Post Development Traffic Volumes Comparison – Weekday PM Peak Hour

As shown within Figure 3.1 and Figure 3.2 the revised land uses, as per the Ardess-Walmsley LSP, are anticipated to result in lower peak hour traffic volumes on the majority of roads than that previously assessed within the Opus report. The exception to this is Mercer Road. Notwithstanding, the primary reason for this is that existing traffic volumes for Mercer Road have been assumed (no existing traffic is assumed within Mercer Road within the Opus report).

3.6 Traffic Impact

3.6.1 Methodology

As discussed with the aforementioned meeting with relevant stakeholders on 16 August 2018 this report focusses upon the suitability of the proposed Private Access Road / Chester Pass Road intersection. As per these discussions, the following outlines an assessment of this intersection.

3.6.2 Heavy Vehicles

Based on advice provided by the Applicant it is understood that the LSP area could likely accommodate up to three transport depots / truck yards based on the characteristics and catchment of the area.

Each transport depot would have slightly different traffic volume characteristics to a 'traditional' industrial use, which has been assumed for all industrial sites for the purposes of this assessment; in accordance with the WAPC Transport Assessment guidelines for Developments: Volume 2 – Structure Plans.

Advice provided by the Applicant indicates that up to 60 restricted access vehicle (RAV) movements per day could be associated with each transport depot. This equates to 180 RAV movements per day and some 36 RAV movements within the respective AM and PM peak hours, adopting a peak to daily ratio of 20% (as per the 'RMS Guide to Traffic Generating Developments 2002' for Road Transport Facilities). Furthermore, it is understood that RAV access to the subject site would be limited to the Private Access Road with no RAV access provisions to Terry Road or the Range Road Extension. The quantum of RAV's in the context of the overall LSP traffic generation is relatively minor.

RAV's are able to pass each other within all assessed parts of the Private Access Road, with the exception of the main bend in the road. In this regard, a probability of conflict assessment has been undertaken using Austroads traffic theory of the probability of two RAV's travelling in opposing directions, meeting during a peak hour. The assessment assumes a 20/80 directional split of traffic, conflict length of 50 metres and average speed of 20 km/hr. The assessment suggests that the probability of two RAV's travelling in opposing directions meeting at least once in this section of road during a peak hour is 40.5%.

Based on this the following recommendations are made:

- An inspection of sight distances around this corner indicated that a number of palm trees, which line the inner radius of the corner, restrict sightlines. Based on this, it is strongly recommended that the trees on the inner radius of the bend in the Private Access Road be removed to allow for appropriate sight lines for oncoming traffic.
- Provide additional shoulder width at the corner to allow for two opposing RAV's to pass each other simultaneously.

3.6.3 Intersection Layout

It is understood that the Private Access Road is not currently part of the RAV Network 7, but that this network status would be sought for this road. This future road classification would permit vehicles up to and including 36.5m to access the site.

Based on this a swept path assessment of a B-Triple (36.5m in length) and a B99 design vehicle at the Private Access Road / Chester Pass Road intersection and around the existing bend within the Private Access Road has been completed and is included within Appendix C.

The swept path assessment shows that the two nominated design vehicles will be able to pass each other within the existing carriageway extents and gravel road shoulder.

3.6.4 Intersection Operation

The operation of the Private Access Road / Chester Pass Road intersection has been assessed for both base case and post development conditions utilising SIDRA INTERSECTION. SIDRA is a traffic modelling software package, which calculates intersection performance, with key performance criteria as follows:

- **Degree of Saturation (DOS)** – The ratio of traffic demand to capacity. For unsignalised intersections, an upper limit DOS of 0.90 is generally considered acceptable.
- **Average Delay (sec)** – Average delay is the average time delay for all vehicles undertaking a particular traffic movement.
- **95th Percentile Queue Length (m)** – The 95th percentile queue length is the value below which 95 per cent of all observed cycle queue lengths fall.

The SIDRA intersection results are summarised within Table 3.5 with full results presented in Appendix D.

SCENARIO	APPROACH	DOS		AVERAGE DELAY (SEC)		95TH PERCENTILE QUEUE (M)	
		BASE CASE	POST DEVELOPMENT	BASE CASE	POST DEVELOPMENT	BASE CASE	POST DEVELOPMENT
Weekday AM Peak Hour	Chester Pass Road (North)	0.09	0.35	2 sec	4 sec	3 m	22 m
	Private Access Road (East)	0.01	0.04	10 sec	16 sec	0 m	1 m
	Chester Pass Road (North)	0.11	0.25	0 sec	0 sec	0 m	0 m
Weekday PM Peak Hour	Chester Pass Road (North)	0.11	0.28	0 sec	1 sec	1 m	8 m
	Private Access Road (East)	0.05	0.16	10 sec	13 sec	1 m	5 m
	Chester Pass Road (North)	0.09	0.25	0 sec	0 sec	0 m	0 m

Table 3.5 – SIDRA INTERSECTION Results

As shown within Table 3.5 the intersection is anticipated to operate with minimal queues and delays on all approaches both for a base case and post development scenario. Indeed, the addition of the traffic associated with the LSP has a relatively modest impact upon the operation of the intersection.

Notwithstanding the above it is evident from a detailed review of the results, and consistent with the commentary in the Opus report, that vehicles may have difficulty in turning right out of any of the east-west roads into Chester Pass Road due to the anticipated through traffic volumes following full development of the LSP area.

Based on the above traffic analysis and swept path assessment the following recommendations are made:

- No mitigating roadworks are required to the physical geometry of the intersection.
- A right-turn exit ban from the Private Access Road to Chester Pass Road will likely be required following full development of the site. Any right-turn ban would best be achieved through signage, as opposed to physical design, due to the swept path requirements of entering/exiting vehicles.
- The provision of a seagull style T-intersection treatment at Henry Street, as highlighted within the Opus report, will preclude the provision of right-turn entry movements to the Private Access Road.

With respect to the above recommendations, the following key points/clarifications are noted:

- Recommendations are based upon the full development of the entire LSP area. That is, right-turn restrictions wouldn't be required immediately as they would be subject to future surrounding intersection works on Chester Pass Road and future through traffic volumes on Chester Pass Road.

- Recommendations would not change should RAV's potentially be restricted in future within Chester Pass Road due to the Albany Ring Road.

3.7 Internal Road Network

As per the Opus assessment, given the preliminary nature of the review it is considered premature to provide detailed advice on the internal road network.

Notwithstanding, and in accordance with the 'WAPC Transport Impact Assessment Guidelines: Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans (August 2016)', Table 3.6 has been prepared to identify the anticipated internal traffic generation of the LSP. As per the Opus report and previous discussions, 25% of industrial, commercial and retail, as well as 100% of the primary school traffic, is assumed to be internal to the LSP network.

LOCATION [1]	LAND USE	SIZE	AM PEAK HOUR TRIP RATE		PM PEAK HOUR TRIP RATE	
			IN	OUT	IN	OUT
Subject Site	Industrial	15,000 sq.m	30 vph	8 vph	8 vph	30 vph
Lot 6	Commercial	12,000 sq.m	48 vph	12 vph	12 vph	48 vph
Lot 271	Commercial	11,000 sq.m	44 vph	11 vph	11 vph	44 vph
Lot 521	Primary School	430 pupils	215 vph	215 vph	215 vph	215 vph
Lot 5498	Mixed-Use	Commercial 7,000 sq.m, Retail 2,000 sq.m	36 vph	9 vph	25 vph	46 vph
Total			**373 vph**	**254 vph**	**270 vph**	**383 vph**

*vph = vehicles per hour

[1] Excludes lot 4925, which only comprises residential uses.

Table 3.6 – Traffic Generation (Internal)

As shown within Table 3.6 a total of 627 and 653 vehicles per hour are anticipated to be internal to the LSP road network during the respective weekday AM and PM peak hours.

3.8 Vehicle Access

3.8.1 General

The LSP, refer to Appendix A, nominates that vehicle access to the subject site is proposed to be provided via Chester Pass Road, Terry Road and Range Road. An additional 'emergency accessway' to Mercer Road is also proposed.

As nominated within Table 3.3 the subject site is anticipated to generate up to 113 vehicles per hour during peak hours. It is important to note that this traffic generation is based upon the 'WAPC Transport Impact Assessment Guidelines: Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans (August 2016)' as well as assumptions regarding the number of industrial lots and the floor area within each. The specific development of the site, including the provision of transport depots and their operation, may result in changes to the anticipated traffic generation of the site.

In the context of the broader road network the generation of 113 vehicle movements in any peak hour, or approximately two vehicles every minute, spread across multiple access points is unlikely to preclude the provision of, nor restriction to, turning movements at either Terry Road or Range Road. This is subject to the appropriate design of intersections, including appropriate stager to nearby intersections.

As discussed previously, vehicle access to Chester Pass Road is considered appropriate, subject to the restrictions to right-turn movements as previously specified following full development of the entire LSP area.

3.8.2 Mercer Road

It is understood that there has been discussion regarding the potential provision of a road link through the site to Mercer Road as shown (in green) within Figure 3.1. This proposal, if approved and implemented, would result in the western portion of the Private Access Road becoming a public road vested with the City of Albany.

