



LOCAL STRUCTURE PLAN

LOT 1 (NO. 501) ALEXANDER DRIVE
MIRRABOOKA



ROWEGROUP

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TABLE OF AMENDMENTS

Amendment No.	Summary of the Amendment	Amendment Type	Date Approved by WAPC

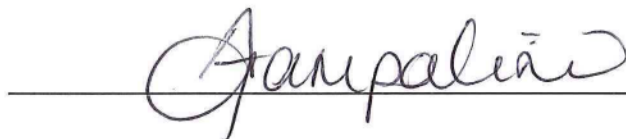
This structure plan is prepared under the provisions of the City of Stirling District Planning Scheme No.3

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY
RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION
ON: 5 October 2016

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

5 October 2016

Date

Date of Expiry: 5 October 2026



EXECUTIVE SUMMARY

This Local Structure Plan (LSP) addresses Part Lot 1, Lot 9251 (Crown Reserve: 34929) and Lot 47 Alexander Drive, Mirrabooka (the 'subject site'). The LSP area comprises 15.02 hectares of land zoned 'Industrial' under the Metropolitan Region Scheme and 'Development' under the City of Stirling District Planning Scheme No. 3.

The site is located approximately 9.8 kilometres north of the Perth Central Area. The subject site is privately owned and is located opposite the Malaga Industrial area, is approximately 1.6 kilometres north of the Mirrabooka secondary centre and is 3.55 kilometres north-west from the Morley strategic metropolitan centre.

The LSP seeks to facilitate the development of a 'Mixed Business Precinct' to accommodate a range of land uses which complement the existing Industrial Area to the east of Alexander Drive whilst providing an appropriate integration with the nearby residential areas.

The 'Mixed Business Precinct' will facilitate a range of uses, including:

- ▲ Office;
- ▲ Showroom;
- ▲ Warehouse;
- ▲ Light Industry; and
- ▲ Other compatible uses as deemed appropriate by the City.

The preparation of the LSP has been undertaken in liaison with the City of Stirling and other relevant government authorities.

Structure Plan Summary Table

Item	Data		Structure Plan Ref (Section No.)
Total area covered by the Structure Plan	15.02 hectares		1.2.2
Area of each land use proposed:	Hectares	Lot Yield	
Mixed Business	15.02 ha	-	4.1
Total estimated lot yield	4 lots		4.3
Number of high schools	0		4.6
Number of primary schools	0		4.6
Estimated commercial floor space	Approx. 3.5 hectares		4.7
Estimated area of percentage of public open space given over to:			
Regional open space	0		4.2
District open space	0		
Neighbourhood parks	0		
Local Parks	0		



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Plan 1. Structure Plan Map

1. Regional Location
2. Local Location
3. Site Plan
4. MRS Zoning
5. DPS 3 Zoning
6. Vegetation Condition
7. Context Plan
8. Indicative Layout Plan





TECHNICAL APPENDICES

Appendix Number	Document Title	Nature of Document	Referral/Approval Agency	Summary of Document Modifications
1.	Certificates of Title	Informational	-	
2.	Environmental Assessment and Management Strategy	Environmental	Department of Parks and Wildlife	
3.	Transport Assessment	Transport	City of Stirling	
4.	Servicing Report	Engineering	Western Power, Water Corporation, City of Stirling	





Part One

IMPLEMENTATION



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1. Structure Plan Area

This Structure Plan shall apply to Part Lot 1 (No. 501), Part Lot 9251 (Crown Reserve: 34929) and Lot 47 Alexander Drive, Mirrabooka being the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map (Plan 1).

2. Operation

This Structure Plan comes into effect on the day it is approved by the Western Australian Planning Commission.

3. Staging

Development of the site will commence upon issue of subdivision and / or development approval. Specific staging and timing for the development is unknown at this stage.

4. Subdivision and Development Requirements

4.1 Structure Plan Map

The subdivision and development of land is to generally be in accordance with the Structure Plan.

4.2 Vehicular Access

- a) Primary vehicular access to the site should be taken from the signalised intersection at Victoria Road and Alexander Drive. Should subdivision/development of the Local Structure Plan area result in the requirement for upgrade/modification of this intersection, any costs associated with these works will be at the cost of the applicant/landowner.
- b) The existing vehicular access point to the site at the intersection of Alexander Drive and Truganina Road is to be modified at the cost of the applicant/landowner to support the anticipated traffic volumes generated by the Structure Plan area at the time of subdivision and/or development.
- c) Notwithstanding clauses 4.2 a) and 4.2 b) above, an alternative Access Strategy may be prepared and implemented at subdivision or development stage, subject to approval from Main Roads WA.

4.3 Drainage Management Plan

An Urban Water Management Plan (UWMP) shall be prepared for the LSP area in consultation with the City of Stirling at subdivision and / or development stage. The UWMP should be prepared in the early stages of the detailed design process to allow for the appropriate consideration of Water Sensitive Urban Design (WSUD) elements.

4.4 Contamination

In accordance with Section 58 (6)(a) and (b) of the Contaminated Sites Act, any applications for the development of the land should be referred to the Department of Environment Regulation for comment, regarding the suitability of the land for any proposed use.

A condition for the investigation, and if required, remediation of contamination to ensure the site is suitable for any proposed development may be imposed.

4.5 Vegetation

Any future subdivision and development applications for the site are to be designed appropriately to address the location of the Threatened Ecological Community.

4.6 Land Use

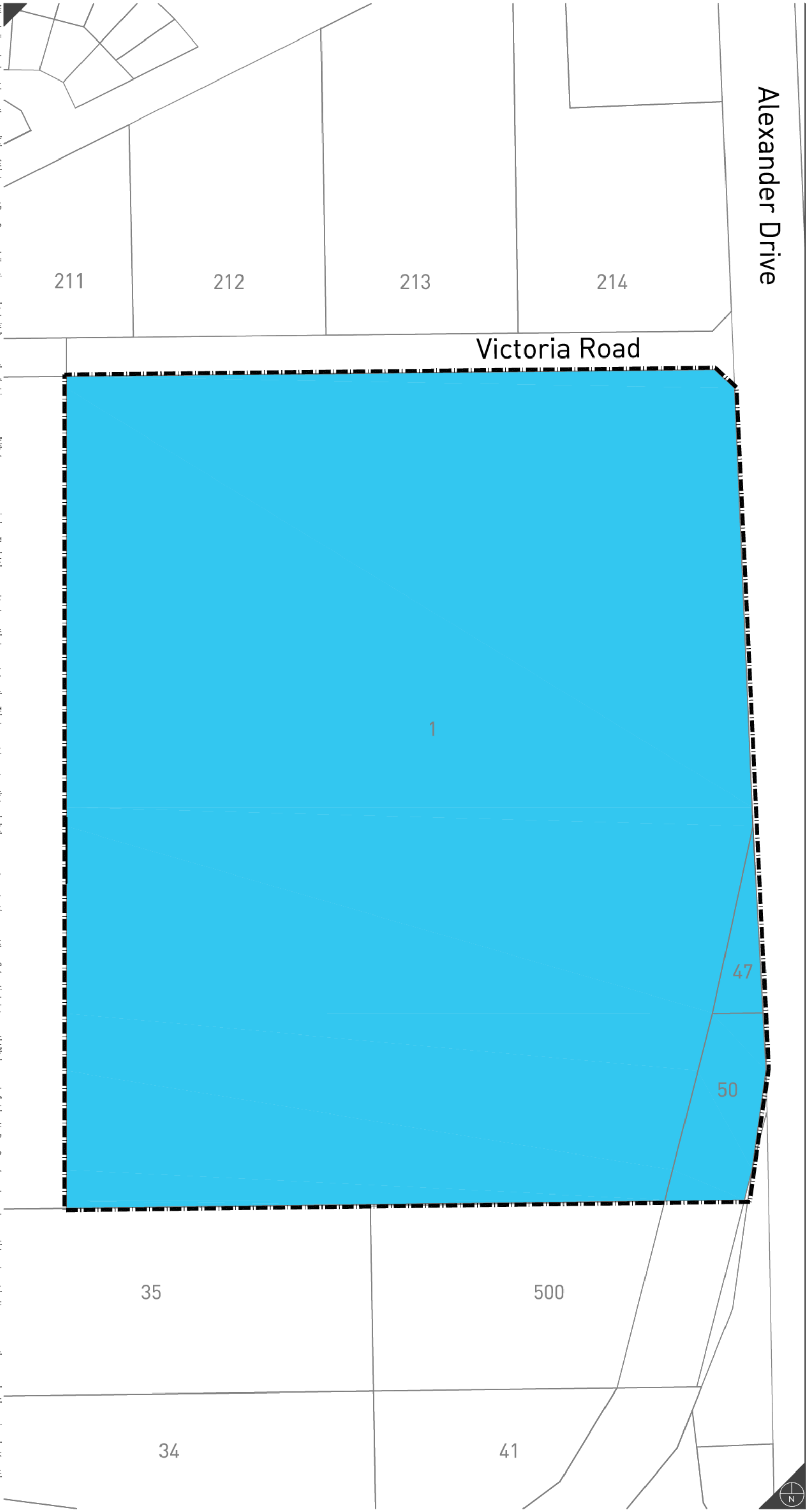
When determining subdivision and/or development applications within the structure plan area, a decision maker is to give due regard to the structure plan and the land-use permissibility and development standards applicable to the 'Mixed Business' zone under the City's District Planning Scheme No. 3, until such time that the site is rezoned to 'Mixed Business'.

5. Additional Information

Additional Information	Approval Stage	Consultation Required
Urban Water Management Plan	Submit with subdivision application	City of Stirling
Contaminated Assessment	Submit with subdivision application	Department of Environmental Regulation
Geotechnical Report	Submit with subdivision application	City of Stirling
Revised Traffic Impact Assessment	Submit with subdivision application	City of Stirling, Main Roads WA and Department of Transport
Bushfire Management Plan	Submit with subdivision application	Department of Fire and Emergency Services

Table 1: Additional Information

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Planning Design Delivery



- LEGEND
- MIXED USE
- Mixed Business
- OTHER
- Structure Plan Boundary
 - Existing Cadastre
 - Existing Lot Numbers

0 50 100 Metres

REVISIONS

Rev	Date	Drawn
B	2015.10.30	W. Clements
C	2015.11.06	W. Clements
D	2015.12.01	W. Clements
E	2016.05.13	W. Clements



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Scale: 1:2000 @ A3
Client: Atlas Bricks
Designer: P. Fitzgerald
Drawn: M. Sullivan
Projection: MGA50 GDA94
Plan ID: 1878-LSP-01-E

Cadastre supplied by JUROVICH SURVEYING

Local Structure Plan

Portion of Lot 1 Alexander Drive,
Mirrabooka
Plan 1



Part Two

EXPLANATORY SECTION



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Planning Background

1.1 Introduction and Purpose

This Local Structure Plan (LSP) has been prepared on behalf of Atlas Group Pty Ltd, as a precursor to subdivision and/or development of Part Lot 1 (No. 501), Part Lot 9251 (Crown Reserve: 34929) and Lot 47 Alexander Drive, Mirrabooka (the 'subject site') zoned 'Development' under the provisions of the City of Stirling District Planning Scheme No. 3 (DPS 3).

This LSP will guide future land use and development within the site and provide a framework for subdivision and development. The purpose of Part 2 of the LSP is to provide an explanation for the Part 1 provisions.

1.2 Land Description

1.2.1 Location

The subject site is located within the municipality of the City of Stirling and is approximately 9.8km north of the Perth Central Area.

The subject site is privately owned and is located opposite to the existing Malaga industrial area within the City of Swan. The site is also located approximately 1.6km north of the Mirrabooka secondary centre and is 3.55km north-west from the Morley strategic metropolitan centre.

The subject site is generally bound by Alexander Drive in the east, a landfill and excavation area to the west and remnant vegetation to the north and south. Reid Highway is located in close proximity to the south of the site with the existing Mirrabooka residential area being located to the north-west of the site.

Refer Figure 1 – Regional Location and Figure 2 – Local Location.

1.2.2 Area and Land Use

The LSP area comprises approximately 15.02 hectares of land, and is generally accessed from Alexander Drive and Victoria Road.

The land has previously been used for brick making and included a quarry (to supply brick sand) which is now utilised for inert landfill. As outlined at Section 2.5.1, agreements are in place with State Government to cease the waste disposal and other uses, thereby making a portion of the site (the LSP area) available for Mixed Business type uses.

Over time, uses on the land have included:

- ▲ Office and administration;
- ▲ Outdoor display area;
- ▲ Concrete batching plant;
- ▲ Aerobic digestion and composting facility;
- ▲ Outdoor storage; and
- ▲ Parking and landscaping.

The uses as outlined above generally operate under formal planning approval with a number of uses operating in accordance with non-conforming use rights. Ultimately all existing land uses on the subject site will cease operation as a result of this LSP and subsequent subdivision/development.

External to the site and the original parent land holding, the land is bounded by government-owned vegetated area, which will ultimately form a contiguous recreation area with that portion of the original lot to be ceded to the Western Australian Planning Commission for Regional Open Space purposes.

Refer Figure 3 –Site Plan.

1.2.3 Legal Description and Ownership

The LSP comprises three (3) land parcels, being:

Lot Number	Address	Plan/ Diagram No.	Vol./Folio	Land Ownership
Portion of Lot 1	501 Alexander Drive	D36381	1656-48	Atlas Brick Pty Ltd
Lot 47	499 Alexander Drive	D70313	1840-357	Western Australian Planning Commission
Lot 501	No street address	P64753	2820-125	Western Australian Planning Commission

Table 2: Land Ownership Details

In accordance with the Deed of Agreement between Atlas Brick Pty Ltd and the Western Australian Planning Commission (WAPC) and the Honourable John Day (MLA) Minister for Planning, Lots 47 and 501 and to be amalgamated with Lot 1 to create a single title over the LSP area.

At the time of writing this report, Deposited 404602 showing the amalgamation of Portion of Lot 1, Lot 47 and Lot 501 has been lodged with Landgate by the Department of Planning for assessment.

Refer to Appendix 1 – Certificates of Title.

Town Planning Framework

2.1 Zoning and Reservations

2.1.1 Metropolitan Region Scheme

The subject site is zoned 'Industrial' under the *Metropolitan Region Scheme* (MRS). The site was rezoned from 'Parks and Recreation' to 'Industrial' on 29 November 2013 (MRS Amendment No. 1247/57).

The subject site is bordered by land zoned 'Parks and Recreation' on the north and south, which is identified a 'Bush Forever' site under the MRS.

Alexander Drive, which abuts the eastern boundary of the site, is reserved as an 'Other Regional Road' under the MRS.

Refer to Figure 4 – Metropolitan Region Scheme Map.

2.1.2 City of Stirling District Planning Scheme No. 3

The subject site was rezoned from 'Private Institutions' to the 'Development' zone under the *City of Stirling District Planning Scheme No. 3* (DPS 3) as part of Town Planning Scheme Amendment No. 42 which was approved by the Minister for Planning on 4 March 2015. It is noted however, the Amendment is yet to be published within the Government Gazette.

In accordance with the provisions of the 'Development' zone under the Scheme, a LSP is required as a precursor to subdivision and development. This LSP has been prepared in accordance with the deemed provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

By reason of the subject site's zoning, it is included within Schedule 10 (Development Areas) of the DPS 3. Schedule 10 identifies the specific purpose of LSPs in Development Areas. In the case of this LSP, Schedule 10 identifies its purpose as being:

To facilitate the development of a range of:

- *light/service industrial uses; and*
- *mixed business uses.*

The LSP proposes a Mixed Business zoning across the site which satisfies the above by way of providing for a range of permissible land uses which includes but is not limited to, light/service industrial uses and mixed business uses.