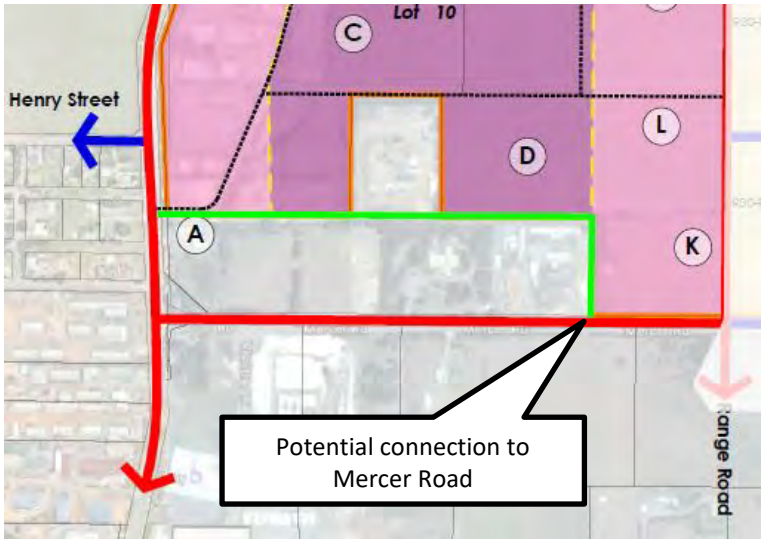


Figure 3.3 – Potential Road Connection to Mercer Road

As per the discussions of Section 3.8.1 the anticipated traffic generation of the site is unlikely to preclude vehicle access to any abutting road. The proposed road connection would be located some 100m west of the proposed Range Road Extension. This offset would allow for the provision of any right-turn lane from Mercer Road (west approach) into Range Road. As such, it is considered that there are no traffic engineering grounds that would preclude the provision of a future connection to the subject site from Mercer Road in the location specified. Notwithstanding, whilst a link may be possible it is noted that from a traffic capacity perspective this link is not required.

3.9 Traffic Noise

It is understood that there has been discussion regarding the traffic noise implications of the subject site and the implications based upon the "State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning". Traffic noise is outside the scope of traffic engineering expertise and falls within acoustic and similar disciplines. In this regard, WGE are unable to provide any specific advice with respect to this policy.

Notwithstanding, it is noted that the objectives of the policy are to:

- *"protect people from unreasonable levels of transport noise by establishing a standardised set of criteria to be used in the assessment of proposals;*
- *protect major transport corridors and freight operations from incompatible urban encroachment;*
- *encourage best-practice design and construction standards for new development proposals and new or redeveloped transport infrastructure proposals;*
- *facilitate the development and operation of an efficient freight network; and*
- *facilitate the strategic co-location of freight handling facilities."*

4. Recommendations

4.1 Midblock

The '*Austroads Guide to Traffic Management – Part 3: Traffic Studies and Analysis'* and the *'RMS Guide to Traffic Generating Developments (2002)'* provides typical mid-block capacities for urban roads. These capacities are summarised within the Opus report.

Reference is made to the post-development traffic volumes provided within Appendix B and the comparison of peak hour traffic volumes provided within Figure 3.1 and Figure 3.2. As nominated previously this comparison shows that traffic volumes on the majority of roads are proposed to decrease.

Notwithstanding the general decrease in traffic volumes as a result of the revised land uses, albeit recognising that would be an increase in RAV traffic volumes, Table 4.1 has been prepared to provide a summary of the Opus recommendations and an updated opinion based on the findings of this assessment. It is important to re-emphasise that a TIA will be prepared, pre-subdivision, for the balance of Lot 521 east of Range Road. Moreover, it is acknowledged that any future construction of the Albany Ring Road would also likely have significant implications upon traffic volumes and movements within the area.

ROAD	RECOMMENDATIONS	
	OPUS ASSESSMENT	WGE ASSESSMENT
Chester Pass Road	Duplication of Chester Pass Road between Henry Street and Harvey Road.	Agree. Notwithstanding, we note that peak hour traffic volumes in either direction on Chester Pass Road, during either peak hour, do not exceed 600 vehicles per hour (Level of Service C) between Harvey Road and Terry Road. As such, there is potential that Chester Pass Road only be duplicated to Terry Road. However, given the relatively short offset between Harvey Road and Terry Road (proposed to be re-aligned north) as well as the traffic volumes, which are approaching the LOS D threshold, the Opus recommendation is considered valid.
Range Road	Single lane in each direction. Potential to duplicate in future due to Yakamia/Lange Structure Plan development.	Agree. Traffic volumes outlined within WGE assessment are less than those assessed within the Opus assessment.
Terry Road	No recommendation	Single lane in each direction. A level of service A/B is anticipated during both the AM and PM peak hours, assuming a single lane is provided in each direction, with a maximum anticipated traffic volume of 217 vph in any direction.
Private Access Road	No recommendation	Single lane in each direction. A level of service A is anticipated during both the AM and PM peak hours with a maximum anticipated traffic volume of 102 vph in any direction. The following recommendations are made at the bend in the road: • Trees on the inner radius of the bend in the Private Access Road be removed to allow for appropriate sight lines for oncoming traffic. • Provide additional shoulder width at the corner to allow for two opposing RAV's to pass each other simultaneously.
Mercer Road	No recommendation	Single lane in each direction. A level of service C/D is anticipated during both the AM and PM

		peak hours with a maximum anticipated traffic volume of 676 vph in any direction. A level of service D indicates that there are restrictions to drivers in achieving their desired speed. Notwithstanding, the anticipated traffic volumes are at the lower end of the Level of Service D range (600-900 vph). Moreover, the Opus assumptions associated with Lot 521 assumes that 50% of traffic uses Mercer Road with 0% utilising Terry Road. In reality, and depending on the internal road network, it is expected that some traffic associated with Lot 521 will utilise Terry Road, which would likely reduce the anticipated volumes along Mercer Road. It is likely that turn lanes will be required at major road intersections (assuming retention of a single lane in each direction) given the mid-block road performance, which is at, or approaching Level of Service D. Overall recommendation to retain Mercer Road at a single lane in each direction.
General	Provide for east-west pedestrian access across Chester Pass Road the Local Centre.	Agree.
Other Considerations	None.	It is understood that there has been discussion regarding the potential provision of a road link through the site to Mercer Road. This proposal, if approved and implemented, would result in the western portion of the Private Access Road becoming a public road vested with the City of Albany. Note only.

*LoS – Level of Service

Source: Based on values as supplied in Guide to Traffic Generating Developments (RMS, 2002)

Table 4.1 – Mid-Block Recommendations

4.2 Intersection

Table 4.2 has been prepared to provide a summary of the Opus recommendations and an updated opinion based on the findings of this assessment:

INTERSECTING ROAD WITH CHESTER PASS ROAD	RECOMMENDATIONS OPUS ASSESSMENT	WGE ASSESSMENT
Harvey Road	Seagull style priority controlled T-intersection.	Agree. Assuming the majority of traffic exiting from Harvey Road will turn right onto Chester Pass Road the post development traffic volumes along Chester Pass Road will likely result in significant delays for these motorists.
Terry Road	No interim recommendation. Potential future roundabout following completion of the Albany Ring Road.	Would require further investigation, noting that Terry Road is located outside of the Ardess-Walmsley LSP. Site generated traffic volumes on Terry Road are comparable to that of Harvey Road and Henry Street. Whilst it is assumed that 100% of Terry Road traffic will travel to/from the south in reality there will be some traffic, which will travel north. As such, there may be a future need to provide a seagull intersection or roundabout treatment to allow for right-turners to safely and efficiently turn right from Terry Road into Chester Pass Road. Recommend that further analysis be completed to confirm an appropriate future intersection treatment as part of the

		Warrenup-Walmsley LSP.
Henry Road	Seagull style priority controlled T-intersection.	Agree. Assuming the majority of traffic exiting from Harvey Road will turn right onto Chester Pass Road the post development traffic volumes along Chester Pass Road will likely result in significant delays for these motorists.
Private Access Road	No recommendation.	Following full development of the internal road network and the LSP, ban right-turn exit movements through signage (either all day or during peak hours only) onto Chester Pass Road. As shown within the preceding modelling the post development traffic volumes on Chester Pass Road will make it difficult for vehicles to turn right from the Private Access Road into Chester Pass Road. Notwithstanding, continue to monitor and review the road network performance prior to implementing any ban. Prior to implementing any ban, the internal road network would need to be completed to allow for motorists travelling northbound to turn onto Chester Pass Road from either Mercer Road or Terry Road. Following the provision of a seagull style T-intersection treatment at Henry Street, as highlighted within the Opus report, right-turn entry movements to the Private Access Road will be precluded.
Mercer Road	Protected right turn lane on Chester Pass Road.	Provide an appropriate intersection treatment. The most appropriate intersection treatment, protected right turn, seagull style priority controlled, roundabout or signalised option would be subject to future traffic modelling and associated trigger point assessment. There are 618 vehicles anticipated to turn right from Chester Pass Road into Mercer Road (assuming 100% of motorists arrive/depart from the south). Mercer Road is clearly the most significant east-west road within the LSP, anticipated to carry 2-3 times the traffic of other east-west roads. As such, a roundabout or traffic signals may be required as the right-turn movement may be too significant, also having regard to anticipated southbound traffic volumes on Chester Pass Road, to operate satisfactorily without their provision. Recommend that further analysis be completed to confirm an appropriate future intersection treatment and it's trigger point.

Table 4.2 – Intersection Recommendations

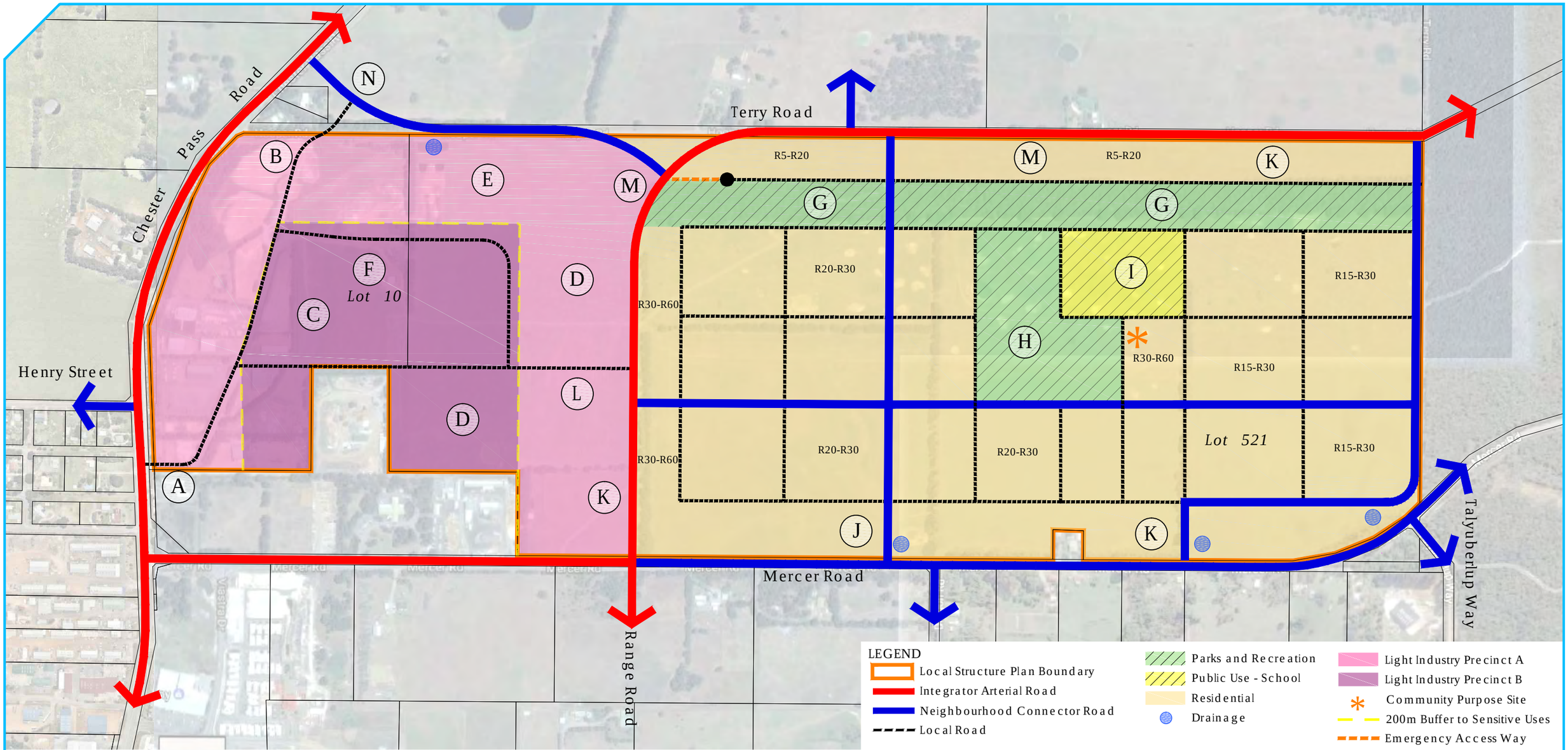
5. Conclusion

This Transport Impact Assessment report has been prepared as part of the Ardess-Walmsley Local Structure Plan and provides an updated assessment/comparison of matters considered within the Opus Transport Assessment of the Warrenup-Walmsley LSP.

Based on the discussions and analysis outlined within this report the following key conclusions are derived:

- The current LSP proposal is anticipated to generate less traffic, on the majority of roads, than that assessed and anticipated within the Opus report.
- The LSP is anticipated to generate and add 2,451 and 2,528 vehicle movements to the external road network during the respective weekday AM and PM peak hours. This represents a decrease of 631 and 659 vehicle movements during the respective weekday AM and PM peak hours than that assessed within the Opus report. There will be more RAV's than that assessed within the Opus report, however, the surrounding roads and intersections have appropriate capacity to accommodate these movements, subject to the adoption of recommendations outlined within this report.
- The traffic impact of the development proposal on the Chester Pass Road / Private Access Road intersection has been assessed using SIDRA INTERSECTION and is considered appropriate, including for additional RAV's, subject to the adoption of recommendations outlined within this report.
- The midblock capacities of the road network within the LSP are within acceptable limits, including allowance for RAV's, subject to the recommendations provided within this and the Opus reports.
- Based on the discussions and analysis outlined within report the following additional recommendations, over and above those already presented within the Opus assessment, are made:
- At the bend in the Private Access Road the following mitigating measures are recommended:
  - Trees on the inner radius of the bend in the Private Access Road be removed to allow for appropriate sight lines for oncoming traffic.
  - Provide additional shoulder width at the corner to allow for two opposing RAV's to pass each other simultaneously.
- Complete further analysis to confirm the likely future intersection treatment and timing / trigger point of the upgrade of the Chester Pass Road / Terry Road intersection and Chester Pass Road / Mercer Road intersections.
- Provide a right-turn entry and exit ban (through signage) to/from the Private Access Road via Chester Pass Road. The timing and implementation of these bans are subject to the development of the entire LSP area and subsequent increase in through traffic volumes on Chester Pass Road and provision of seagull style intersection treatments at surrounding intersections.

APPENDIX A – Ardess-Walmsley Local Structure Plan



Notes:

A) Existing access to the Ardess Industrial Estate. Approved by Main Roads WA for Restricted Access Vehicles (RAVs). Provides access to City approved uses, including warehouses, that include RAVs. The *City of Albany Local Planning Scheme No.1* (LPS1) limits access between the Ardess Industrial Estate and Chester Pass Road to a single entry road. This is a privately owned and managed road.

B) City approved access, between the Ardess Industrial Estate and Terry Road, which is only suitable for as-of-right vehicles. No RAVs are permitted on Terry Road and accordingly there are no RAV impacts on future residential development to the north of Terry Road.

C) Existing Light Industry zoned land to be developed, without connection to reticulated sewerage, based on former approvals and current LPS1 provisions.

D) Future Light Industry development/subdivision, on land currently zoned 'General Agriculture' to be connected to reticulated sewerage following rezoning to 'Light Industry'.

E) Light Industry Precinct A - no transport depots are permitted.

F) Light Industry Precinct B - transport depots are a 'D' (discretionary) use. A Development Application is required to be submitted to the City where it will be assessed against LPS1 provisions, Council's local planning policies and EPA guidelines. Following completion of the Albany Ring Road to the Port of Albany, there is no guarantee that RAVs will be permitted to use Chester Pass Road between Menang Drive and the main roundabout. Transport depots, that only operate as-of-right vehicles, are not impacted by possible future limitations of access to Chester Pass Road. Precinct B is well-suited to small to medium sized transport depots given its proximity to Albany, excellent existing and future road network and suitable buffers to sensitive uses. Precinct B will provide an alternative cost-effective location in Albany to establish transport depots, along with other suitable uses, on lease land. The provision of leased industrial/employment land has considerably lower establishment costs compared to businesses establishing on freehold land.

G) Native vegetation / ecological corridor to be conserved. Either vested and managed by the City as public open space (consistent with the endorsed and draft versions of *Liveable Neighbourhoods*) or privately owned and managed in a few 'conservation' lots. Based on *Liveable Neighbourhoods*, can be 'restricted use' public open space where a 2% credit applies.

H) District public open space - to be at least 7.6 hectares in area and ceded free-of-cost to the City. The district sized public open space will benefit the community both within and outside of the structure plan area.

I) Primary school - benefits the community both within and outside of the structure plan area.

J) Residential area to be fully serviced including connected to reticulated sewerage. This will readily address the small portion of the structure plan area where soils have a low Phosphorus Retention Index (PRI).

K) As part of detailed design, a service road may be required adjoining Mercer Road, Range Road and Terry Road. Subject to land uses, lot sizes and site conditions, there are also opportunities for alternative design techniques including rear vehicle access with buildings fronting the main road to provide better urban design outcomes. This will be addressed through future Local Development Plans.