2.2 Regional and Sub-Regional Structure Plan

2.2.1 Draft Perth and Peel @ 3.5 Million

The Draft *Perth and Peel @ 3.5 Million* was released for public comment in May 2015, and seeks to provide a framework for the development of the Perth and Peel regions as the population reaches an estimated 3.5 million by 2050. The document seeks to meet the targets identified under *Directions 2031* and the *State Planning Strategy 2050*. The suite of documents include the over-arching *Perth and Peel @ 3.5 million* report and four draft planning frameworks for the Central, North-West, North-East and South Metropolitan Sub-Regions.

The subject site is identified as 'Industrial Centre' under the draft Central Metropolitan Sub-Regional Framework.

2.2.2 Draft Central Sub-Regional Planning Framework

As noted above, the subject site is identified as an 'Industrial Centre' under the draft *Central Sub-Regional Planning Framework* (the 'Framework'). Whilst the subject site is rather isolated and of significantly smaller scale than other 'Industrial Centres' identified under the Framework, the site presents a unique opportunity to provide for an appropriate transition between the existing Malaga Industrial area to the east of Alexander Drive and the existing residential area to the north of Victoria Road.

The LSP has been assessed against the objectives of 'Industrial Centres' under the framework as follows:

- ▲ The Mixed Business zoning proposed under the LSP facilitates a diverse range of employment opportunities for the Mirrabooka locality, including but not limited to, showrooms, office, warehouse and other complementary uses.
- ▲ The site's proximity to Reid Highway in conjunction with the existing industrial area to the east of Alexander Drive offers a unique employment node which is border by existing residential areas to the north. Whilst previously heavier type industrial uses have been operating out of the site, the transition to a Mixed Business zone allows the site to maintain its identification as an Industrial Centre whilst providing for a more complementary suite of uses to adjoining residential areas.
- ▲ The site is uniquely located along Alexander Drive which is a primary arterial route into and out of the city centre. The proposed Mixed Business zoning will ensure employment diversity is maintained along a key Regional Road and an appropriate level of industrial land is provided for within the Central Sub-Region.

On this basis, the LSP is considered to satisfy the objectives of 'Industrial Centres' under the Framework and is compliant in this regard.

2.2.3 Draft Central Metropolitan Perth Sub-Regional Strategy

Directions 2031 and Beyond provides a broad strategic framework defining the overall visions for the Perth and Peel Regions for the next 20 years. It sets out the planning framework and objectives for the delivery of housing, infrastructure and services to accommodate future projected population growth within both regions.

To support the implementation of Directions 2031 two sub-regional strategies were prepared – the *Outer Metropolitan Perth and Peel Sub-Regional Strategy*, and the *Central Metropolitan Perth Sub-Regional Strategy*. The subject land is situated within the *Central Metropolitan Perth Sub-Regional Strategy* (the 'Strategy') which refines the framework set under Directions 2031.

The LSP complies with the general intent of the draft sub-regional strategy as it is appropriate to consolidate and contain future industrial development to the subject site, in close proximity to established regional road infrastructure and nearby complimentary industrial uses.

2.3 Planning Strategies

2.3.1 Economic and Employment Lands Strategy: (Non-Heavy Industrial)

The *Economic and Employment Lands Strategy: (Non-Heavy Industrial)* outlines the State Government's planning for the future of industrial land use in the Perth and Peel Regions. It builds on *Directions 2031 and Beyond*, and focuses on a strategy for industrial sites, on light and general industry uses and the future provision of industrial land.

The Department of Planning's reporting on the MRS Amendment specifically references a broader range of uses on the land, including commercial, stating that:

The proposed amendment is in accordance with the general intent of the Economic and Employment Lands Strategy ('EELS') as it seeks to better acknowledge existing industrial land uses, and contain future industrial/commercial development to the subject land.

The LSP seeks to build upon the rezoning of the land under both the MRS and DPS 3 by facilitating the site for a range of industrial and commercial uses on industrial zoned land. The LSP achieves this by way of providing the framework for the land to be developed as a Business Park with a suite of permissible uses which complement the existing Malaga Industrial Area.

The LSP is therefore considered to be consistent with the provisions of the EELS.

2.3.2 City of Stirling Draft Local Planning Strategy

The City of Stirling adopted its draft *Local Planning Strategy* (the 'Strategy') in March 2013. The Strategy has since been referred to the WAPC however to date, has not received consent to advertise.

The draft Strategy is broadly based on the culmination of all Local Area Plans, whilst using the principles of the City's reviewed Corporate Strategic Plan and is within the realms and restrictions of the State and Local planning related strategies.

A key objective of the Strategy is to provide for increased employment and commercial opportunities within the City. The LSP meets this objective of the Strategy by way of providing for additional short and long term employment and development opportunities.

As the draft *Local Planning Strategy* is yet to be advertised, it is not considered to be a seriously entertained planning proposal for the purpose of progressing this LSP.

2.3.3 Mirrabooka Local Area Plan

The *Mirrabooka Local Area Plan* (LAP) was released by the City of Stirling in January 2010 and provides a comprehensive, community-based plan, which identifies and considers social, economic and environmental issues for the Mirrabooka locality.

With specific regard to the subject site, the LAP notes that:

There may still be opportunities for further expansion of economic activity within the Local Area itself. At present the redevelopment of the Atlas Brickwork site into a business park is possible, which could diversify and increase local employment opportunities.

The Mixed Business zoning proposed over the site as part of the LSP is consistent with the LAP as it will facilitate the site for development as a 'Business Park' which may include uses such as showrooms, warehouses, offices and other associated uses. The suite of uses available under the



proposed Mixed Business zoning is considered to diversify and increase local employment opportunities, consistent with the LAP.

This is further recognised under the LAP which notes there are few employment opportunities within the bounds of the Mirrabooka locality itself, with 88% of residents working beyond the local area. The LAP also notes that a total of 6.5% of residents within the locality are unemployed, compared to the 3.6% average of residents City-wide.

In accordance with the LAP, the provision of local jobs in close proximity to existing residents is highly desirable. The provision of a diverse range of land uses, facilitated by the Mixed Business zone in a 'Business Park' arrangement, is consistent with the established strategic planning for the area and with the expectations of local residents. The LSP will assist the City in meeting the objectives of the LAP, particularly through the creation of considerable local employment opportunities.

2.4 Policies

2.4.1 Bush Forever

The *Bush Forever Policy* was prepared by the WAPC in 2000 as a ten year strategic plan for the retention and protection of regionally significant bushland within the Perth Metropolitan region. Bush Forever presents a 'whole of government approach' to the protection of bushland (and associated wetlands), with the Bush Forever policy endorsed by the Government of Western Australia, WAPC, the Environmental Protection Authority, and other key environmental agencies.

One of the principle aims of Bush Forever is to provide a guide to site implementation for landowners, developers and the community, by clearly distinguishing each Bush Forever site and associated site implementation recommendations.

The subject site adjoins Bush Forever Site 385 on its northern and southern boundaries. Notwithstanding, the activities associated with the proposed LSP do not encroach upon these boundary nor are not expected to impact upon the conservation area. The LSP is therefore considered to comply with the requirements of the WAPC's *Bush Forever Policy*.

2.4.2 State Planning Policy (SPP 2.8) Bushland Policy for the Perth Metropolitan Region

State Planning Policy 2.8 (SPP 2.8) was gazetted in June 2010. The aim of SPP 2.8 is to provide a policy and implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning to secure long-term protection of biodiversity and associated environmental values.

The policy applies to the Metropolitan region and addresses two distinct aspects of bushland management being, Bush Forever sites and local bushland.

The policy recognises the protection and management of significant bushland areas as a fundamental consideration in the planning process, while also seeking to integrate and balance wider environmental, social and economic considerations. Generally, the policy does not prevent development where it is consistent with policy measures.

Whilst the site is bound by a Bush Forever site, as previously noted the activities associated with the proposed LSP are not expected to impact upon the conservation areas. Further, it is noted that any remaining vegetation within the boundaries of the site is degraded in nature which is considered to hold little ecological value.

2.4.3 State Planning Policy 4.1 – Draft State Industrial Buffer (Amended)

The draft State Planning Policy 4.1 (SPP 4.1) provides for a state-wide, consistent approach to the protection and long-term security of industrial zones, transport terminals, other utilities and special uses. Draft SPP 4.1 also provides for the safety and amenity of surrounding land uses while having regard to the rights of landowners who may be affected by residual emissions and risk.

The proposed Mixed Business zone would not result in industrial uses that could affect the residential area to the north in terms of noise, dust, odour or other impacting factors (Cottage, General, Light and Service are the only Industry types available).

The Policy states structure plans are to identify buffer areas around major existing or proposed industrial areas and infrastructure. The intent of the LSP is to provide for a mix of complementary uses such as showrooms, office and General/Light Industry, none of which are expected to negatively impact the surrounding residential amenity, nor require any specific buffers. The LSP is therefore considered to satisfy the principles and objectives of SPP 4.1.

2.4.4 State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning

The general objectives of State Planning Policy 5.4 are to ensure people are protected from unreasonable levels of transport noise and to ensure new development is compatible with existing transport corridors and freight operations.

Under the provisions of Schedule 1 of the policy, Alexander Drive is classified as a 'primary freight road' under the jurisdiction of the local government.

Given the LSP does not seek to create any new residential areas, noise from Alexander Drive is not considered to be a development constraint in this instance, nor impact upon the day-to-day operation of uses on the site.

2.5 Other Approvals and Decisions

2.5.1 Deed of Agreement

A Deed of Agreement was signed on December 2012 by the owner of the subject site (Atlas Brick Pty Ltd), the Minister for Planning and the Western Australian Planning Commission (WAPC) to provide a framework for the coordinated cessation of waste disposal and affiliated uses on site, the ceding and remediation of a portion of the site for Regional Open Space, and the conversion of the remainder of the site for 'Mixed Business' type uses.

In accordance with the provisions of the Deed, an amendment to the MRS was initiated and subsequently approved by the Minister for Planning in 2013, rezoning the subject site to 'Industrial'.

Following the rezoning of the site under the MRS, the subject site was rezoned 'Development' under the City of Stirling DPS 3 in March 2015. At the time of writing this report, the Amendment is yet to be published in the Government Gazette.

The provisions of the Deed require a Local Structure Plan to be prepared and lodged for the site following the gazettal of the Local Planning Scheme Amendment. This LSP has therefore been prepared in accordance with the provisions of the Deed to fulfil this requirement.



The Deed also addresses responsibilities and timeframes for:

- ▲ Preparation and endorsement of the LSP;
- ▲ Subdivision of the land and preparation of necessary surveys;
- ▲ Lodgement of documentation and transfer of land;
- ▲ Finalisation of leases and land uses.

The ultimate identification of the land for Mixed Business under this LSP reflects previous discussions with the Department of Planning and the City of Stirling. It is an expectation of the landowner that LSP designations are consistent with these previous commitments.

Site Conditions and Constraints

3.1 Biodiversity and Natural Area Assets

The following provides a summary of the environmental site conditions and constraints. For further information, the Environmental Assessment and Management Strategy (EAMS) prepared by 360 Environmental is provided at Appendix 2.

3.1.1 Flora and Vegetation

The subject site is located within the Heddle vegetation mapping unit of 'Karrakatta Complex, Central and South'. The site also falls within the Shepherd vegetation mapping unit, 'Bassendean_1001' which is described as 'medium very sparse woodland; jarrah, with low woodland; banksia and casuarina'.

A Level 1 Flora and Vegetation Survey was undertaken by 360 Environmental on 5 October 2015. The survey identified the following two vegetation associations within the LSP area:

- ▲ BmMps – Low Open Woodland of *Banksia menziesii* over *Mesomelaena pseudostygia*, *Daviesia nudiflora* subsp. *nudiflora*, *Xanthorrhoea preissii*, *Eremaea pauciflora* var. *Pauciflora*, *Stirlingia latifolia*, *Acacia pulchella* and *Daviesia triflora*.
- ▲ Em – Low Open Woodland of *Eucalyptus marginata* over *Mesomelaena pseudostygia*, *Jacksonia sternbergiana* and *Daviesia divaricata* subsp. *divaricata* (ms) over introduced species.

The results of the survey noted that remnant vegetation within the LSP area occupies approximately 0.17 hectares and ranges in condition from 'Excellent' to 'Completely Degraded'.

It is also noted that a search of the Department of Parks and Wildlife NatureMap database revealed no species of conservation significant flora were located within two kilometres of the subject site.

Refer to Figure 5 – Vegetation Condition

3.1.2 Priority and Threatened Ecological Communities

The Department of Parks and Wildlife Mapping of Priority (PECs) and Threatened Ecological Communities (TECs) reveals that no PECs are mapped within the subject site, however the site falls within the buffer area of mapped TECs. The TEC is associated with 'SCP 20a – Banksia attenuate woodland over species rich dense shrublands'.

The Level 1 Flora and Vegetation Survey undertaken by 360 Environmental recorded vegetation association BmMps, which has been identified as FCT SCP20a and is described as '*Banksia attenuate* woodlands over species rich dense shrublands', listed as 'Endangered' by the State.

The total area of the TEC identified within the site is 0.15 hectares, which includes the inferred TEC area comprising Em vegetation.

The LSP area is considered to hold little ecological value due to the degraded nature and limited amount of remaining vegetation within the site. Notwithstanding, given the identification of the TEC SCP20a within the subject site, clearing of native vegetation within this area will require a native vegetation clearing permit.

3.1.3 Fauna

A desktop fauna review was undertaken using Department of Parks and Wildlife Threatened Species and Communities database revealed two threatened species, two species protected under international agreement and two priority species were identified as occurring within 2km of the subject site.

The fauna species which have previously been recorded within 2km of the subject site include:

- ▲ *Bettongia penicillata subsp. ogilbyi* (Woylie, Brush-tailed Bettong) – Threatened;
- ▲ *Calyptorhynchus latirostris* (Carnaby's Cockatoo) – Threatened;
- ▲ *Ardea modesta* (Eastern Great Egret) – International Agreement;
- ▲ *Merops ornatus* (Rainbow Bee-eater) – International Agreement;
- ▲ *Neelaps calonotos* (Black-striped Snake) – Priority 3;
- ▲ *Macropus irma* (Western Brush Wallaby) – Priority 4;
- ▲ *Oxyura australis* (Blue-billed Duck) – Priority 4; and
- ▲ *Synemon gratiosa* (Graceful Sunmoth) – Priority 4.

The limited vegetation within the site may have the potential to provide habitat for the above species with the exception of the *Ardea modesta* (Eastern Great Egret) and the *Oxyura Australia* (Blue-billed Duck) which prefer wetland habitats.

Given the small area of remnant vegetation, it is expected that the vegetation would only provide potential habitat in association with the surrounding Bush Forever areas which appear to contain better quality vegetation, based on desktop investigations.

The potential habitat for Black Cockatoos has been considered and whilst some suitable habitat species have been identified within the site, 360 Environmental consider that a referral for impacts to Matters of National Environmental Significance is not required based on the small area of vegetation within the site (0.17 hectares).

3.2 Landform and Soils

Site specific contour mapping indicates that the site elevation ranges from approximately 45 metres Australian Height Datum (mAHD) in the east, up to 60mAHD in the west. The majority of the site is flat to gently sloping however there is a steep incline in the western portion of the site.

Soil mapping has been completed at a regional scale which shows the site as occurring within the Bassendean system within the soil phase 212Bs_S8 which is characterised by 'sand – very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin.

3.2.1 Acid Sulphate Soils

The Department of Environmental Regulation (DER) Acid Sulphate Soil (ASS) Risk Mapping identifies the entire site as having 'moderate to low risk of acid sulphate soils occurring within 3m of the natural soil surface'.

Given the considerable separation to groundwater, it is unlikely any requirement for ASS investigations will be triggered.