L) Proposed expanded Light Industry area consistent with the draft *Albany Local Planning Strategy*, the *Albany Industrial Land Strategy* and a range of other State, regional and local strategies which promote job creation and economic development. Accordingly, no requirement to prepare an additional industrial demand and supply analysis. Light industry is compatible with future residential development.

M) Strategically significant extension of Range Road along with opportunities to widen the Terry Road reserve.

N) Based on Main Roads WA advice, it is expected that the Terry Road/Chester Pass Road intersection will be relocated north. This is being progressed via the separate *Warrenup-Walmsley Local Structure Plan*.

REVISED LOCAL STRUCTURE PLAN
Lot 10 Chester Pass Road and Lot 521 Mercer Road Walmsley

REV	DESCRIPTION	YYMMDD
E	NOTES AND MODS	180515
D	ADD EMERGENCY A. WAY.	171118
C	MINOR MODIFICATIONS	171023
B	MINOR MODIFICATIONS	171022
A	LOCAL STRUCTURE PLAN	171012

DRAWING NUMBER EP 170520 06 | REV E | SCALE 1:7500 | SHEET A3

NORTH

0 150 300m

Issued for design intent only.
All areas and dimensions are subject to detail design + survey.

edge PLANNING & PROPERTY

Edge Planning & Property
134 Hare Street, Mount Clarence
ALBANY WA 6330
E: steve@edgeplanning.com.au
M: 0409 107 336

APPENDIX B – Traffic Volumes

Existing Conditions

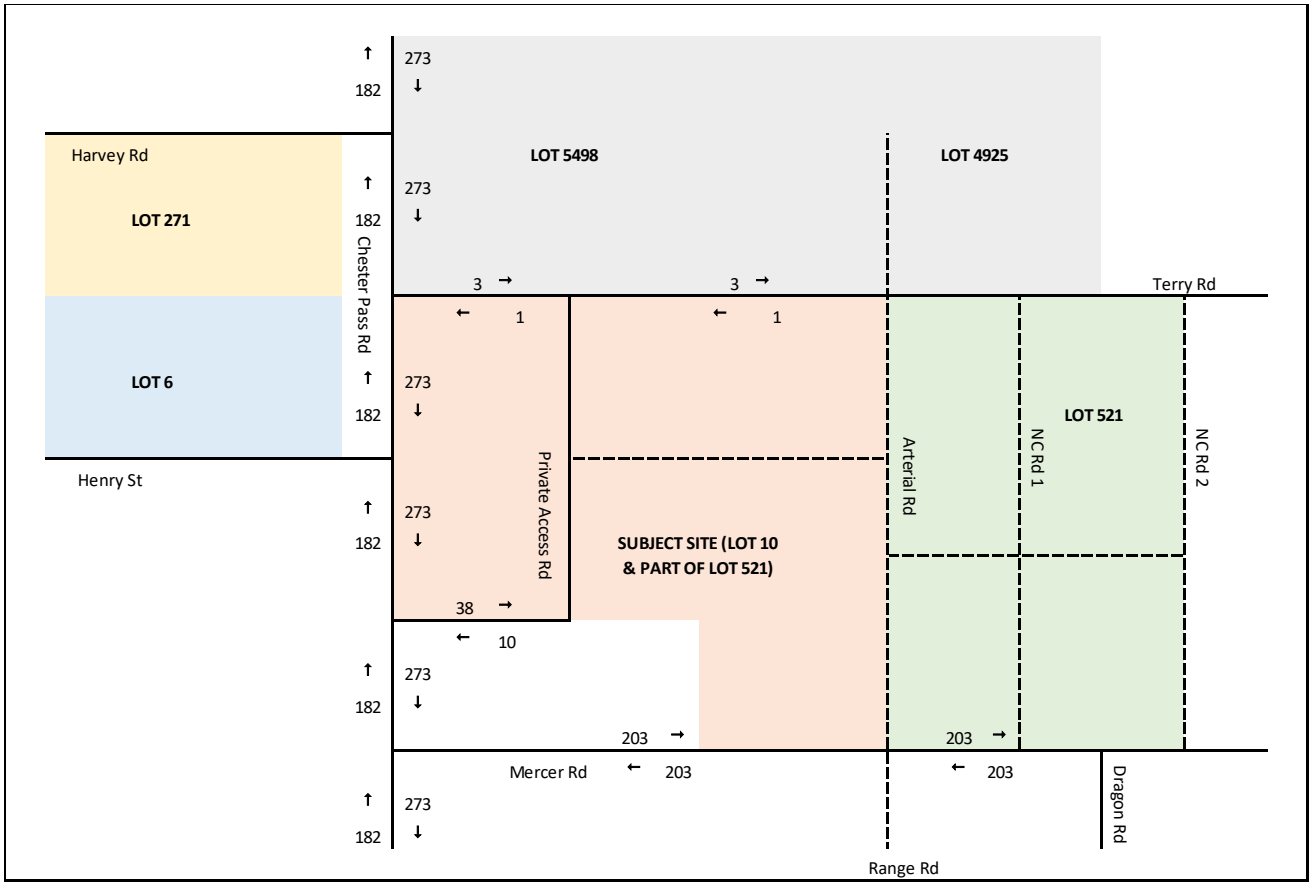


Figure B.1 – Existing Traffic Volumes - Weekday AM Peak Hour

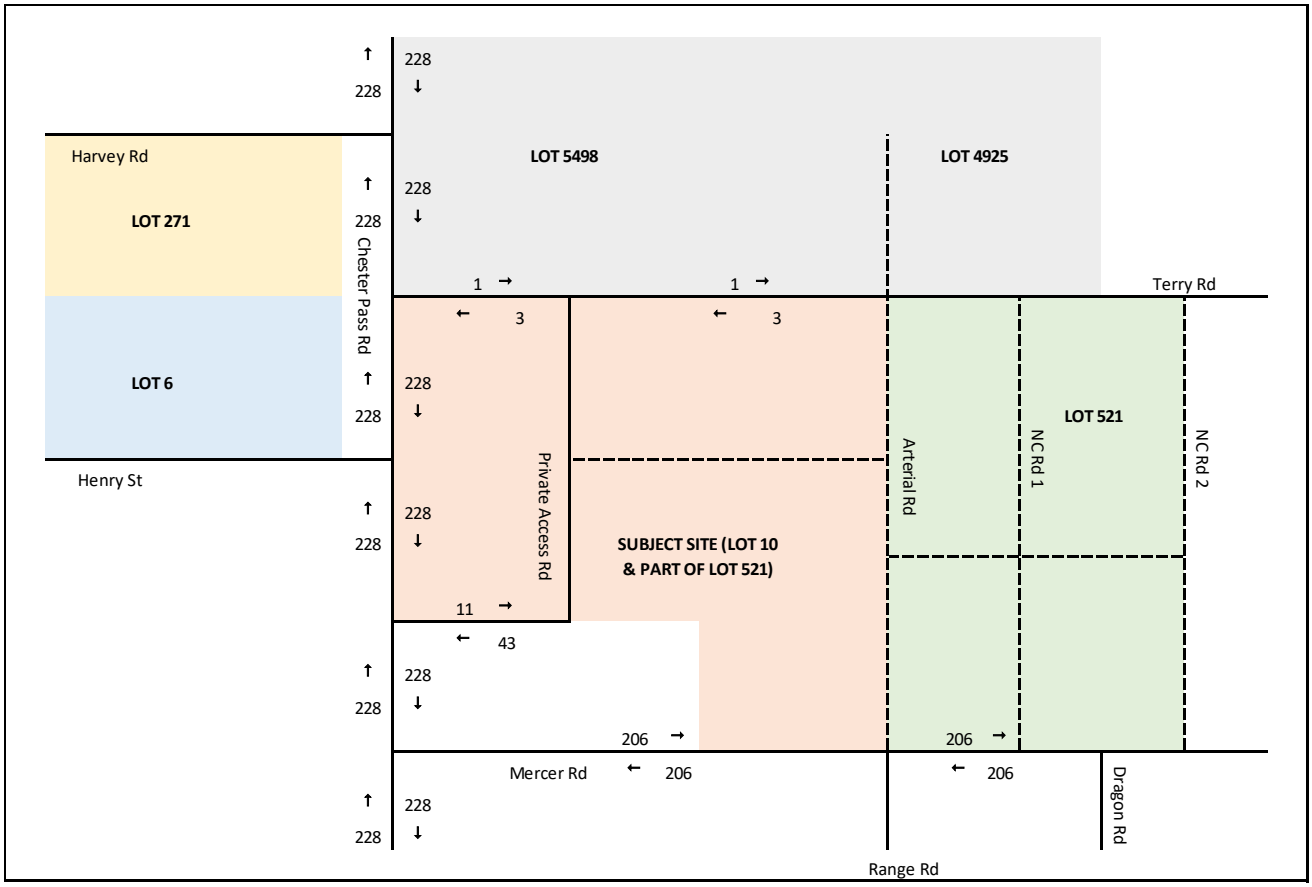


Figure B.2 – Existing Traffic Volumes - Weekday PM Peak Hour

Base Case

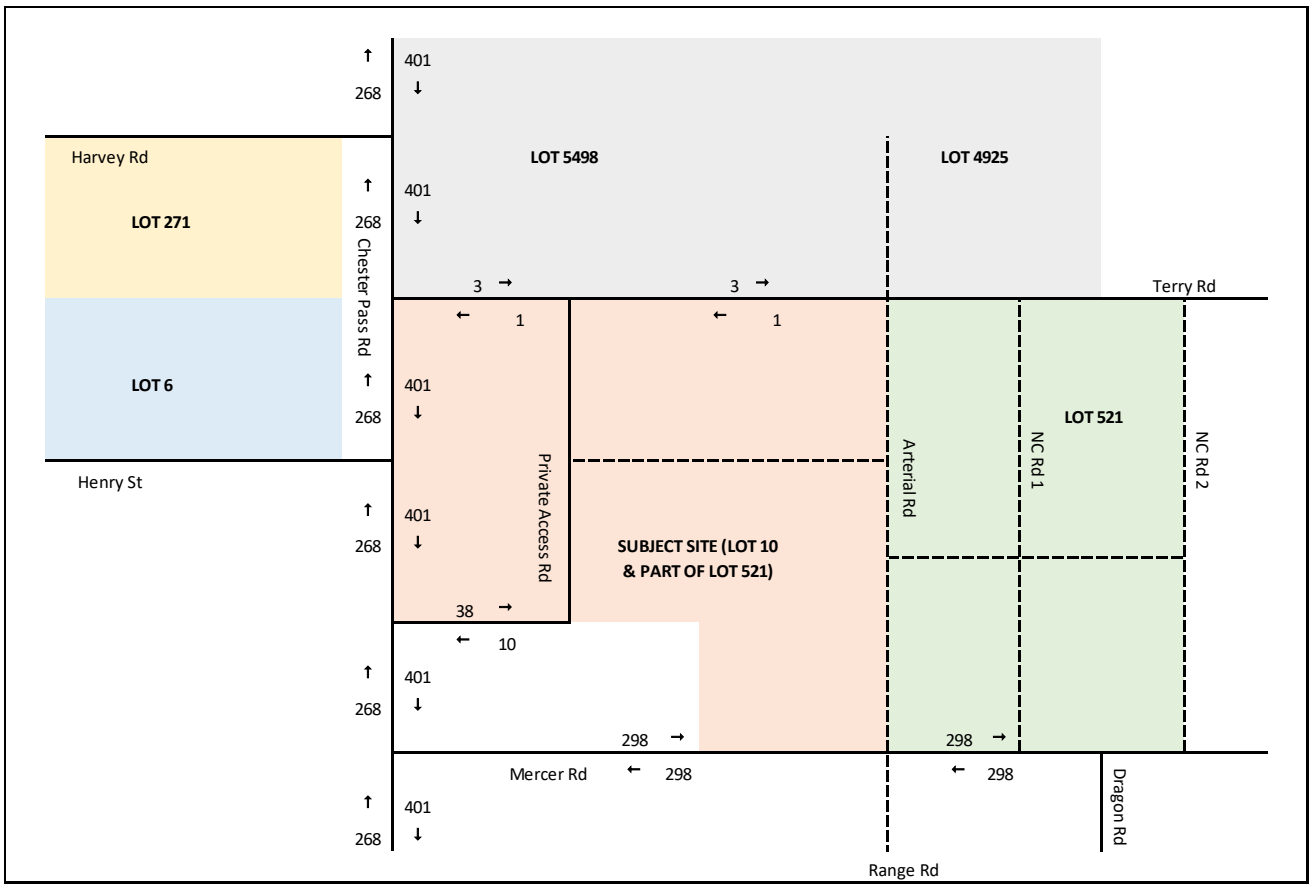


Figure B.3 – Base Case Traffic Volumes - Weekday AM Peak Hour