3.2.2 Contamination

The subject site has historical been used for inert landfilling operations since 1977. Between 1977 and 1997 the landfill was licenced to accept putrescibles waste. In 2009, an investigation notice was issued for the site due to potential contamination issues caused by landfilling activities. GHD were commissioned in 2010 to undertake a Preliminary Site Investigation (PSI) which was later submitted to the Department of Environment Regulation (DER).

The DER concluded that further investigations were required to determine the nature and extent of any contamination, and classified the site as '*Possibly contaminated – investigation required*' under the Contaminated Sites Act 2003 on 19 September 2011. Since this time, several investigations have been undertaken in relation to potential contamination resulting from previous landfilling activities at the site. These investigations include:

- ▲ A Sampling and Analysis Plan (SAP);
- ▲ A Groundwater Investigation Report (GIR); and
- ▲ A Limited Risk Assessment (based on the outcomes of the Groundwater Investigation Report).

A mandatory auditor was then appointed to review this information prepared by GHD prior to submission to DER. In 2013, the Mandatory Auditors Report (MAR) and GIR were submitted to DER. Correspondence was received from the DER in February 2014 advising as follows:

"the classification of the site remains unchanged... however the reasons for the classification have been updated."

The action required to be undertaken to determine the presence of potential contaminants and thus the current classification of the site are:

- ▲ Soil investigations to be carried out in accordance with DER's Contaminated Sites Management Series of guidelines and the 'National Environmental Protection (Assessment of Site Contamination) Measures 1999'; and
- ▲ Landfill gas investigations with reference to the guideline 'Assessing risks posed by hazardous ground gases to buildings' (Construction Industrial Research and Information Association 2007).

Prior to subdivision approval, the proponent will ensure it is demonstrated that the site is able to support the proposed development in accordance with any requirements of the DER.

In addition, following a detailed health assessment the DER have advised the following:

The levels of substances present in groundwater beneath the site and the Bush Forever reserve immediately south and west are unlikely to pose a risk to human health under the current landuse. However, they may pose a risk to human health under a more sensitive landuse such as residential or public open space... if groundwater is being, or is proposed to be abstracted, DER recommend that analytical testing should be carried out.

Given that the development is not considered a more sensitive land use and groundwater abstraction is not proposed, there will be no source to receptor contact and it is expected that analytical testing will not be required.

3.3 Groundwater and Surface Water

3.3.1 Groundwater

Regional groundwater contour mapping suggests that the groundwater table below the site is between 29 and 31mAHd which equates to between 16 and 31 metres below ground level.

Given the considerable separation to groundwater and the porous, sandy nature of the soils within the site, infiltration potential is expected to be maximised. 360 Environmental has consulted with both the Department of Water and the City of Stirling who have advised that a Local Water Management Strategy for the site is not required as part of the LSP.

An Urban Water Management Plan will however be required as part of any future subdivision / development approval for the subject site. Provision has been included within Part 1 of the LSP text accordingly.

3.3.2 Surface Water

According to the Department of Water mapping, no streams or tributaries occur within the subject site. Similarly, Department of Parks and Wildlife online mapping indicates no streams or tributaries are present within the LSP area.

3.4 Bushfire Hazard

The subject site is situated within an existing Urban area, and therefore the risk of bushfire attack is considered to be low. Existing vegetation on the subject site will be cleared as part of the development of the site (subject to obtaining the necessary approvals), and therefore does present a bushfire risk.

It is noted that the subject site is bordered on its northern and southern boundaries by Bush Forever Site 385. Notwithstanding, this area of bushland is not considered to pose a bushfire risk to any future development. As depicted on the Indicative Layout Plan contained at Figure 7, it is likely that internal roads will be provided at these boundaries to facilitate vehicular access and movement through the site. As a result of providing internal roads to these boundaries, the separation distance between any future buildings and the adjacent bushland vegetation would be in excess of that prescribed under the WAPC's *Planning for Bushfire Protection Guidelines*.

Given the low bushfire risk presented to the subject site, a Bushfire Management Plan is not considered to be necessary and has therefore not been prepared as part of this Local Structure Plan.

3.5 Heritage

3.5.1 Indigenous Heritage

A search of the Department of Aboriginal Affairs Aboriginal Heritage Inquiry System identified no sites of Indigenous heritage significance being located within the LSP area.

3.5.2 Non-Indigenous Heritage

No places were identified on the Heritage Council of Western Australia Heritage Places Database or the City of Stirling Municipal Heritage List for the LSP area.

3.6 Context and Other Land Use Constraints

The subject site is located approximately 250m south of existing residential areas, 450m north of Reid Highway and is located immediately adjacent to the Malaga Industrial area.



The subject site provides for an important transition between existing residential areas to the north of and industrial uses to the east of Alexander Drive. The Mixed Business zoning proposed under the LSP provides for a gradual transition between the industrial uses to the east and residential uses to the north-west of Alexander Drive. The Mixed Business zoning provides for the opportunity to create a high quality built form Business Park estate which would have a significantly lesser impact on adjacent residential areas compared to that of a wholly industrial estate.

04

Land Use and Subdivision Requirements

4.1 Land Use

The LSP sets out land use, environmental considerations and servicing requirements for the subject site.

The LSP is proposed to comprise a range of 'Mixed Business' uses to both complement the nearby Malaga Industrial area and provide for an appropriate to the existing residential area to the north of the site.

The following describes the design response proposed under the LSP.

Please also refer to the LSP Plan 1, provided at the end of Part One.

4.2 Open Space

In accordance with Development Control Policy 4.1 – Industrial Subdivision, the LSP does not provide for any new areas of public open space. The land abutting the LSP area remains zoned 'Parks and Recreation' under both the MRS and the City of Stirling District Planning Scheme No. 3 which ultimately be developed for recreational purposes once the inert land fill activities cease operation.

4.3 Residential

The LSP does not propose any new areas of residential development. Existing residential areas are located to the north-west of the subject site and on the southern side of Reid Highway.

4.4 Movement Network

The following provides a summary of the proposed movement network. For further information it is recommended the reader consult the Transport Assessment included at Appendix 3.

4.4.1 Existing Road Network

4.4.1.1 Alexander Drive

Alexander Drive forms the eastern boundary of the development and is classified as a District Distributor A under the Main Roads Functional Road Hierarchy. Alexander Drive is constructed as a median-divided dual carriageway and is intended to perform the function of carrying inter and intra-regional traffic. This allows frequent connections to local streets with a low percentage of trucks and a bus route.

The subject site currently has two access points off Alexander Drive.

4.4.1.2 Truganina Road

Truganina Road is identified as an access road which terminates at the intersection with Alexander Drive. Truganina Road is a single lane carriageway with an approximate 22m wide road reserve and 10m wide pavement with kerbing. Truganina Road predominantly provides vehicle access to abutting properties.

4.4.1.3 Victoria Road

Victoria Road is classified as a 'Local Distributor' under the Main Roads Functional Hierarchy and has an approximately road reserve width of 20m with a 7m wide seal and kerbing. Victoria Road extends

across both sides of Alexander Drive and forms the northern boundary of the subject site and allows movement of traffic within local areas and connects access roads to higher order distributors.

The subject site currently has one access point off Victoria Road which has been temporarily modified to be used as an exit only.

4.4.2 Proposed Road Network

It is anticipated that the proposed road network will be defined as part of detailed design to be undertaken at subdivision / development stage. The final built form outcome for the site has not yet been defined with the LSP providing the framework for further subdivision / development of the site into a Business Park in the near future.

Notwithstanding, an Indicative Layout Plan has been prepared based upon the findings of the Transport Assessment prepared by Porter Consulting Engineers. The indicative layout shown at Figure 7 has been provided as an example only and represents how the built form may be developed taking into consideration the comments of the Transport Assessment.

The LSP and Transport Assessment have been prepared taking into consideration the key points of the submission lodged by Main Roads WA as part of the MRS Amendment process. The submission is summarised as follows:

- *A traffic impact assessment will need to be undertaken in the future detailed planning stages;*
- *An access strategy for the site will need to be prepared in liaison with MRWA; and*
- *The proponent is advised to liaise with MRWA during the future detailed planning stages.*

As detailed within the Transport Assessment, it is recommended that further detailed traffic modelling is undertaken at the development application stage once the built form has been defined. The modelling should determine whether additional upgrades are required to the surrounding intersections of Victoria Road and Alexander Drive or Truganina Road and Alexander Drive.

The LSP proposes the following access strategy to the site, taking into consideration the recommendations of the Transport Assessment:

- ▲ Primary vehicular access to and from the site being taken from the signalised intersection of Alexander Drive and Victoria Road.
- ▲ The existing vehicular access point to the site from the intersection of Alexander Drive and Truganina Road should be modified to a 'left-in / left-out' access only for northbound traffic.
- ▲ The second vehicular crossover point to Alexander Drive being removed as part of the redevelopment of the site.
- ▲ Victoria Road being extended to allow access to the landfill and excavation site for the period of the lease agreement between Atlas Group and the WAPC in accordance with the Outline Structure Plan.

It is also anticipated that Victoria Road will require upgrading for the portion of road abutting the LSP boundary as a condition of subdivision / development. In accordance with the provisions of the Deed, lease rights are required between Atlas Group and the WAPC to allow access to the rear portion of Lot 1, not subject to this LSP. Access to the rear portion of Lot 1 is required to be maintained to allow Atlas Group to continue landfill and excavation activities in accordance with the provisions of the Deed.

4.4.3 Public Transport

The site is currently serviced by the following Transperth Bus Routes which operate along Alexander Drive:

- ▲ Transperth Bus Routes 886 and 887 operate between the Roe Street Bus Station (Perth CBD) and the Alexander Heights Shopping Centre.
- ▲ Transperth Bus Route 889 operates between the Roe Street Bus Station (Perth CBD) to Lassen Park off Guadalupe Drive (Ballajura).

Bus Stop No. 12844 is located on the western side of the Alexander Drive road reserve, north of Truganina Road.

4.4.4 Pedestrian and Cycle Networks

In accordance with Liveable Neighbourhoods requirements, footpaths will be provided on at least one side of every street. Footpaths should be provided to a minimum width of 2m.

The Traffic Report prepared by Porter Consulting Engineers recommends that a Principal Shared Path (PSP) be constructed along the development frontage to both Alexander Drive and Victoria Road which may be accommodated as part of further detailed design.

On-street cycle lanes may also be accommodated throughout the site which could connect to the PSP along Victoria Road and Alexander Drive. It is noted that an existing shared path which forms part of the Perth Bicycle Network is located along the western side of the Alexander Drive road reserve which connects to the wider bicycle network.

4.5 Water Management

Preliminary discussions with both the Department of Water and City of Stirling indicate that the preparation and lodgement of a Local Water Management Strategy to support the LSP is not required in this instance for the following reasons:

- ▲ The minimum depth to groundwater across the site is 10m which will enable the infiltration of stormwater runoff within the future lot boundaries;
- ▲ There are no onsite waterways within the boundaries of the subject site; and
- ▲ Future development is to be designed in a manner that would allow for drainage (up to the 100 year ARI event) to be accommodated on site.

Notwithstanding, in accordance with discussions with the City of Stirling, an Urban Water Management Plan (UWMP) will be required as a condition of subdivision / development which is to guide the stormwater drainage design for the proposed development. In accordance with preliminary comments received from the City of Stirling's Technical Services Department, the UWMP is to be prepared in accordance with the requirements of the Department of Water's Better Urban Water Management (2008) and Stormwater Management Manual for WA (2004 – 2007).

The UWMP is required to address the following:

- ▲ Both the flood protection 1% annual exceedance probability (AEP) event and also Water Sensitive Urban Design (WSUD) objectives to the complete satisfaction of the City of Stirling and shall be approved by the City of Stirling prior to the commencement of the detailed drainage design for the development.

- 
- ▲ WSUD elements to be considered shall include but not be limited to rainwater tank, tree pits, rain gardens/bioretenation swales, soakwells, roof gardens, green walls and stormwater pollutant traps. It is noted the proposed car parking areas will provide excellent opportunities for the implementation of WSUD elements such as rain gardens/bioretenation swales and tree pits. These WSUD initiatives should be incorporated early on in the planning process to ensure that sufficient land area is provided to allow the integration of the WSUD elements into the car park layout.
 - ▲ The UWMP should be prepared collaboratively by civil engineering, architectural, landscape and drainage design consultants to maximise opportunities for 'at source' management of rainfall in accordance with WSUD objectives.
 - ▲ The UWMP should allow for the retention of the major 1% AEP within the boundaries of the lot. The drainage design consultant will be responsible for determining the on lot storage requirements taking into account soil permeability. The absolute minimum onsite retention storage volume to be provided shall be equivalent to 15 millimetres of rainfall occurring over all impervious surfaces.
 - ▲ Rainfall runoff from roof areas shall be managed by capture, reuse (if applicable) and infiltration systems that shall be separate to those systems used to manage runoff from other impervious surfaces including access roads, car parks and courtyards where increased pollutant loads will occur.

4.6 Education Facilities

The LSP does not propose the creation of any new school sites nor trigger the requirement for a new school site.

The site is within close proximity to a number of local schools including, Boyare, Dryandra and North Morley and Camboon Primary Schools. Senior education is similarly available with nearby secondary schools including Balga, Morley and Mirrabooka Senior High Schools as well as Ballajurra Community College.

4.7 Activity Centres and Employment

In accordance with State Planning Policy 4.2 – Activity Centres for Perth and Peel (SPP 4.2), the closest Strategic Metropolitan Centre to the site is Morley, which is located approximately 4.1 kilometres to the south-east.

The Mirrabooka Secondary Centre is located approximately 1.5 kilometres to the south-west of the LSP area which provides for a diversity of land uses, including a range of economic and community services to service the locality.

The LSP will provide for new commercial development and employment opportunities within the area which will support the existing centres within the north-west corridor. The creation of a 'Mixed Business' precinct with uses such as showrooms, light industry, offices and other associated uses will support the existing Malaga Industrial Area located on the eastern side of Alexander Drive whilst providing for range of additional employment opportunities for local residents.

In accordance with the findings of the Transport Assessment prepared by Porter Consulting Engineers, the site is capable of accommodating up to 35,000m² of 'General Office' and up 35,000m² of 'Bulky



Goods' such as Showroom and Warehouse uses without causing the intersection of Alexander Drive and Victoria Road to fail.

The establishment of new businesses as a result of the LSP will also provide for additional employment opportunities within the locality.

4.8 Infrastructure Coordination, Servicing and Staging

The Engineering Services Report prepared by Porter Consulting Engineers confirms there are no significant servicing constraints to the Structure Plan area with the required utilities.

The following provides a summary of the infrastructure and servicing for the LSP area, however for further information it is recommended the reader consult the Engineering Services Report provided at Appendix 4.

4.8.1 Earthworks / Drainage

The site's geology should result in high permeability of material which would allow for drainage basins and soak wells to be used for the processing of stormwater. Should this be the case then a soakage basin would be required on the site with a storage capacity of between 7,000 – 9,000m³.

The site's storage requirements should be further reviewed and determined at detailed design stage.

4.8.2 Water Supply

The site currently has an existing water connection off the 200mm reticulation main located adjacent to the intersection of Alexander Drive and Truganina Road. Whilst the Water Corporation is not in a position to confirm service capacity until the LSP has been adopted, given water infrastructure is located adjacent to the site, it is unlikely that the Water Corporation will require servicing upgrades as part of the development.

It is also noted that the subject site is serviced by an existing 150mm diameter PVC fire service with water connection from the 375mm distribution main. A fire booster is located adjacent to the Alexander Drive road reserve. An internal 150mm PVC fire mains has been installed throughout the site with hydrants located as required.