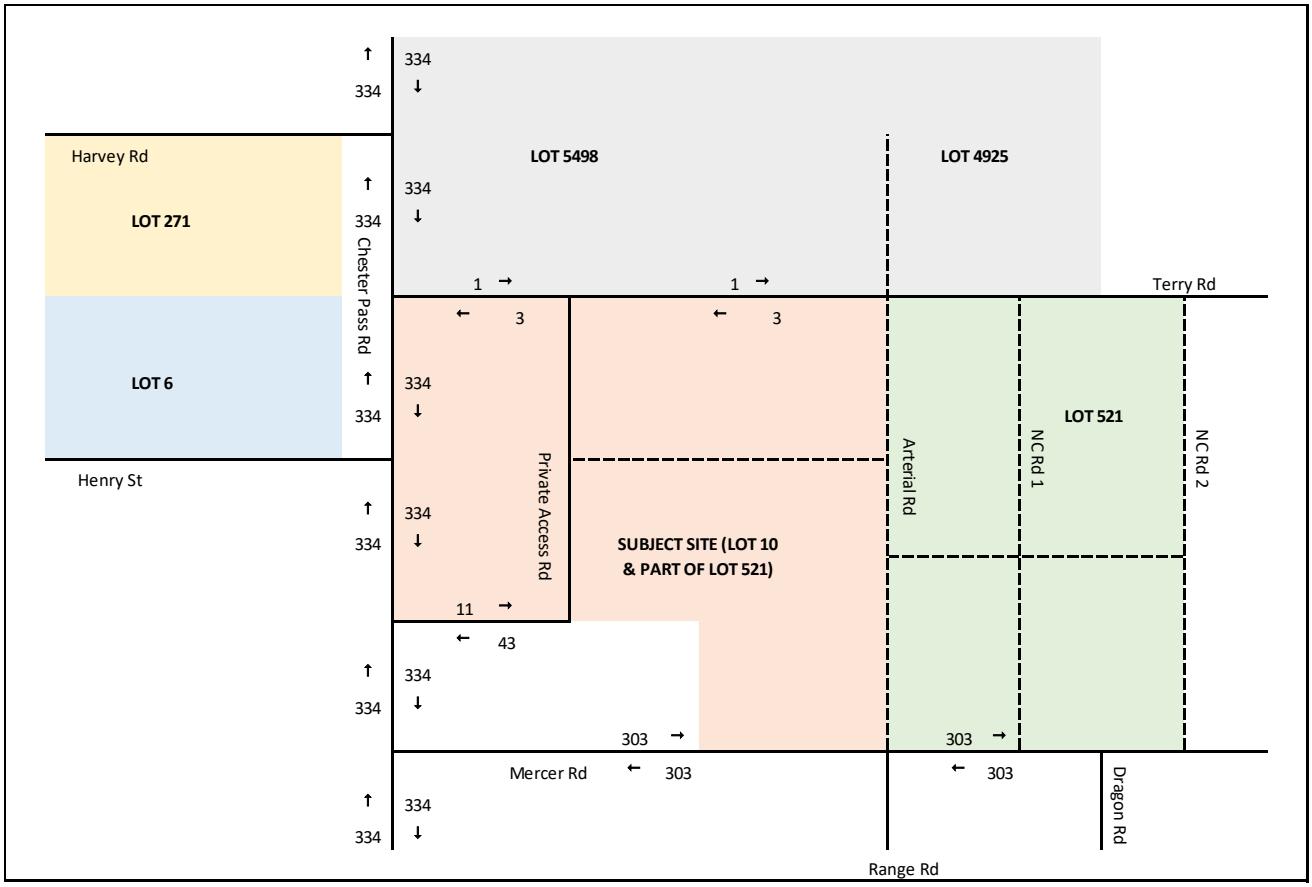


Figure B.4 – Base Case Traffic Volumes - Weekday PM Peak Hour

Site Generated

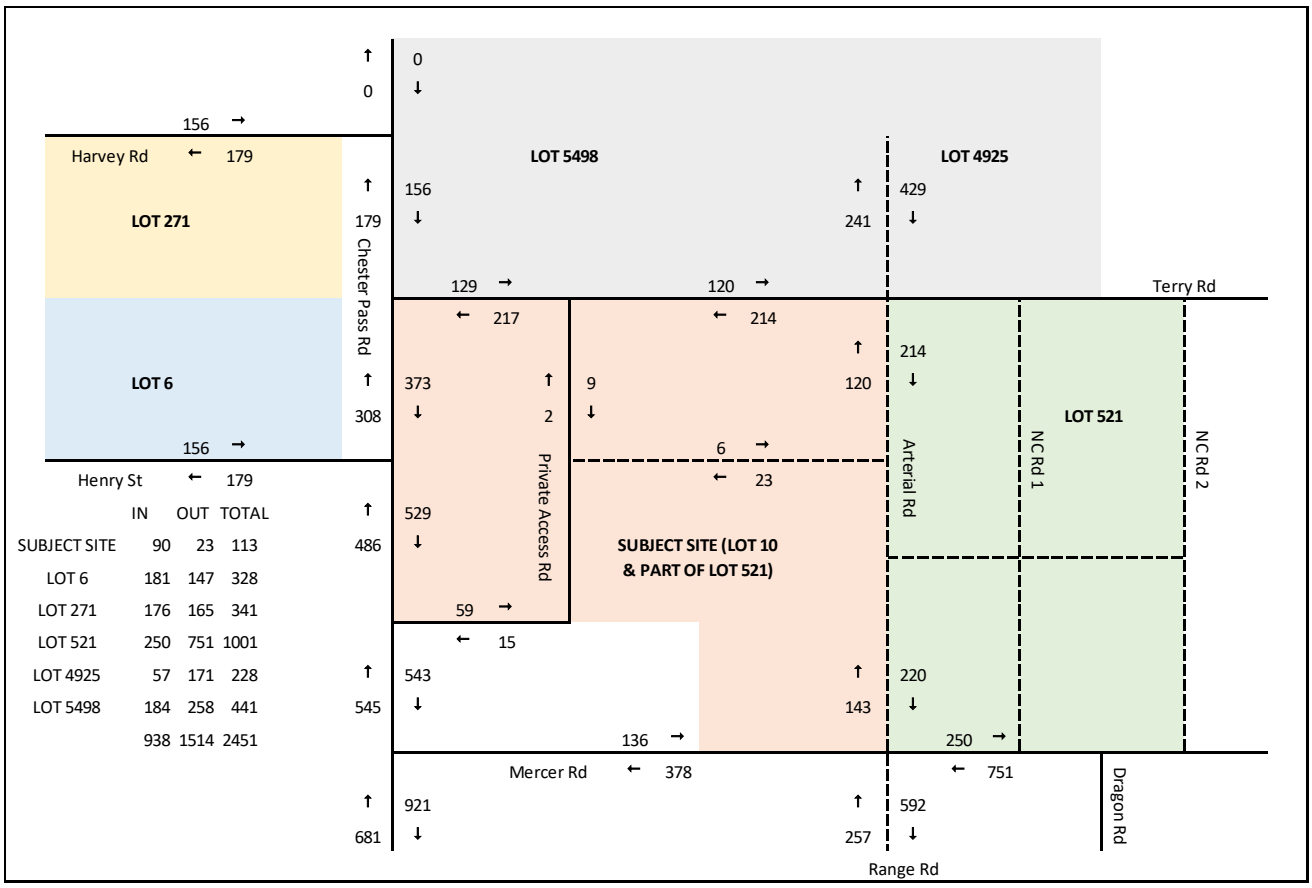


Figure B.5 – Site Generated Traffic Volumes - Weekday AM Peak Hour

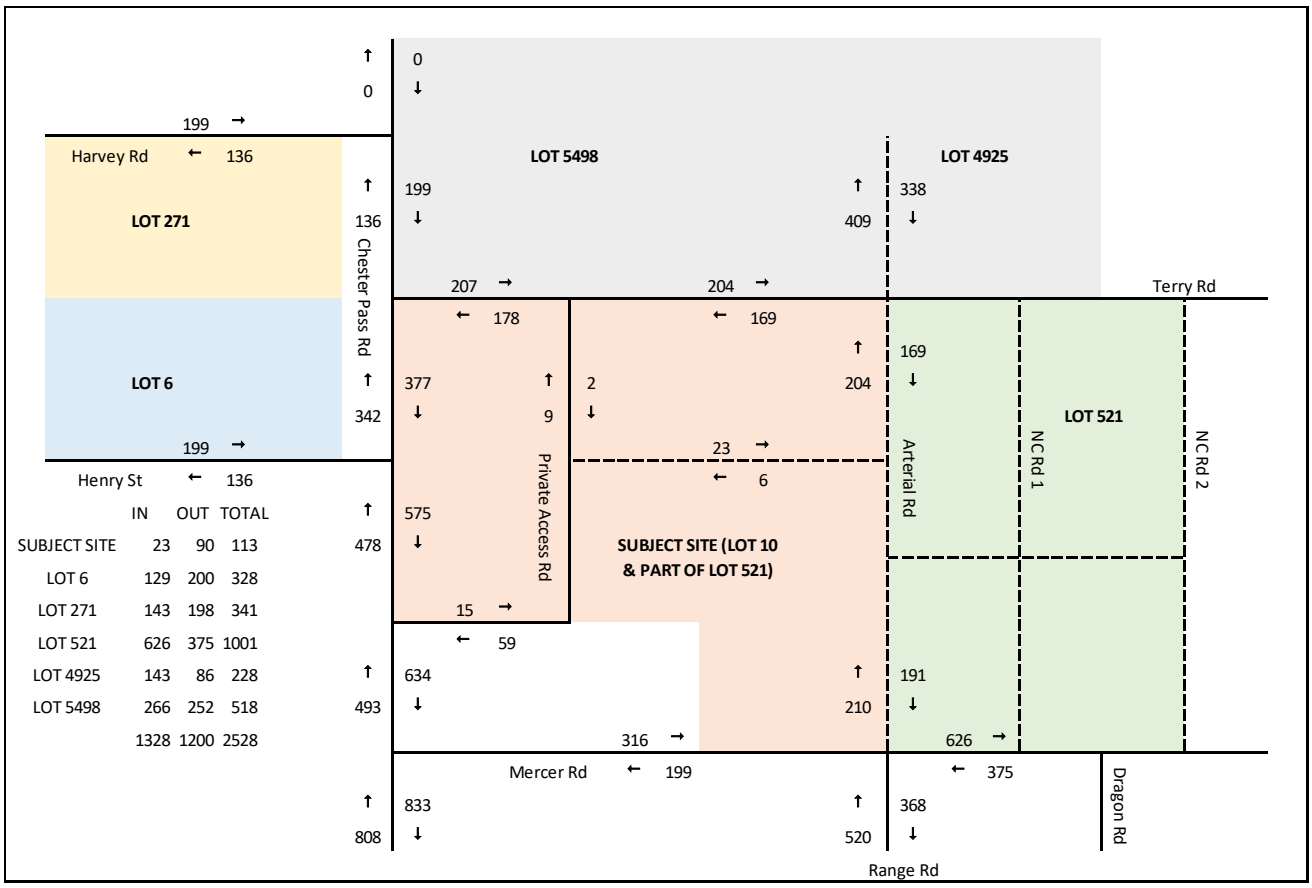


Figure B.6 – Site Generated Traffic Volumes - Weekday PM Peak Hour

Post Development (WGE)