4.8.3 Sewer

Water Corporation is not in a position to provide service information until the LSP has been adopted. Notwithstanding, Water Corporation future planning shows that the Harris Street pump station is currently operating above 7.91/s with future planned capacity of 10.61/s.

The most likely method to service the site would be to extend the existing Truganina Road sewer through the centre of the site. Should this occur, the likely minimum height the proposed buildings finished floor levels would need to be is RL 45 to RL 46m AHD. This level could potentially be reduced at detailed design stages once the final development concept is known.

Once the details of the proposed development are known, the Water Corporation should be contacted to confirm the capacity of the existing downstream pump station to handle the additional wastewater generated from the development.



4.8.4 Gas

There is existing gas infrastructure located adjacent to the subject site. Gas supply is not anticipated to be a present a constraint to the development.

4.8.5 Electricity

Existing power infrastructure is located adjacent to the subject site. The infrastructure will need to be extended through the subject site to reticulate the proposed development. Western Power will need to be contacted once the details of the development are known to confirm the capacity of the infrastructure.

4.9 Development Contribution Arrangements

No Development Contributions Arrangements are proposed or required by virtue that the land will be in single ownership following amalgamation of the lots in accordance with the provisions of the Deed.



FIGURES



ROWE GROUP



Portion of Lot 1 Alexander Drive, Mirrabooka

Figure 1

Regional Location

N:\TOWN PLANNING\1000-1999\1878\DRAWING\A-CAD\1878_FIG04A_20140827 MIRRABOOKA (REGIONAL)DWG
Matt Sullivan 28 August 2014

REVISIONS

Rev	Date	Drawn
A	2014.08.27	M. Sullivan



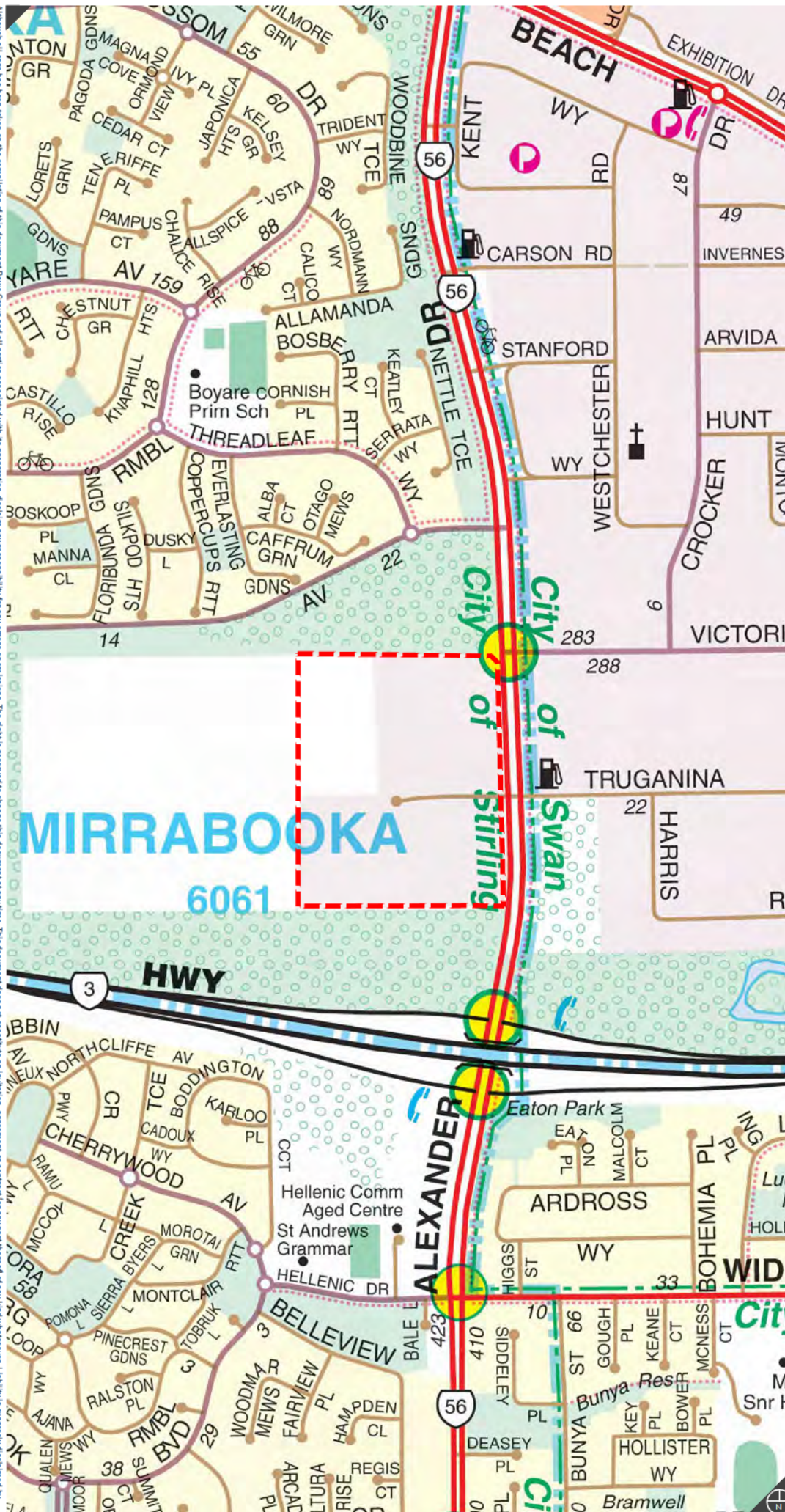
W www.rowegroup.com.au
E info@rowegroup.com.au
P 08 9221 1991

Date Drawn:	2014-08-27
Job Ref:	1878
Scale:	NTS @ A4
Client:	Atlas Bricks
Designer:	P. Fitzgerald
Drawn:	M. Sullivan
Projection:	N/A
Plan ID:	1878-FIG-04-A
Regional Map supplied by WA Planning Commission	



LEGEND

--- Subject Site



REVISIONS

Rev	Date	Drawn
A	2014.08.27	M. Sullivan
B	2015.10.21	W. Clements



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Date Drawn: 2014-08-27
Job Ref: 1878
Scale: NTS @ A4
Client: Atlas Bricks
Designer: P. Fitzgerald
Drawn: M. Sullivan
Projection: N/A
Plan ID: 1878-FIG-05-B
Mapping Information supplied by Streetsmart

Local Location

Portion of Lot 1 Alexander Drive, Mirrabooka

Figure 2



LEGEND

- Subject Site
- Contours
- 7 Existing Lot Numbers
- Existing Boundaries

0 50 100 Metres

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A	2014.08.27	M. Sullivan



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Date Drawn: 2014-08-27
 Job Ref: 1878
 Scale: 1:3000 @ A4
 Client: Atlas Bricks
 Designer: P. Fitzgerald
 Drawn: M. Sullivan
 Projection: MGA50 GDA94
 Plan ID: 1878-FIG-06-A
 Cadastre supplied by JUVICH SURVEYING
 Aerial Photography supplied by NEARMAP



Site Plan

Portion of Lot 1 Alexander Drive, Mirrabooka

Figure 3

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LEGEND

--- Subject Site

RESERVED LANDS

■ Parks And Recreation

■ Primary Regional Roads

■ Other Regional Roads

ZONES

■ Urban

■ Industrial

Victoria Road

Alexander Drive

0 50 100 Metres

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A	2014.08.27	M. Sullivan
B	2015.10.21	W. Clements



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Date Drawn: 2014-08-27
Job Ref: 1878
Scale: 1:3000 @ A4
Client: Atlas Bricks
Designer: P. Fitzgerald
Drawn: M. Sullivan
Projection: MGA50 GDA94
Plan ID: 1878-FIG-07-B
Zoning supplied by WA Planning Commission

Metropolitan Region Scheme

Portion of Lot 1 Alexander Drive,
Mirrabooka
Figure 4



LEGEND

- Subject Site
- METROPOLITAN REGION SCHEME RESERVES**
 - Parks And Recreation
 - Primary Regional Roads
 - Other Regional Roads
- ZONES**
 - Residential
 - Development *
- OTHER**
 - Local Government Boundary
 - R20 R Codes
 - No Zone

NOTE:

*Yet to be published in the government gazette

0 50 100 Metres

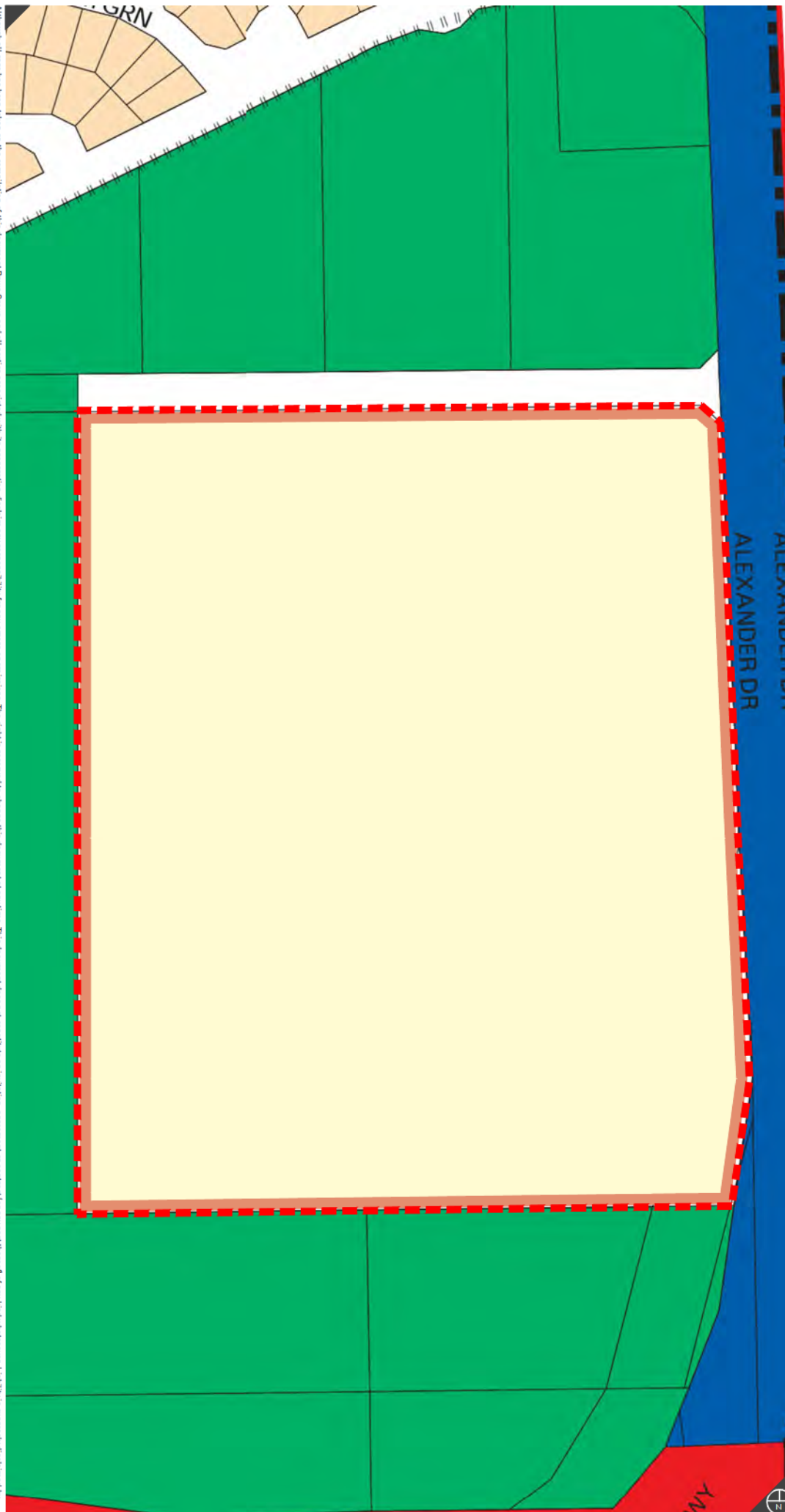
REVISIONS

Rev	Date	Drawn
A	2014.08.27	M. Sullivan
B	2015.10.21	W. Clements
C	2015.12.01	W. Clements



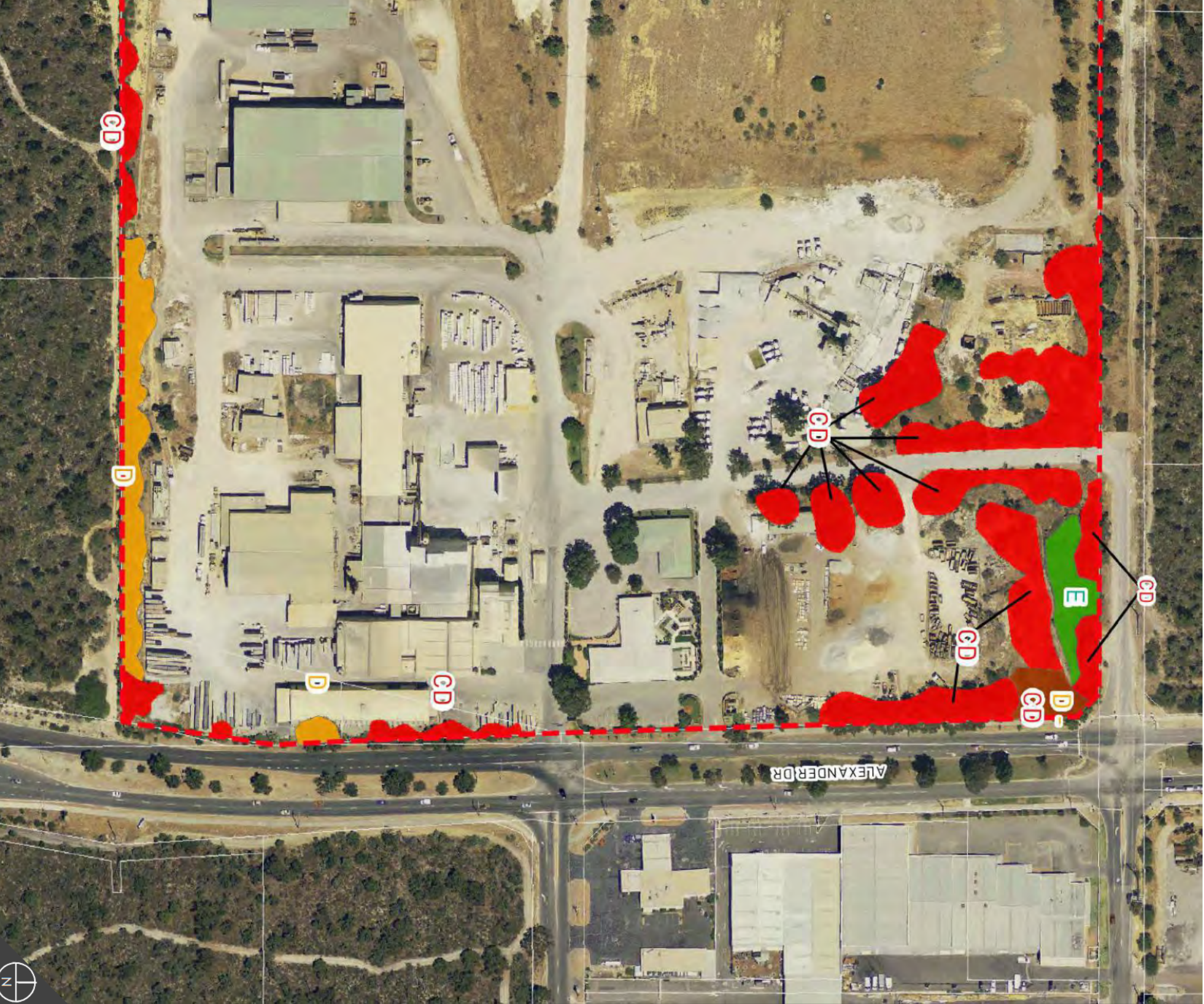
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p: 08 9221 1991

Date Drawn: 2014-08-27
Job Ref: 1878
Scale: 1:3000 @ A4
Client: Atlas Bricks
Designer: P. Fitzgerald
Drawn: M. Sullivan
Projection: MGA50 GDA94
Plan ID: 1878-FIG-08-C
Zoning supplied by WA Planning Commission



Portion of Lot 1 Alexander Drive,
Mirrabooka
Figure 5

Town Planning Scheme No.3 Zoning



- LEGEND**
- Subject Site
 - Vegetation Conditions
 - Excellent
 - Degraded
 - Degraded - Completely Degraded
 - Completely Degraded

0 75 150 Metres

REVISIONS

Rev	Date	Drawn
A	2015.12.01	W. Clements



W: www.rowegroup.com.au
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p: 08 9221 1991

Date Drawn: 2015.12.01
Job Ref: 1878
Scale: 1:3000 (A3)
Client: Atlas Group Pty Ltd
Designer: R. Dial
Drawn: W. Clements
Projection: MGA50
Plan ID: 1878-FIG-14-A
Vegetation condition supplied by 360 Environmental.

Lot 1 (No. 501) Alexander Drive
Mirrabooka
Figure 6



LEGEND
Subject Site

Planning Design Delivery

0 75 150 Metres

REVISIONS

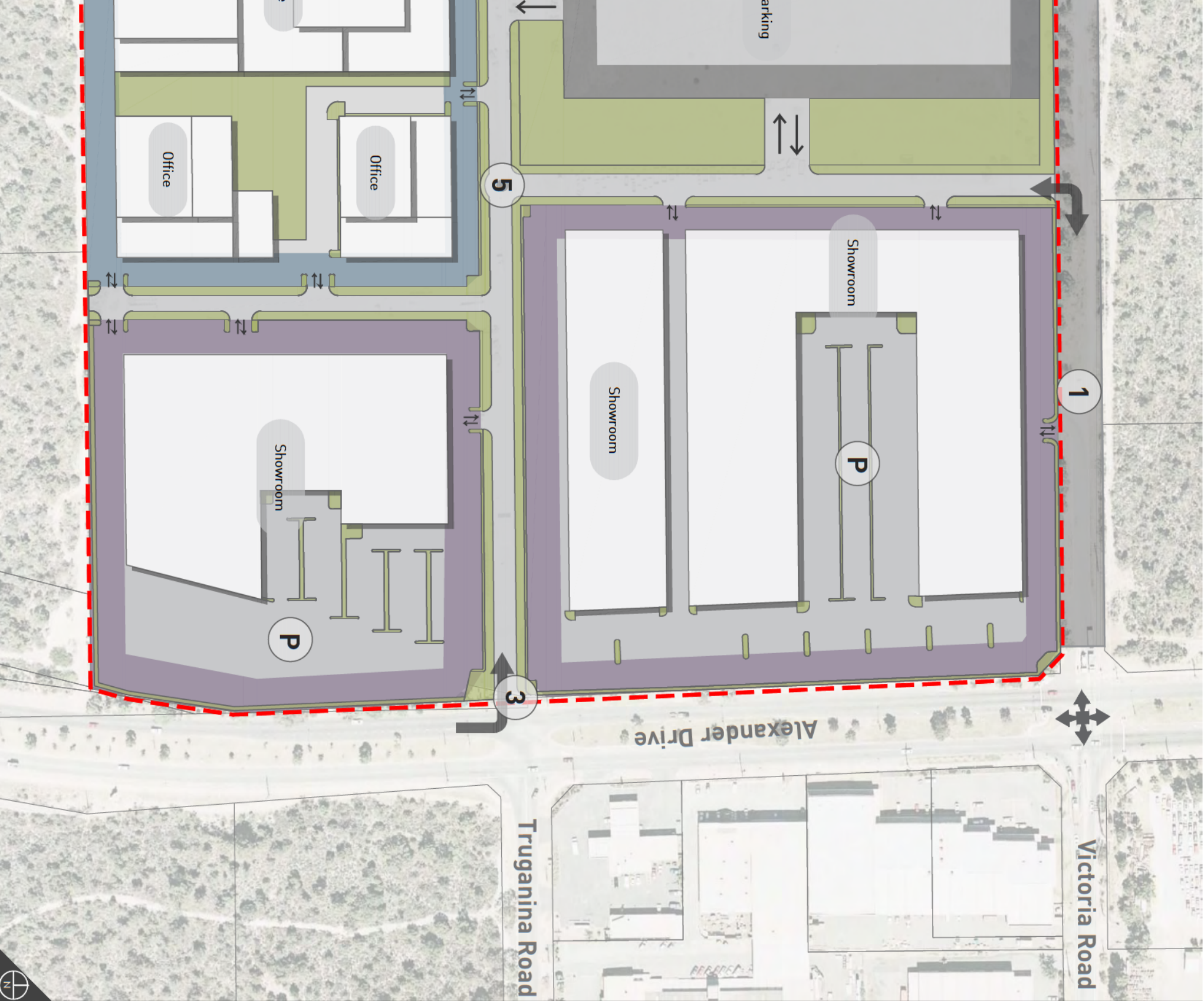
Rev	Date	Drawn
A	2015.10.21	W. Clements
B	2015.12.02	W. Clements



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p: 08 9221 1991

Date Drawn: 2015.10.21
Job Ref: 1878
Scale: 1:3000 @ A3
Client: Atlas Group Pty Ltd
Designer: R. Dial
Drawn: W. Clements
Projection: MGA50
Plan ID: 1878-FIG-12-B
Aerial Photography captured and supplied by Nearmap

Lot 1 (No. 501) Alexander Drive
Mirrabooka
Figure 7



Lot 1 (No. 501) Alexander Drive
Mirrabooka
Figure 8



Planning Design Delivery

LEGEND

- Subject Site
- Commercial - Showrooms
- Commercial - Offices
- Carparking
- Landscaping

- Victoria Road to be upgraded for the length of the LSP boundary.
 - Access to landfill and excavation area to be maintained for Atlas Brick
 - Left in access only
 - Proposed future 'parks and recreation'. Landfill and excavation to continue until a time as agreed between the Western Australian Planning Commission and the landowner.
 - Indicative Roundabout Location
 - Indicative Open Car Parking
 - Existing Signalized Intersection (4-way movement)
- Note:** Proposed development scenario shown is indicative only and subject to further detailed design at subdivision/development stage.

0 75 150 Metres

REVISIONS

Rev	Date	Drawn
E	2015.11.06	W. Clements
F	2015.11.12	W. Clements
G	2015.12.02	W. Clements

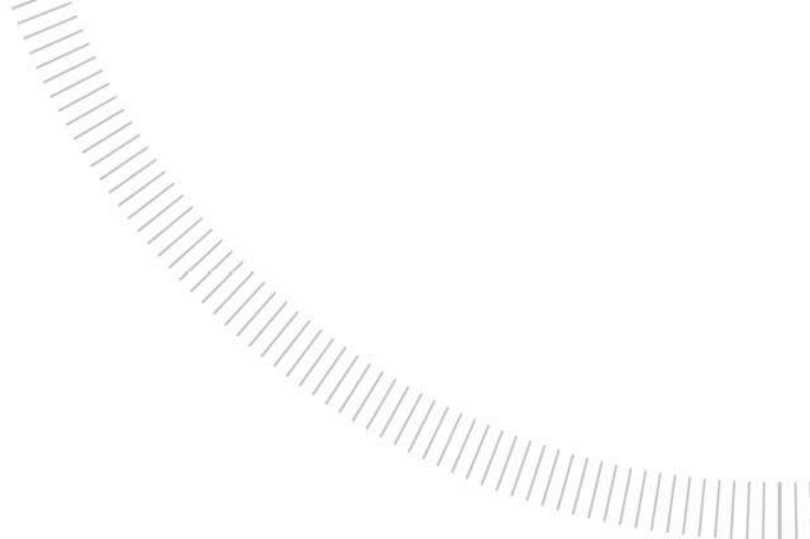


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PLANNING DESIGN DELIVERY

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P: 08 9221 1991

Date Drawn: 2015.10.12
Job Ref: 1878
Scale: 1:2000 @ A3
Client: Atlas Group Pty Ltd
Designer: R. Dial
Drawn: W. Clements
Projection: MGA50 GDA94
Plan ID: 1878-FIG-11-G
Aerial Photography captured and supplied by Neemap



Part Three

TECHNICAL APPENDICES



ROWE GROUP



APPENDIX 1

CERTIFICATES OF TITLE



ROWEGROUP

WESTERN



AUSTRALIA

REGISTER NUMBER

1/D36381DUPLICATE
EDITION**1**

DATE DUPLICATE ISSUED

21/7/2011

RECORD OF CERTIFICATE OF TITLE **UNDER THE TRANSFER OF LAND ACT 1893**

VOLUME
1656FOLIO
48

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 1 ON DIAGRAM 36381

REGISTERED PROPRIETOR: **(FIRST SCHEDULE)**

ATLAS BRICK PTY LTD OF CARE OF ARTHUR YOUNG & CO., 22 MOUNT STREET, PERTH
 (A C652902) REGISTERED 10 NOVEMBER 1983

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

1. THE RIGHT TO MINES OF COAL OR OTHER MINERALS BEING EXCLUDED FROM PORTION OF THE SAID LAND
2. THE LAND THE SUBJECT OF THIS CERTIFICATE OF TITLE EXCLUDES ALL PORTIONS OF THE LOT DESCRIBED ABOVE EXCEPT THAT PORTION SHOWN IN THE SKETCH OF THE SUPERSEDED PAPER VERSION OF THIS TITLE. VOL 1656 FOL 48.
3. *B403704 CAVEAT BY THE STATE HOUSING COMMISSION AS TO PORTION ONLY LODGED 16.9.1977.
4. *K923941 MEMORIAL. CONTAMINATED SITES ACT 2003 REGISTERED 29.4.2009.
5. *M534658 CAVEAT BY WESTERN AUSTRALIAN PLANNING COMMISSION AS TO PORTION ONLY. LODGED 29.1.2014.

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: 1656-48 (1/D36381).
 PREVIOUS TITLE: 399-29A.
 PROPERTY STREET ADDRESS: 501 ALEXANDER DR, MIRRABOOKA.
 LOCAL GOVERNMENT AREA: CITY OF STIRLING.

NOTE 1: N178477 DEPOSITED PLAN 404602 LODGED.

WESTERN



AUSTRALIA

REGISTER NUMBER 47/D70313	
DUPLICATE EDITION N/A	DATE DUPLICATE ISSUED N/A

RECORD OF CERTIFICATE OF TITLE UNDER THE TRANSFER OF LAND ACT 1893

VOLUME
1840FOLIO
357

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 47 ON DIAGRAM 70313

REGISTERED PROPRIETOR: (FIRST SCHEDULE)

STATE PLANNING COMMISSION OF 22 SAINT GEORGE'S TERRACE, PERTH
(T E121547) REGISTERED 8 JUNE 1989

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

1. SAVE AND EXCEPT THE RIGHTS TO MINES OF COAL OR OTHER MINERALS

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: 1840-357 (47/D70313).
PREVIOUS TITLE: 1674-144.
PROPERTY STREET ADDRESS: 499 ALEXANDER DR, MIRRABOOKA.
LOCAL GOVERNMENT AREA: CITY OF STIRLING.
RESPONSIBLE AGENCY: WESTERN AUSTRALIAN PLANNING COMMISSION.

NOTE 1: N178477 DEPOSITED PLAN 404602 LODGED.

WESTERN



AUSTRALIA

REGISTER NUMBER 501/DP64753	
DUPLICATE EDITION N/A	DATE DUPLICATE ISSUED N/A

RECORD OF CERTIFICATE OF TITLE UNDER THE TRANSFER OF LAND ACT 1893

VOLUME
2820FOLIO
125

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 501 ON DEPOSITED PLAN 64753

REGISTERED PROPRIETOR: (FIRST SCHEDULE)

WESTERN AUSTRALIAN PLANNING COMMISSION OF LOCKED BAG 2506, PERTH
(TF M239411) REGISTERED 12 APRIL 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.

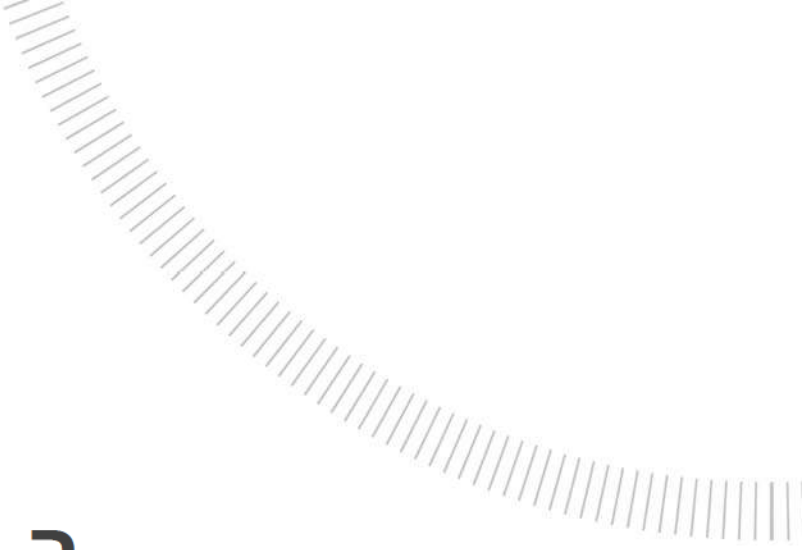
-----END OF CERTIFICATE OF TITLE-----

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:	DP64753.
PREVIOUS TITLE:	LR3156-322, LR3163-826.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF STIRLING.
RESPONSIBLE AGENCY:	WESTERN AUSTRALIAN PLANNING COMMISSION.

NOTE 1:	M239411	NO DUPLICATE TITLE ISSUED.
NOTE 2:	I900659	SECTION 138D TLA APPLIES TO CAVEAT I301137
NOTE 3:	N178477	DEPOSITED PLAN 404602 LODGED.



APPENDIX 2

ENVIRONMENTAL ASSESSMENT AND MANAGEMENT STRATEGY



ROWE GROUP

Our Ref: 1015AB



23 October 2015

Reyne Dial
Rowe Group
3/369 Newcastle Street
Northbridge
WA 6003

Dear Reyne,

Lot 1 (No. 501) Alexander Drive, Mirrabooka - Environmental Assessment and Management Strategy

1. Background

360 Environmental Pty Ltd (360 Environmental) have been commissioned by Rowe Group to prepare a report detailing the environmental opportunities and constraints, and the proposed management of these constraints to facilitate the development of the eastern portion of Lot 1 (No. 501) Alexander Drive, Mirrabooka (the site, Figure 1).

The site is currently zoned to support 'industrial' landuse under the *Metropolitan Region Scheme* and 'development' under the City of Stirling's *Local Planning Scheme No. 3*. 360 Environmental has undertaken a review of available environmental information, as well as a desktop assessment to determine the environmental features of the site and relevant opportunities and constraints in order to facilitate a range of land uses consistent with the Mixed Business zoning such as showrooms, light industry, offices and other associated supporting uses. Consideration of management measures in accordance with the City of Stirling and state agency expectations is also provided.

2. Existing Environment

2.1. Topography and Hydrogeology

Site specific contour mapping indicates that the site elevation ranges from approximately 45 meters Australian Height Datum (mAHD) in the east, up to 60 mAHD in the west. The majority of the site is flat to gently sloping however there is a steep incline in the western portion of the site. Regional groundwater contour mapping suggests that the

groundwater table below the site is between 29 and 31 mAHD which equates to between 16 and 31 meters below ground level.