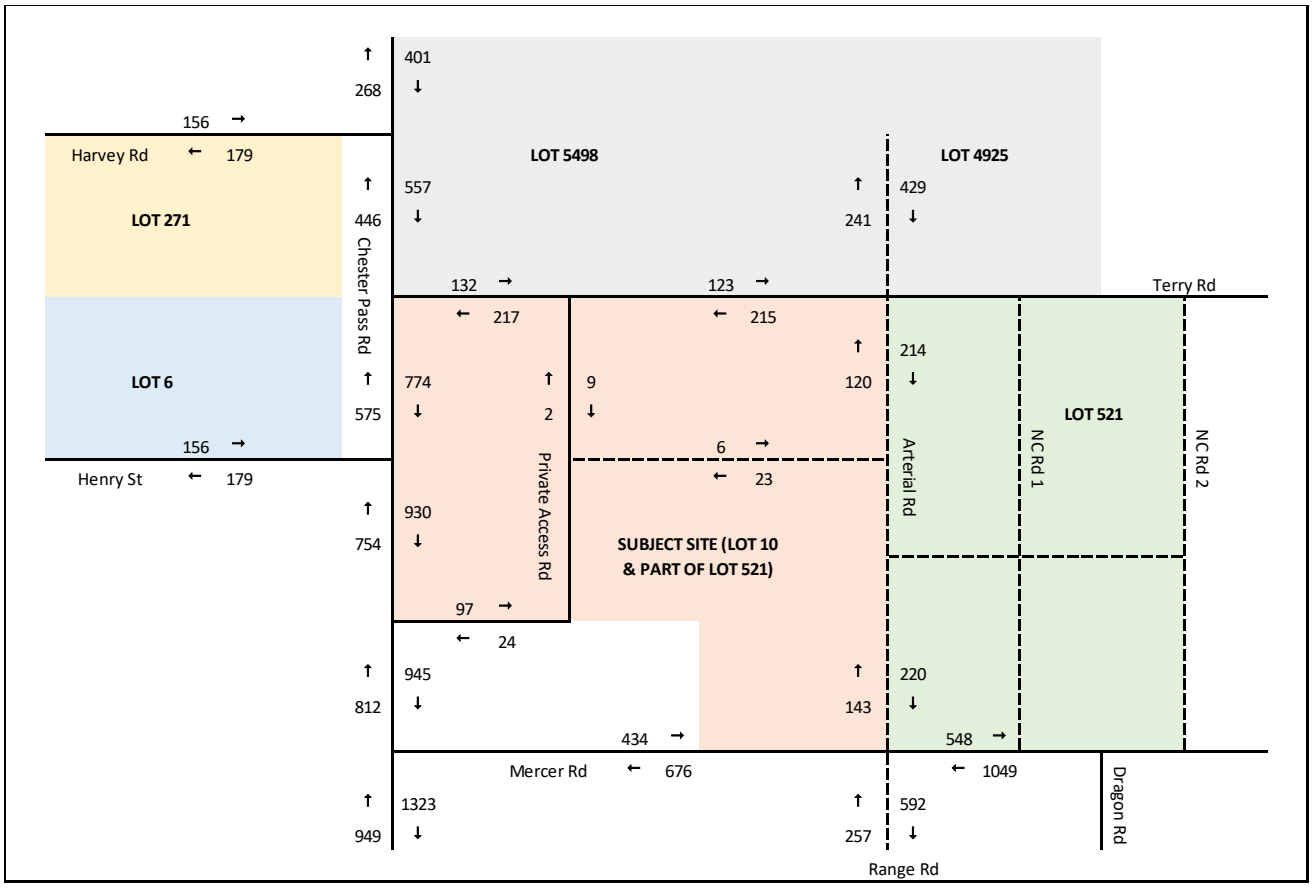


Figure B.7 – Post Development Traffic Volumes (WGE) - Weekday AM Peak Hour

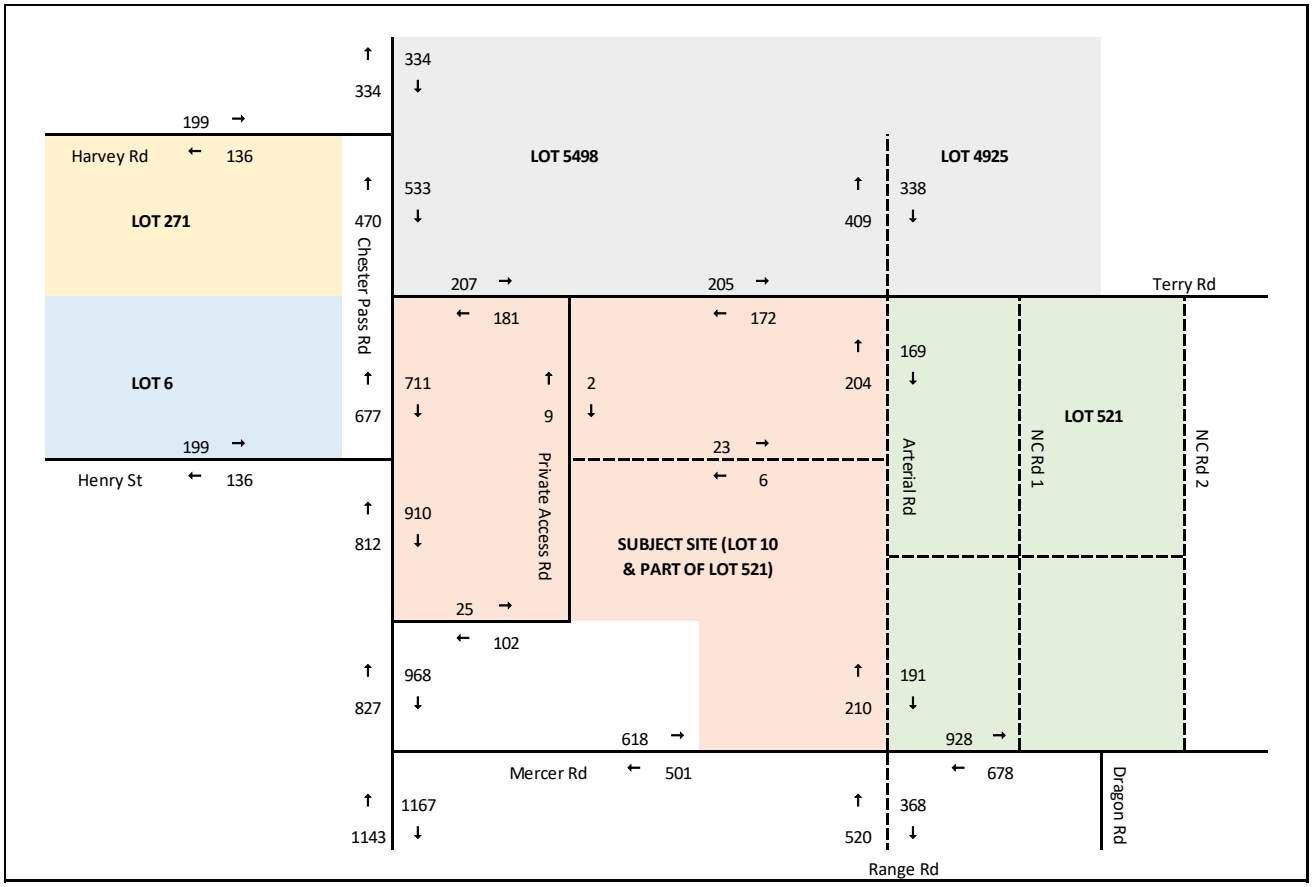


Figure B.8 – Post Development Traffic Volumes (WGE) - Weekday PM Peak Hour

Post Development (Opus)