Soil mapping has been completed at a regional scale by DAFWA (2012) which shows the site as occurring upon the Bassendean system within the following soil phase: 212Bs_S8 which is characterised by 'sand- very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin.

Given the considerable separation to groundwater and the porous, sandy nature of the soils within the site, infiltration potential is expected to be maximised. The proponent has liaised with the Department of Water and the City of Stirling who have advised that they would not require a water management plan to be prepared for the proposed development until future approval stages.

2.2. Surface Water

There are no EPP Lakes (EPA 2010), geomorphic wetlands (DPaW 2015), or surface hydrological features (Landgate 2012) mapped within the site. The closest water body of conservation significance is a Resource Enhancement Wetland (REW) located approximately 430 meters south-east of the site (DPaW 2015). The proposed development is considered to be adequately setback from this REW.

2.3. Acid Sulfate Soils

Acid Sulfate Soil (ASS) are naturally occurring soils containing iron sulphides and are widespread in low-lying, coastal areas of Western Australia. ASS risk mapping by the Department of Environment Regulation (DER 2014) has identified the majority of the Site as having a 'moderate to low risk of ASS within 3m from the ground surface' (Figure 2). The DER have prepared guidance outlining the situations where ASS investigations should be undertaken (DER 2015) including any excavation below the water table. Given the considerable separation to groundwater, it is unlikely any requirement for ASS investigations will be triggered.

2.4. Contamination

Landfilling operations were previously carried out on the site from 1977. Between 1977 and 1997 the landfill was licenced to accept putrescible waste. In 2009 an investigation notice was issued for the site due to potential contamination issues caused by landfilling activities. In 2010 GHD were commissioned to undertake a Preliminary Site Investigation (PSI) to be submitted to the Department of Environment Regulation (DER).

The DER concluded that further investigations were required to determine the nature and extent of any contamination, and classified the site as '*Possibly contaminated-investigation required*' under the *Contaminated Sites Act 2003* on 19 September 2011. Since this time several investigations have been undertaken in relation to potential contamination resulting from previous landfilling activities at the site. These investigations include:

- A Sampling and Analysis Plan;
- A Groundwater Investigation Report (GIR); and
- A Limited Risk Assessment (based on the outcomes of the GIR).

A mandatory auditor was then appointed to review this information prepared by GHD prior to submission to DER. In 2013 the mandatory auditors report (MAR) and GIR were submitted to DER. Correspondence was received from the DER in February 2014 (DER reference 10015) advising that 'the classification of the site remains unchangedhowever the reasons for the classification have been updated'.

The actions required (as per DER 10015) to be undertaken to determine the presence of potential contaminants and thus the current classification of the site are:

- Soil investigations to be carried out in accordance with DER's Contaminated Sites Management Series of guidelines and the 'National Environmental Protection (Assessment of Site Contamination) Measures 1999'¹; and,
- Landfill gas investigations with reference to the guideline 'Assessing risks posed by hazardous ground gases to buildings' (Construction Industry Research and Information Association 2007).

Following subdivision approval, the proponent will ensure it is demonstrated that the site is able to support the proposed development in accordance with any requirements of the DER prior to any subdivision works being undertaken.

In addition, following a detailed health assessment the DER have advised that 'the levels of substances present in groundwater beneath the site and the Bush Forever reserve immediately south and west are unlikely to pose a risk to human health under the current landuse. However, they may pose a risk to human health under a more sensitive landuse such as residential or public open space....if groundwater is being, or is proposed to be abstracted, DER recommend that analytical testing should be carried out...'

¹ This version has now been superseded by NEPM 2013

Given that the development is not considered a more sensitive landuse and groundwater abstraction is not proposed, there will be not source to receptor contact and it is expected that analytical testing will not be required.

2.5. Public Drinking Water Source Areas

Mapping by the Department of Water (2015) indicates that the entire site falls within a Priority 3 (P3) public drinking water source area (Figure 3). P3 classification areas are defined to 'manage the risk of pollution to the water source from catchment activities' (DoW 2004). P3 areas are declared over land where water supply sources coexist with other land uses such as residential, commercial and light industrial development (DoW 2004). Considerations have been given to the P3 classification of the area and are outlined in Section 3.

2.6. Flora and Fauna

Regional vegetation mapping indicates that the site occurs within the following Heddle vegetation mapping unit- 'Karrakatta Complex, Central and South' which has 23.9% of its pre-European extent remaining within the Swan Coastal Plain (PBP 2013). The site also falls within Shepherd vegetation mapping unit 'Bassendean_1001' which is described as 'medium very sparse woodland; jarrah, with low woodland; banksia and casuarina' (DAFWA 2012a). This unit has approximately 24.7% of its pre-European extent remaining.

EPA Position Statement No.9 identifies vegetation complexes with 30 per cent or less or their pre-clearing extent remaining in a bioregion, or 10 per cent or less of their pre-clearing extent remaining in constrained areas on the Swan Coastal Plain, to be critical assets. The site is considered to be located within a constrained area and therefore within acceptance of these thresholds.

A Level 1 Flora and Vegetation Survey (the survey) was undertaken by 360 Environmental on 5 October 2015 (Attachment A). This flora survey also included scope for determining the presence of conservation significant ecological communities, which are discussed in the following section.

The survey identified the following two vegetation associations within the LSP area:

- BmMps- Low Open Woodland of *Banksia menziesii* over *Mesomelaena pseudostygia*, *Daviesia nudiflora* subsp. *nudiflora*, *Xanthorrhoea preissii*, *Eremaea pauciflora* var. *pauciflora*, *Stirlingia latifolia*, *Acacia pulchella* and *Daviesia triflora*.

- Em – Low Open Woodland of *Eucalyptus marginata* over *Mesomelaena pseudostygia*, *Jacksonia sternbergiana* and *Daviesia divaricata* subsp. *divaricata* (ms) over introduced species.

The remnant/ regrowth native vegetation within the LSP area occupies approximately 0.17 hectares and was considered to range from Excellent to Completely Degraded in condition, in accordance with the vegetation condition scale developed by Keighery (1994) and explained in *Bush Forever* (Government of Western Australia 2000).

A search for conservation significant flora and fauna within two kilometres of the site was undertaken using of the Department of Parks and Wildlife (2015a) *NatureMap* database. The search returned no conservation significant flora, however records of conservation significant fauna were returned within this two kilometre search radius. The fauna records included two threatened species, two species protected under international agreement and two priority species. The fauna species which were identified as having been previously recorded within two kilometres of the site are:

- *Bettongia penicillata* subsp. *ogilbyi* (Woylie, Brush-tailed Bettong) - Threatened;
- *Calyptorhynchus latirostris* (Carnaby's Cockatoo) - Threatened;
- *Ardea modesta* (Eastern Great Egret) - International Agreement;
- *Merops ornatus* (Rainbow Bee-eater) - International Agreement;
- *Neelaps calonotos* (Black-striped Snake) - Priority 3;
- *Macropus irma* (Western Brush Wallaby) - Priority 4;
- *Oxyura australis* (Blue-billed Duck)- Priority 4; and
- *Synemon gratiosa* (Graceful Sunmoth) - Priority 4.

The limited vegetation within the site may have the potential to provide habitat for the above species with the exception of the *Ardea modesta* (Eastern Great Egret) and the *Oxyura australis* (Blue-billed Duck) which prefer wetland habitats. However given the small area of vegetation, it is expected that the vegetation would only provide potential habitat in association with the surround Bush Forever areas which appear to have much better quality vegetation, based on aerial imagery.

The proponent has considered the potential habitat for Black Cockatoos and the requirements of the *Environment Protection and Biodiversity Conservation Act 1999*. Although some suitable habitat species were identified within the site, it is believed that a referral for impacts to Matters of National Environmental Significance is not required based on the small area of the vegetation within the site (0.17 ha). This advice is given in line with the current 'EPBC Act referral guidelines for three threatened black cockatoo species' (DotE 2012).

2.6.1. Priority and Threatened Ecological Communities

Mapping of Priority (PECs) and Threatened Ecological Communities (TECs) by DPaW (2015b) shows that no PECs are mapped within the site, however the site falls within the buffer area of mapped TECs. This TEC is associated with 'SCP 20a- *Banksia attenuata* woodland over species rich dense shrublands'.

As mentioned previously, the 360 Environmental survey undertaken in October 2015, included a floristic analysis to determine the presence or absence of the above TEC within the LSP area. The flora survey recorded vegetation association BmMps, which has been identified as FCT SCP20a. SCP20a is described as '*Banksia attenuata* woodlands over species rich dense shrublands' and is listed as Endangered by the State. The total area of this TEC identified within the site is 0.15 ha, which includes the inferred TEC area comprising Em vegetation.

2.7. Conservation Areas

The site is bordered to both the north and south by Bush Forever site 385 (DoP 2014) (Figure 4). Bush Forever sites are generally recognised as regionally significant bushland which is given consideration during regional planning processes. The activities associated with the development are not expected to impact upon this conservation area.

The Perth Biodiversity Project (PBP 2013) mapping shows two ecological linkages as being mapped through the site (linkage 21 and 22). Given the degraded nature and little remaining remnant vegetation within the site, the LSP area is considered to hold little ecological value. The surrounding Bush Forever site provides ample vegetated area to act as an ecological corridor. In addition, following the cessation of landfilling activities at Lot 1 Alexander Drive, the portion of the site which occurs outside of the LSP area and is zoned 'Parks and Recreation' thus providing an area for potential rehabilitation and additional ecological value.

Given the identification of the TEC SCP20a, clearing of any native vegetation within this area will require a native vegetation clearing permit. The proponent will consider the retention of this vegetation where practicable, however in the event that clearing of the 0.15 ha area of TEC is proposed, a clearing permit application will be submitted to the Department of Environment Regulation.

3. Impacts and Management

3.1. Acid Sulfate Soils

Without appropriate management, iron sulphide containing soils when disturbed can cause the production of sulfuric acid, which can result in significant environmental impacts. For this reason, appropriate management and monitoring strategies are required to minimise the impact of disturbing these soils through ground intrusive works.

Although unlikely given the considerable separation to groundwater, a preliminary ASS risk assessment in accordance with any requirements of the DER will be considered prior to subdivision, in the event that any excavation near the water table, or dewatering is proposed.

3.2. Public Drinking Water Source Areas

The DoW's Water Quality Protection Note (2004) for landuse compatibility in PDWSAs states that light industrial, offices and other landuses such as those proposed, are permissible within P3 areas with the condition that the development must be connected to deep sewerage, except where exemptions apply under State Government Sewerage Policy. The development is able to be connected to deep sewerage if necessary, in order to be considered compatible with the P3 area.

3.3. Flora and Fauna

The development may necessitate the clearing of a small area (up to 0.17 ha) of remnant vegetation and potential habitat within the site. Native vegetation will be retained in the road reserves and any areas of the development where possible. Any landscaping works will be undertaken with native species in order to enhance environmental value.

As mentioned previously, if clearing of the 0.15 ha TEC SCP20a is necessary, a native vegetation clearing permit will be applied for.

4. Conclusion

Based on the review of available information for the Site, there does not appear to be any significant environmental features or constraints that would not be manageable and may prevent consideration of the development. In addition management measures outlined in this report have been proposed to mitigate any environmental impacts that may result through implementation of the development.

Should you have any questions or require further action please do not hesitate to contact Carli Turner or the undersigned on (08) 9388 8360. We look forward to hearing from you.

For and on behalf of

360 Environmental Pty Ltd



Tamara Smith – Director/ Principle Environmental Consultant

Enc:

Figure 1 – Location Plan

Figure 2 – Acid Sulfate Soil Mapping

Figure 3 – Public Drinking Water Source Area

Figure 4 – Conservation Areas

Attachment A- 360 Environmental Flora and Vegetation Survey

References

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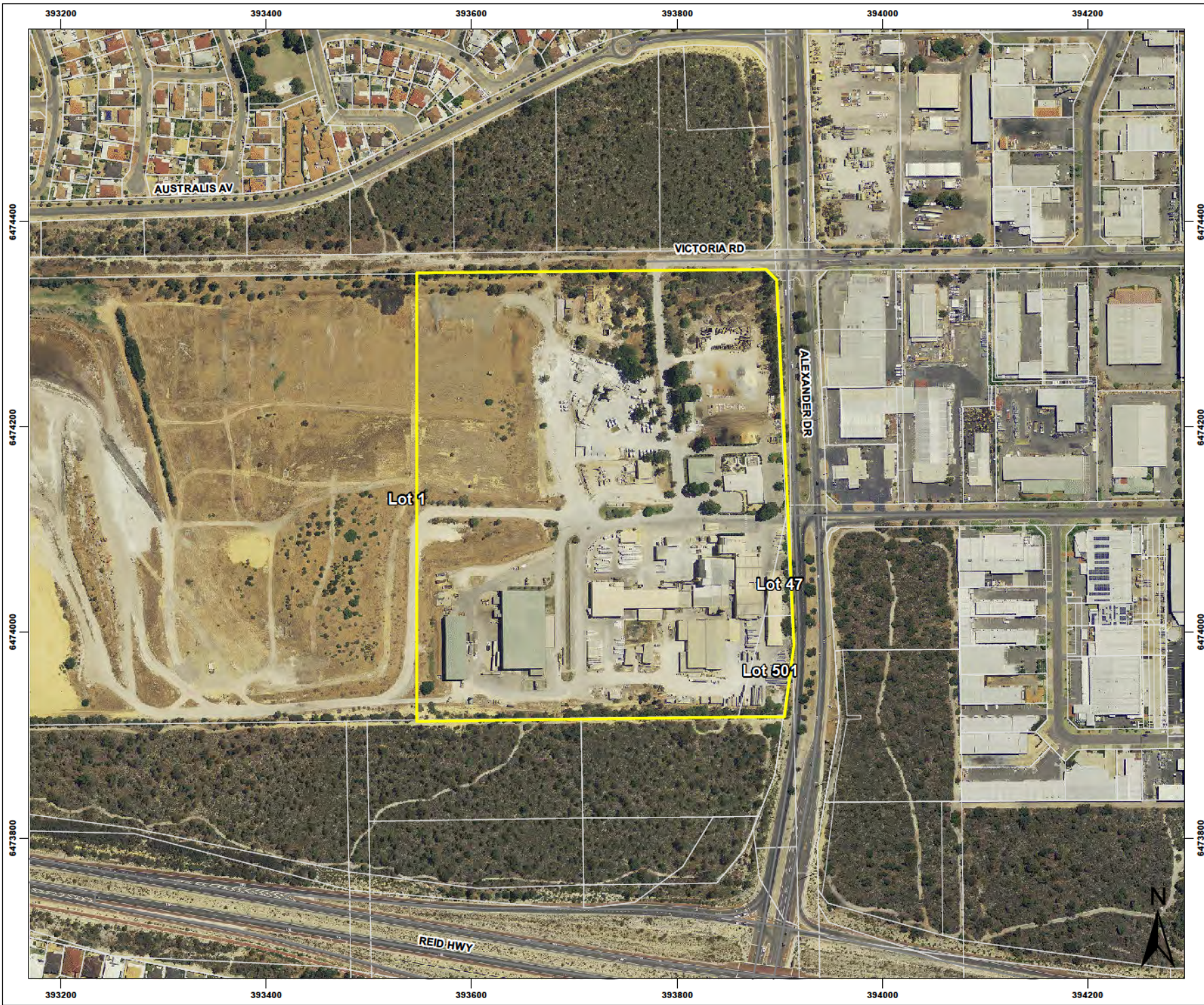
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FIGURES



Legend

Local Structure Plan Area
(15.68 ha)

- NOTE THAT POSITION ERRORS CAN BE -5M IN SOME AREAS
 - LOCALITY MAP SOURCED LANDGATE 2006
 - CADASTRE SOURCED SLIP SERVICES 16 JULY 2015
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2015
 (© Western Australian Land Information Authority 2015)

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www.360environmental.com.au

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Meters

1:5,000 @ A4

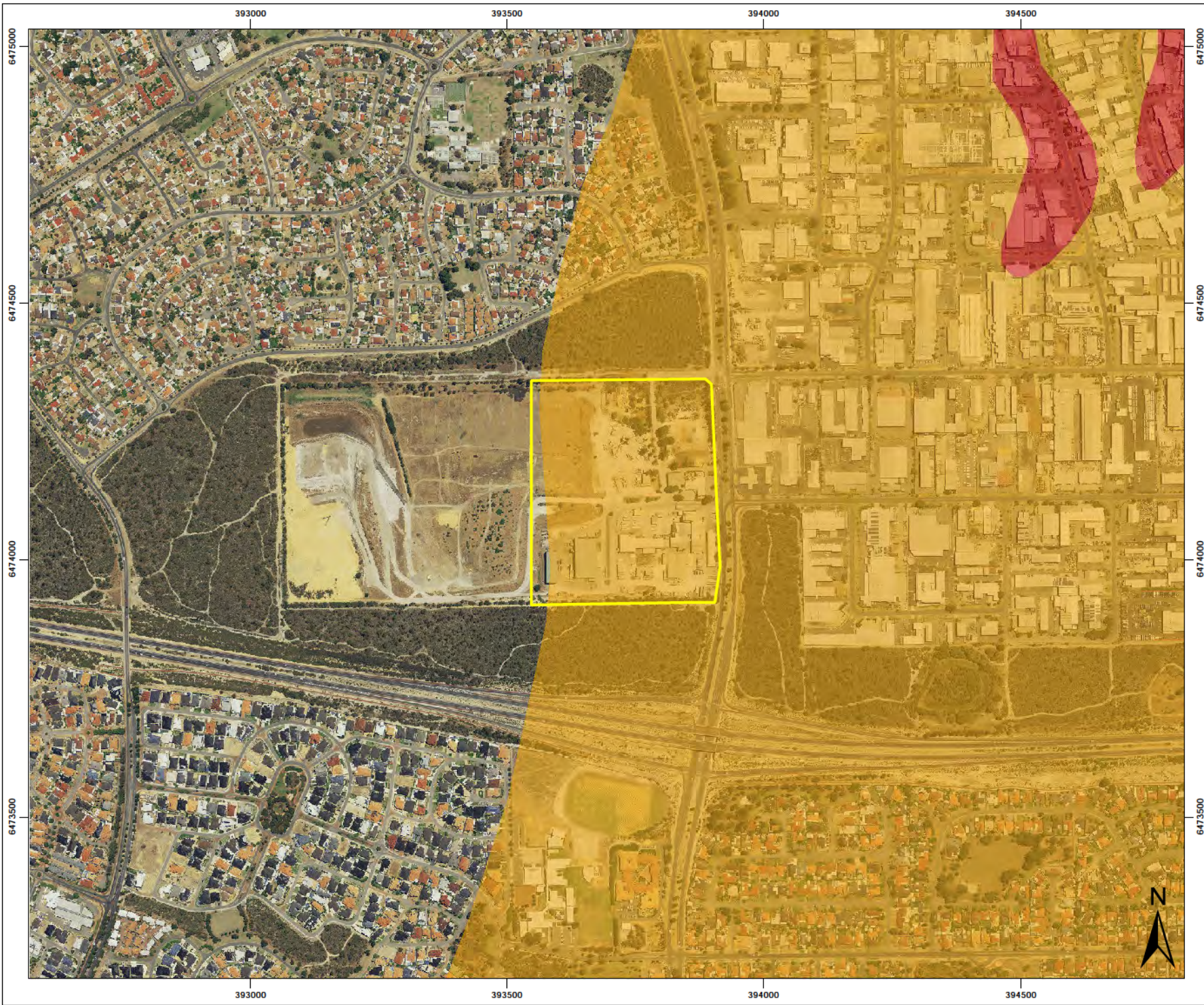
LOCALITY MAP

PROJECT ID		DATE	
1096_f1_site_location.mxd		08-Oct-15	
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS/JJ	CT	LR	0

Rowe Group
 501 Alexander Drive, Mirrabooka

**Environmental Assessment
 Management Strategy (EAMS)**

Figure 1 - Site Location and Premises boundary



Legend

LSP Area

Acid Sulfate Soils Risk

High to moderate risk

Moderate to low risk

- NOTE THAT POSITION ERRORS CAN BE ~5M IN SOME AREAS
 - LOCALITY MAP SOURCED LANDGATE 2006
 - ASS MAPPING SOURCED FROM DER 2014
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2015
 (© Western Australian Land Information Authority 2015)

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0 50 100 200 300 400

Meters

1:10,000 @ A4

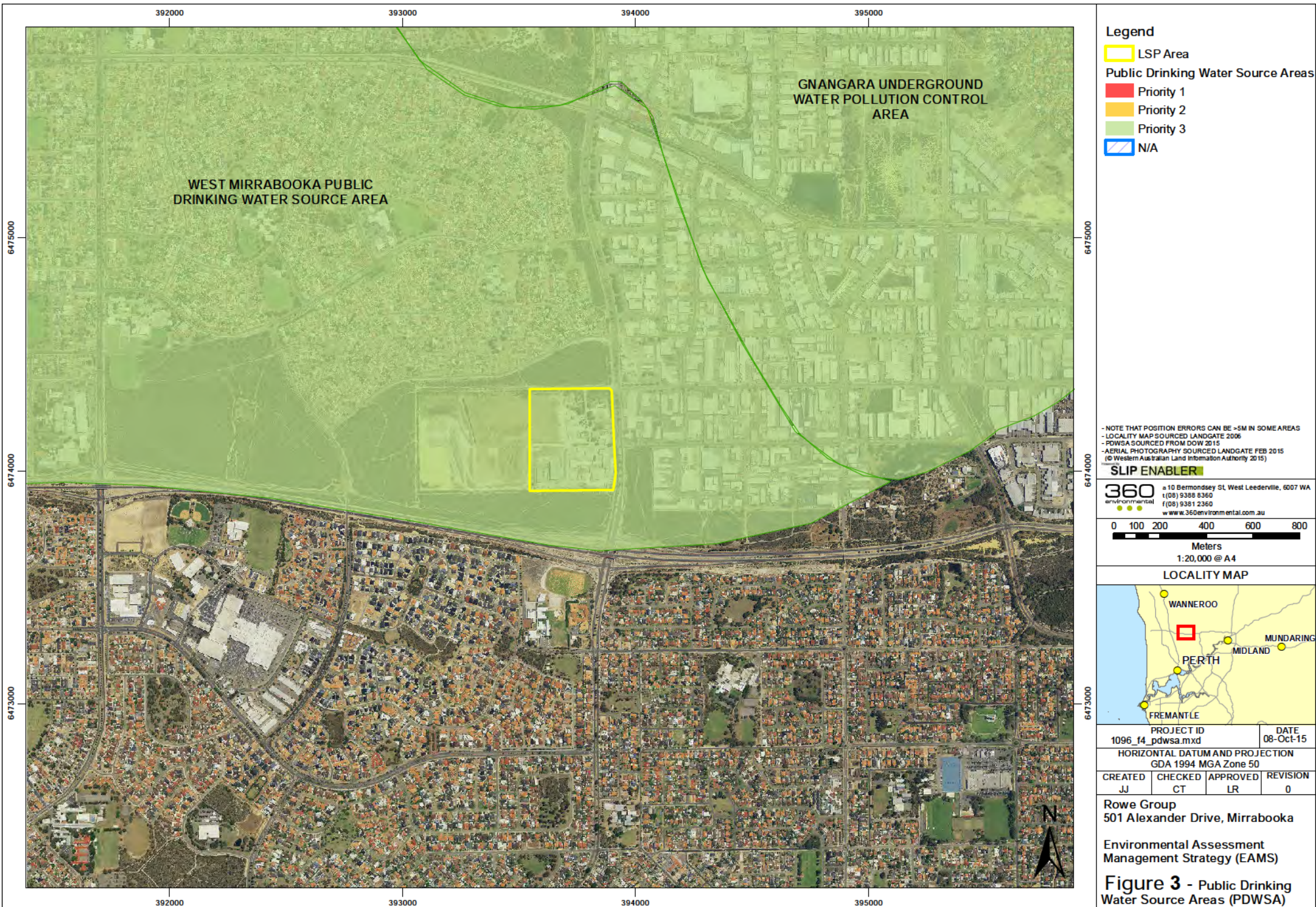
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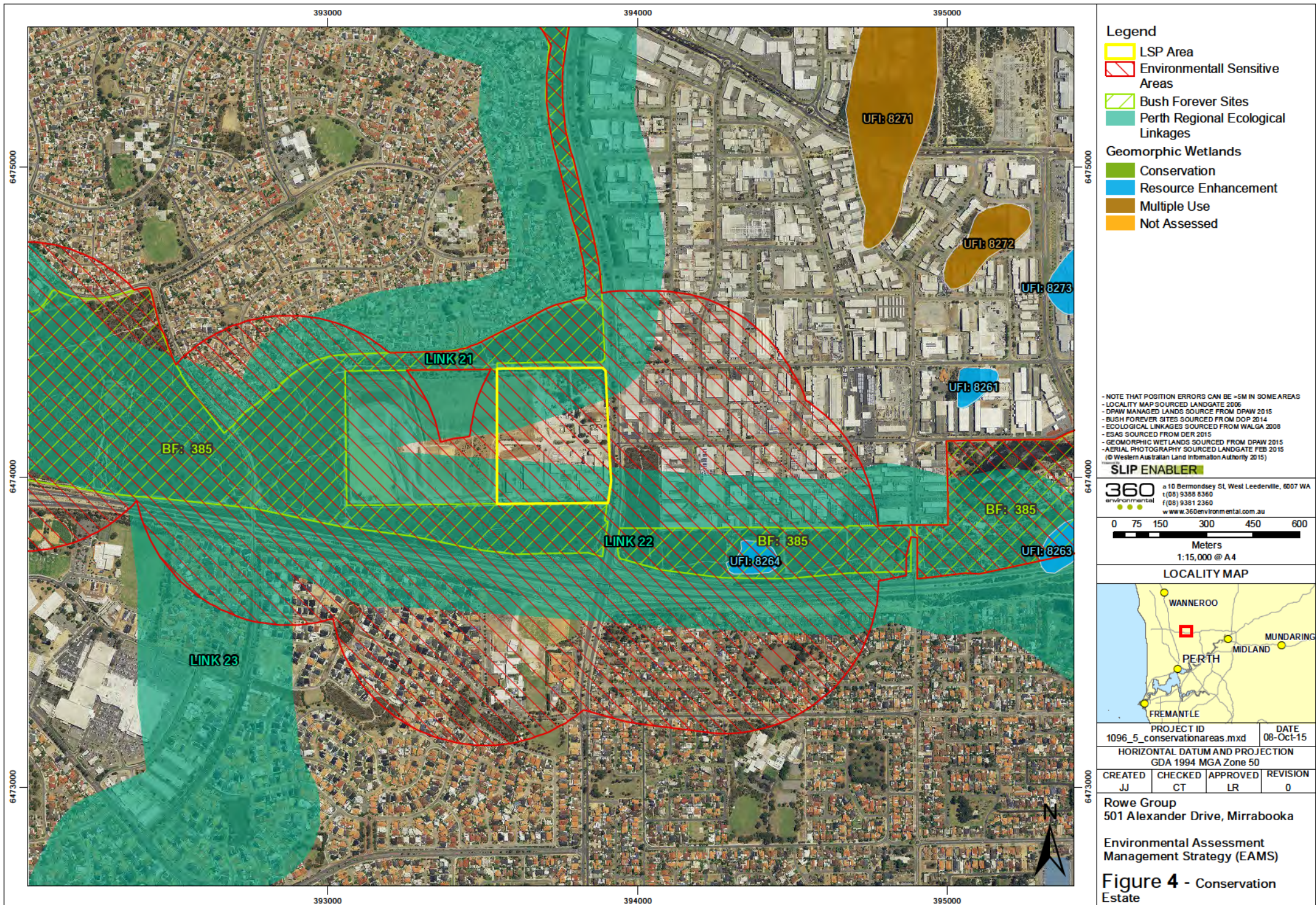
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HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50			
CREATED JJ	CHECKED CT	APPROVED LR	REVISION 0

Rowe Group
 501 Alexander Drive, Mirrabooka

Environmental Assessment
 Management Strategy (EAMS)

Figure 2 - Acid Sulfate Soil (ASS) Risk





ATTACHMENT A



Lot 1 (No. 501) Alexander
Drive, Mirrabooka

Level 2 Flora and Vegetation Survey Report

Prepared for:
Rowe Group

October 2015

● people ● planet ● professional

Document Reference	Revision	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
1303 AB	A INTERNAL DRAFT	NW	FJ		22/10/15
1303 AB	B SUBMITTED TO CLIENT	NW	Rowe Group	1 Electronic (email)	22/10/15

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Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by Rowe Group in September 2015 to undertake a Level 2 Flora and Vegetation Assessment for the eastern portion of Lot 1 (No. 501) Alexander Drive, Mirrabooka (Survey Area). The Survey Area is approximately 15.81 ha in size.

Database searches returned 19 flora species of conservation significance potentially occur within the Survey Area. This included 14 Threatened species, and five Priority species.

Of the Threatened species, *Caladenia huegelii*, was considered likely to occur within the Survey Area, due to the presence of suitable habitat, however it was not recorded during the survey, which was completed within the flowering period for this species.

A search of the DPaW database and EPBC PMST for TECs and PECs identified one State listed TEC as occurring within five kilometres of the Survey Area and two Priority communities.

A total of 58 taxa (including species, subspecies, varieties and forms) from 48 genera and 24 families were recorded in the Survey Area.

No Threatened species pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* and/or gazetted as Declared Rare Flora pursuant to the *Wildlife Conservation Act 1950* were recorded during the survey. No Priority species, as listed by Department of Parks and Wildlife were recorded during the survey.

A total of 13 introduced plant species were recorded during the survey. None of these are listed as Declared under the *Biosecurity and Agriculture Management Act 2007* or listed as Weeds of National Significance.

Two vegetation associations were mapped on site. The vegetation association, BmMps, has been identified as FCT SCP20a. SCP20a is described as '*Banksia attenuata* woodlands over species rich dense shrublands' and is listed as Endangered by the State.

Vegetation association Em has also been inferred as SCP20a even though it lacks community structure and the dominant species that typifies FCT SCP20a, such as *Banksia attenuata*. There are known occurrences of FCT SCP20a being dominated by *Eucalyptus marginata* and without the disturbances that have occurred in the Survey Area it is likely that associations BmMps and Em formed the same community type.

Possible impacts to TECs are taken into account by state assessment bodies when applications to develop or clear land are evaluated. Under the EP Act, any clearing of native vegetation requires a permit unless done for an exempt purpose. These exemptions do not apply in Environmentally Sensitive Areas (ESAs). TECs have been defined under the regulations as ESAs so the exemptions from requiring a clearing

permit do not apply in these areas. Any such clearing proposal, therefore, must be undertaken under a specific permit and be assessed for any environmental impact.

Vegetation condition ranged from Excellent to Completely Degraded with the majority of the Survey Area considered to be in Completely Degraded condition (1.02 ha). All vegetation excluding a small pocket of vegetation in the north east corner of the Survey Area consists of non-endemic and/or garden variety species. The strip of vegetation along the southern boundary contains non-endemic Eucalypt species with an understorey of a few scattered native species dominated with introduced grasses. The only area considered to be in Excellent condition is the pocket of native vegetation. This area is very small and has been recently disturbed from the installation of a fire break and the removal of dead trees and shrubs

Permits

This flora survey was conducted under the following licences issued by DPaW; Licence to take flora for scientific or other prescribed purposes SL011541 and Permit to take Declared Rare Flora 44-1516 issued to Narelle Whittington.