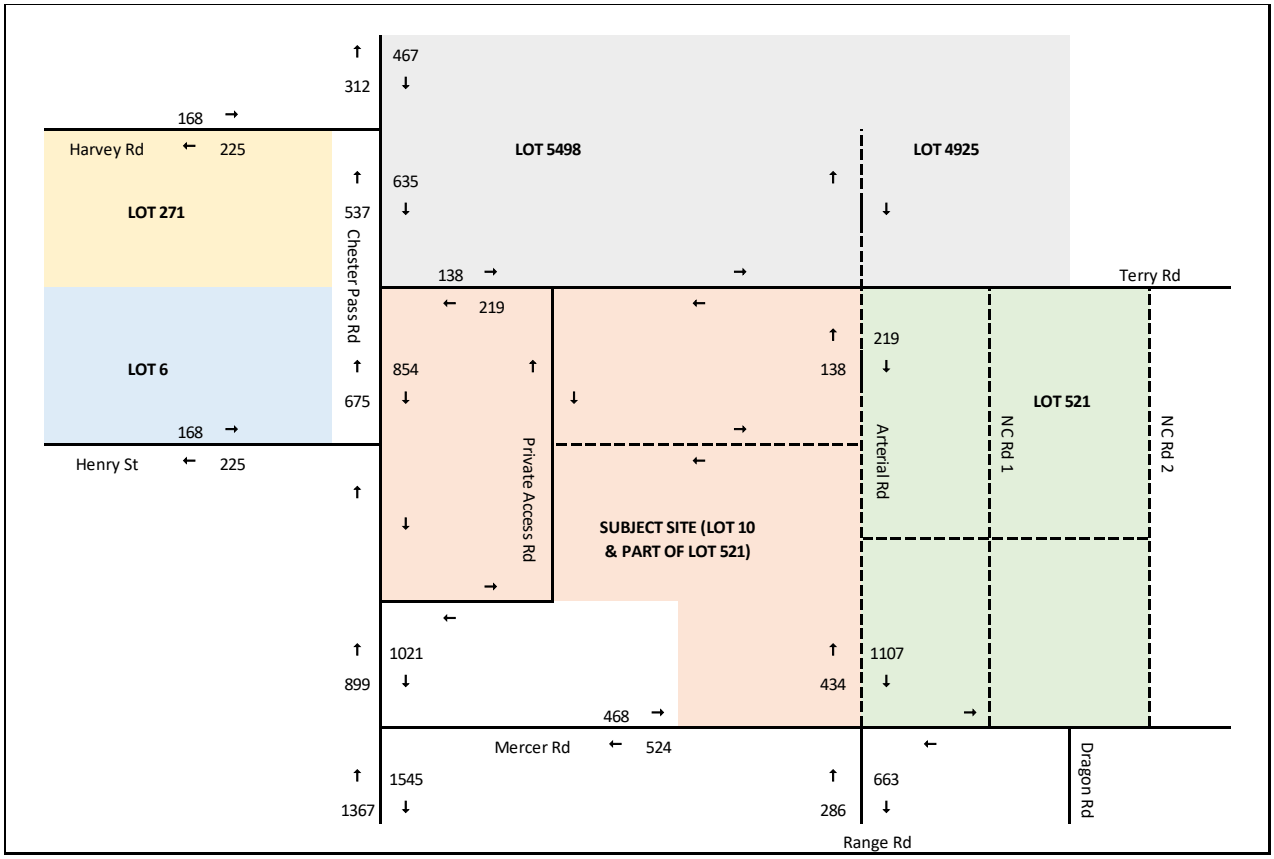


Figure B.9 – Post Development Traffic Volumes (Opus) - Weekday AM Peak Hour

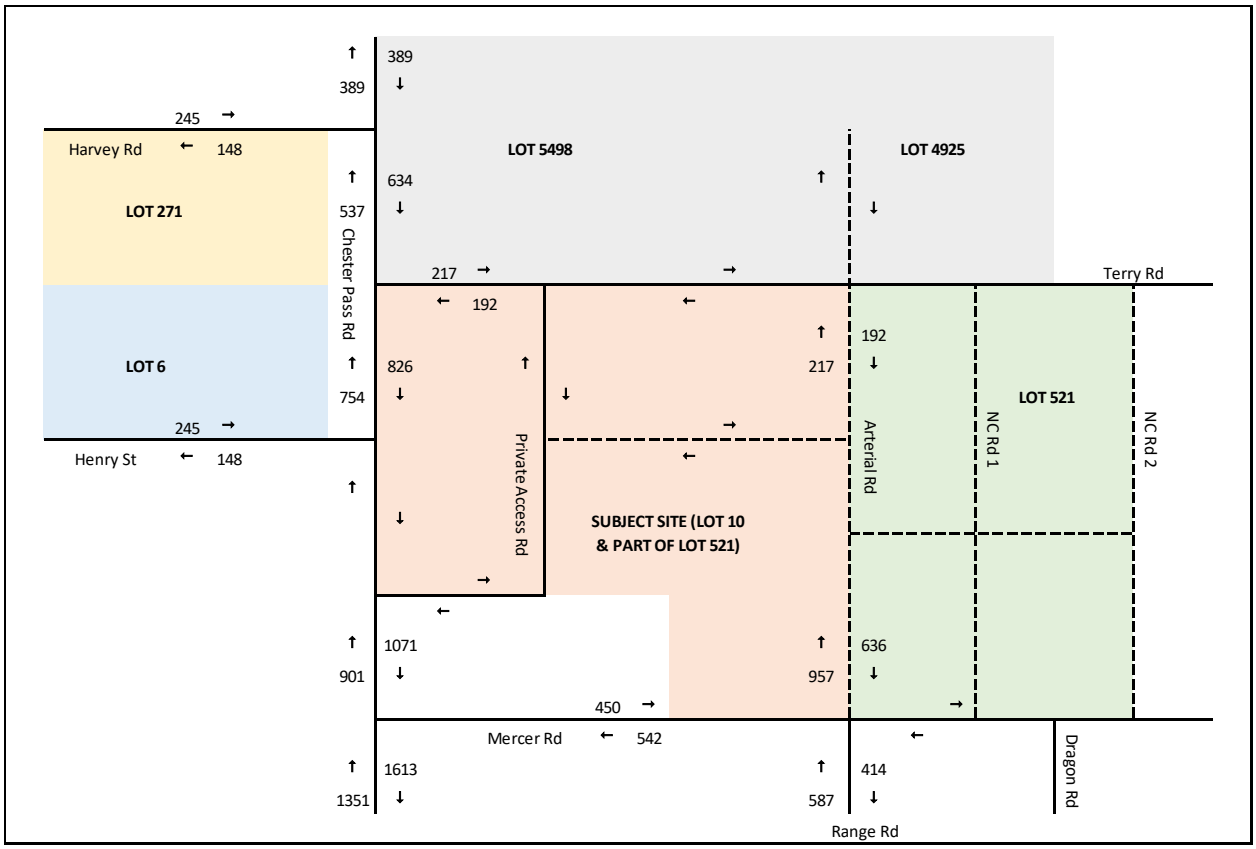


Figure B.10 – Post Development Traffic Volumes (Opus) - Weekday PM Peak Hour

APPENDIX C - SIDRA Intersection Results

LANE SUMMARY

Site: 101 [Base Case - AM Peak]

Chester Pass Road / Private Access Road
Stop (Two-Way)

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Chester Pass Road (South)													
Lane 1	138	10.0	1831	0.075	80[6]	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	130	10.0	1379	0.094	100	3.1	LOS A	0.4	3.0	Full	500	0.0	0.0
Approach	268	10.0		0.094		1.5	NA	0.4	3.0				
East: Private Access Road (East)													
Lane 1	10	10.0	905	0.011	100	9.5	LOS A	0.0	0.3	Full	500	0.0	0.0
Lane 2	1	10.0	324	0.003	100	16.8	LOS C	0.0	0.1	Short	14	0.0	NA
Approach	11	10.0		0.011		10.2	LOS B	0.0	0.3				
North: Chester Pass Road (North)													
Lane 1	201	10.0	1830	0.110	100	0.0	LOS A	0.0	0.0	Short	150	0.0	NA
Lane 2	201	10.0	1831	0.110	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	402	10.0		0.110		0.0	NA	0.0	0.0				
Intersection	681	10.0		0.110		0.8	NA	0.4	3.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

LANE SUMMARY

Site: 101 [Base Case - PM Peak]

Chester Pass Road / Private Access Road
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Chester Pass Road (South)													
Lane 1	153	10.0	1831	0.083	80[6]	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	181	10.0	1729	0.105	100	0.6	LOS A	0.1	1.0	Full	500	0.0	0.0
Approach	334	10.0		0.105		0.3	NA	0.1	1.0				
East: Private Access Road (East)													
Lane 1	43	10.0	944	0.046	100	9.4	LOS A	0.2	1.2	Full	500	0.0	0.0
Lane 2	1	10.0	328	0.003	100	16.6	LOS C	0.0	0.1	Short	14	0.0	NA
Approach	44	10.0		0.046		9.5	LOS A	0.2	1.2				
North: Chester Pass Road (North)													
Lane 1	167	10.0	1830	0.091	100	0.0	LOS A	0.0	0.0	Short	150	0.0	NA
Lane 2	168	10.0	1831	0.091	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	335	10.0		0.091		0.0	NA	0.0	0.0				
Intersection	713	10.0		0.105		0.8	NA	0.2	1.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

LANE SUMMARY

Site: 101 [Post Development - AM Peak]

Chester Pass Road / Private Access Road
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Chester Pass Road (South)													
Lane 1	509	10.0	1831	0.278	80[6]	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	303	10.0	869	0.349	100	10.8	LOS B	2.9	21.8	Full	500	0.0	0.0
Approach	812	10.0		0.349		4.0	NA	2.9	21.8				
East: Private Access Road (East)													
Lane 1	24	10.0	618	0.039	100	11.9	LOS B	0.1	1.0	Full	500	0.0	0.0
Lane 2	1	10.0	29	0.034	100	119.8	LOS F	0.1	0.7	Short	14	0.0	NA
Approach	25	10.0		0.039		16.2	LOS C	0.1	1.0				
North: Chester Pass Road (North)													
Lane 1	465	10.0	1831	0.254	100	0.0	LOS A	0.0	0.0	Short	150	0.0	NA
Lane 2	466	10.0	1831	0.254	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	931	10.0		0.254		0.0	NA	0.0	0.0				
Intersection	1768	10.0		0.349		2.1	NA	2.9	21.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

LANE SUMMARY

Site: 101 [Post Development - PM Peak]

Chester Pass Road / Private Access Road
Stop (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Chester Pass Road (South)													
Lane 1	404	10.0	1831	0.221	80[6]	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	423	10.0	1528	0.277	100	2.7	LOS A	1.0	7.9	Full	500	0.0	0.0
Approach	827	10.0		0.277		1.4	NA	1.0	7.9				
East: Private Access Road (East)													
Lane 1	102	10.0	629	0.162	100	12.1	LOS B	0.6	4.5	Full	500	0.0	0.0
Lane 2	1	10.0	30	0.034	100	117.5	LOS F	0.1	0.7	Short	14	0.0	NA
Approach	103	10.0		0.162		13.2	LOS B	0.6	4.5				
North: Chester Pass Road (North)													
Lane 1	455	10.0	1831	0.249	100	0.0	LOS A	0.0	0.0	Short	150	0.0	NA
Lane 2	456	10.0	1831	0.249	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	911	10.0		0.249		0.0	NA	0.0	0.0				
Intersection	1841	10.0		0.277		1.4	NA	1.0	7.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

APPENDIX D – Electronic Swept Path Assessment

DATE PLOTTED: Fri Sep 7 12:16:01 2018 BY: THOMAS SENIOR

SWEPT PATH LEGEND

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- CLEARANCE FROM VEHICLE BODY
  - 500mm B-TRIPLE (RAV CAT 7)
  - 300mm B99

ASSUMED SPEED 5KM/H

B-TRIPLE

	meters		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 17.2
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

1:250 2.5 0 2.5 5 7.5 10 12.5 A1
1:500 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
A	PRELIMINARY ISSUE	TS	DT	07/09/18

ARCHITECT/CLIENT

PROJECT: LOT 10 CHESTER PASS ROAD/ LOT 521 MERCER ROAD, ALBANY

TITLE: SWEPT PATH ASSESSMENT TURNING IN MOVEMENTS

WOOD & GRIEVE ENGINEERS

PRELIMINARY
NOT FOR CONSTRUCTION
TRANSPORTATION

SCALE @ A1	PROJECT No	DRAWING No	REV
1:250	39605	TR-400-P01	A

CAD FILE: 39605-TR-400-P01-P02.DWG

DATE PLOTTED: Fri Sep 7 11:40:33 2018 BY: THOMAS SENIOR

SWEPT PATH LEGEND

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- CLEARANCE FROM VEHICLE BODY
  - 500mm B-TRIPLE (RAV CAT 7)
  - 300mm B99

ASSUMED SPEED 5KM/H

B-TRIPLE

	meters		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 17.2
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
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1:250 2.5 0 2.5 5 7.5 10 12.5 A1
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SCALE @ A1	PROJECT No	DRAWING No	REV
1:250	39605	TR-400-P02	A