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Appendix A: Definition of Declared Rare / Priority / Threatened Flora and Fauna Species
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1 Introduction

1.1 The Project

360 Environmental Pty Ltd (360 Environmental) was commissioned by Rowe Group in September 2015 to undertake a Level 2 Flora and Vegetation Assessment for the eastern portion of Lot 1 (No. 501) Alexander Drive, Mirrabooka (Survey Area). The Survey Area is approximately 15.81 ha in size and located 11 km North of Perth in the Swan Coastal Plain Biogeographic Region of Western Australia (WA) (Figure 1).

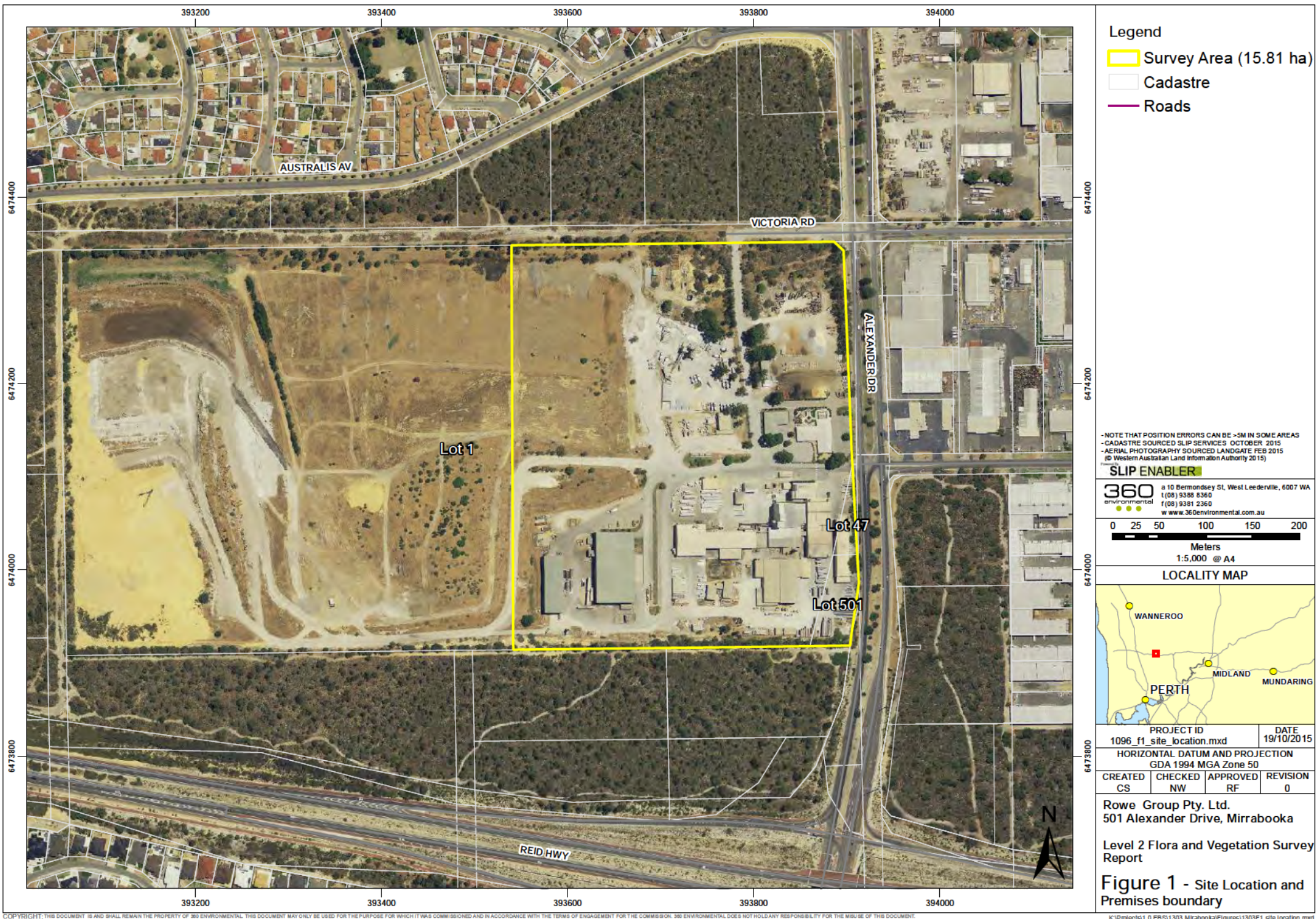
The Survey Area is bound on three sides by Bush Forever site 385 with a road on the eastern side.

1.1.1 Objective and Scope of Work

The scope of the flora and vegetation assessment were to:

- Conduct a desktop assessment of relevant literature, databases and spatial datasets to determine the environmental values and any potential issues, such as Threatened/Rare and significant species, Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs), that may be present in the site and the surrounding area;
- Produce a list of plant species (including weed species);
- Document and map the location of any Declared Rare Flora (DRF), Priority flora and any other flora of local or taxonomic significance;
- Identify, map and discuss the significance of any TECs, PECs and any other areas of ecological importance (e.g. National Parks, wetlands and Environmentally Sensitive Areas [ESAs] etc.);
- Assess, map and photograph vegetation condition; and
- Document, describe and map the vegetation associations present.

The objective of this scope of work was to support a Local Structure Plan application.



1.2 Background to the Protection of Flora and Vegetation

Western Australian (WA) flora is protected formally and informally by various legislative and non-legislative measures, which are as follows:

Legislative measures:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Wildlife Conservation Act 1950* (WC Act);
- *Environmental Protection Act 1986* (EP Act); and
- *Biosecurity and Agriculture Management Act 2007* (BAM Act).

Non-legislative measures:

- Western Australian Department of Parks and Wildlife (DPaW) Priority lists for flora and ecological communities;
- Weeds of National Significance (WONS); and
- Recognition of locally significant populations by the DPaW.

Other definitions, including species conservation categories, are provided in Appendix A. Conservation categories for ecological communities are provided in Appendix B.

1.2.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance (MNES). Under the EPBC Act, the Commonwealth Department of the Environment lists threatened species and communities in categories determined by criteria set out in the Act (www.environment.gov.au/epbc/index.html) (Appendix A and B).

Projects likely to cause a significant impact on MNES should be referred to the DotE for assessment under the EPBC Act.

1.2.2 WC Act

The WA DPaW lists flora under the provisions of the WC Act as protected according to their need for protection (Appendix A).

Flora is given Declared Rare status when populations are geographically restricted or are threatened by local processes. In addition, under the WC Act, by Notice in the WA Government Gazette of 9 October 1987, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) is protected throughout the State.

1.2.3 EP Act

Declared Rare Flora (DRF) and TECs are given special consideration in environmental impact assessments, and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the *Environmental Protection (Clearing of Native Vegetation)*

Regulations 2004. Exemptions for a clearing permit do not apply in an ESA. In addition, habitat necessary for the maintenance of indigenous fauna is considered in the clearing principles and assessed during consideration of applications for a clearing permit.

1.2.4 BAM Act

Plants may be 'Declared' by the Agriculture Protection Board (APB) under the BAM Act 2007 (WA). Declared Plants are gazetted under three categories (C1-C3), which define the action required. Details of the definitions of these categories are provided in Appendix C. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties (Department of Agriculture and Food WA [DAFWA] 2015).

DPaW Weed Prioritisation Process

The DPaW Weed Prioritisation Process (WPP) was developed to progress the Environmental Weed Strategy of WA (CALM 1999). The Weed Prioritisation Process for DPaW (DPaW 2013) prioritises weeds in each of the DPaW Regions, with the aim being to establish both a species-led and an asset-protection-based approach to weed management

The species-led process assesses weed species for their invasiveness, ecological impacts, potential and current distribution and feasibility of control. The resulting priorities focus on infestations of species which are considered to be high impact, rapidly invasive and still at a population size which is feasible to eradicate or contain to a manageable size. Weed species which are already widespread do not rank as a high priority through this part of the process.

The next stage of the process investigates the use of an asset-protection-based approach to guide the management of widespread weeds. This approach focuses on identifying high value biodiversity assets, the weeds that pose a threat to these assets and the sites where control will have the greatest biodiversity benefit and cost effectiveness. Social, cultural and economic assets as well as good neighbour issues are considered at a later stage of the process.

1.2.5 Weeds of National Significance

The Australian Government along with the State and Territory governments has endorsed 32 WONS. Four major criteria were used in determining WONS:

- The invasiveness of a weed species;
- A weed's impacts;
- The potential for spread of a weed; and
- Socio-economic and environmental values.

Each WONS has a national strategy and a national coordinator, responsible for implementing the strategy. WONS are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts (Thorp & Lynch 2000).

1.2.6 DPaW Priority Lists

The DPaW lists 'Priority' flora that have not been assigned statutory protection as Declared Rare or 'Scheduled' under the WC Act, but which are under consideration for declaration as DRF. Flora assessed as Priority 1-3 are considered to be in urgent need of further survey. Priority 4 flora require monitoring every 5-10 years and Priority 5 flora are subject to a specific conservation program (Appendix A).

The DPaW maintains a list of PECs which identifies ecologically valuable communities that need further investigation before possible nomination for TEC status. Once listed, a community is a PEC, and when endorsed by the WA Minister of Environment becomes a TEC, and protected as an ESA under *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Appendix B).

1.2.7 Informal Recognition of Flora

Certain populations or communities of flora may be of local significance or interest because of their patterns of distribution and abundance. For example, specific locations of flora may be locally significant because they are range extensions to the previously known distribution, or are newly discovered taxa (and have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, changed fire regimes), and relict populations of such species assume local importance for the DPaW. It is not uncommon for the DPaW to make comment on these species of interest.

2 Biophysical Environment

2.1 Climate

The closest official Bureau of Meteorology (BoM) weather station which provides all climate data near to the Survey Area is the Perth Metro Weather Station (Station number 009225), approximately 6.1 km south of the Survey Area. The climate for Perth is described as Mediterranean (Mitchell *et al.* 2002), with mean minima of approximately 12.8°C and a maxima of 24.7°C. Rainfall totals approximately 733.3 mm per annum (BoM 2015).

The Perth Metro Weather Station recorded 460.8 mm of rain in the months prior to the Spring survey (January 2015 – September 2015), 204.1 mm (30.7%) below the long term average rainfall of 664.9 mm for the same period (BoM 2015). The three months prior to survey (July 2015 – September 2015), Perth Metro Weather Station recorded 267.4 mm of rainfall, 24.7% below the 355.1 mm average long term rainfall for the same period (BoM 2015) (Figure 2).

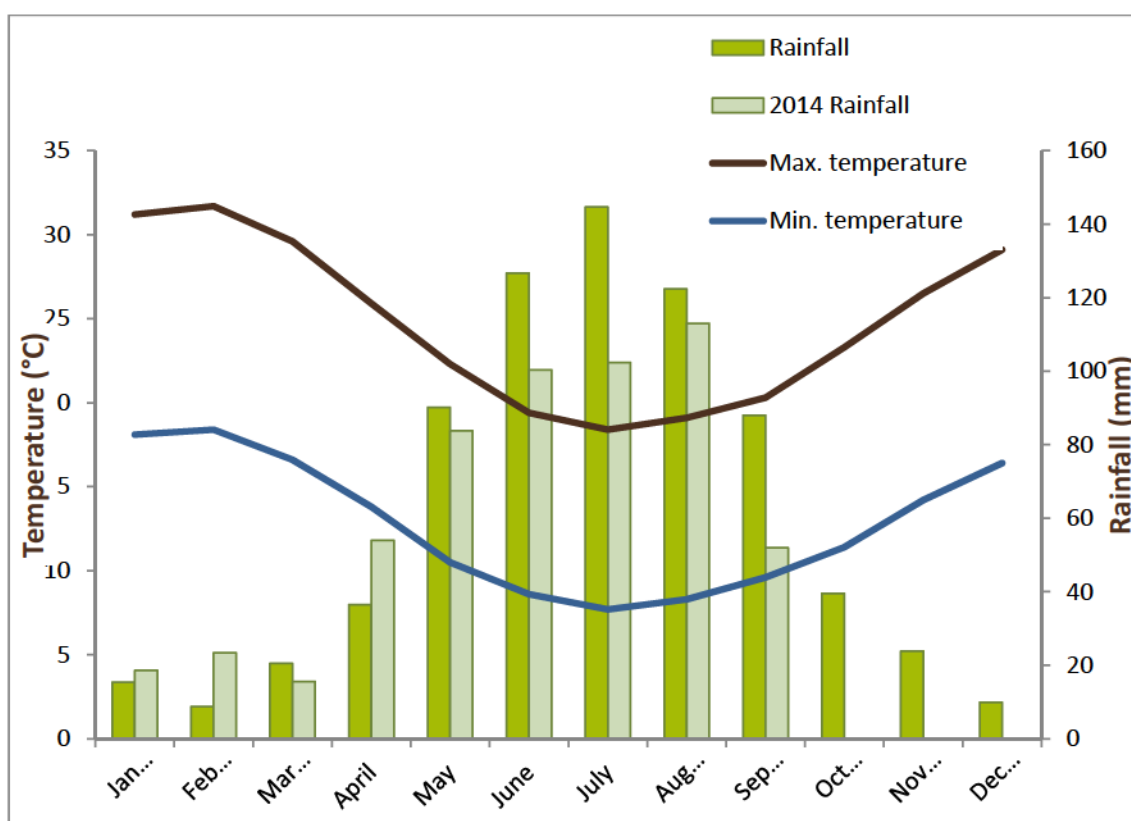


Figure 2: 2015 rainfall (mm) and temperature (°C) for Perth Metro from 1990 to 2015 (BoM 2015).

2.2 Geology and Soils

Soil-landscape mapping of south WA has been captured at scales ranging from 1:20,000 to 1:250,000 (DAFWA 2012). Soil-landscape mapping describes broad soil and landscape characteristics from regional to local scales. The Survey Area contains the following soil system:

- 211Sp; Sand dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands; and
- 212Bs; Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil. Banksia-paperbark woodlands and mixed heaths.

2.3 Hydrology

No streams or tributaries according to Department of Water (DoW 2015) or Geomorphic wetlands as mapped by Department of Parks and Wildlife occur in the Survey Area (DPaW 2015d).

2.4 Bush Forever

Bush Forever is a State Government Policy and program that identifies 51,200 ha of regionally significant vegetation for protection, covering 26 vegetation complexes. This amounts to approximately 18% of the original vegetation on the Swan Coastal Plain (SCP) portion of the Perth metropolitan area.

Regionally significant vegetation has been identified based on criteria relating to its conservation value. Important criteria in the identification process include the achievement, where possible, of a comprehensive representation of all the ecological communities originally occurring in the region, principally through protecting a target of at least 10% of each vegetation complex in the Bush Forever project boundary (Government of WA 2000).

No Bush Forever Sites are in the Survey Area. There is one Bush Forever site adjacent to the survey area on the north, west and south boundaries, Site 385 Reid Highway Bushland, Mirrabooka/Malaga (Figure 3).

2.5 Ecological Linkages

The Survey Area forms part of the Perth Biodiversity Project's Draft Regional Ecological linkage network presented in Figure 3. The purpose of the Regional Ecological Linkages identified by the Perth Biodiversity Project was to link protected natural areas with other areas of mapped native vegetation. Priority was given to identifying linkages through those areas having the greatest assumed protection and to those areas that maximised opportunities to form continuous corridors of native vegetation. The Survey Area forms part of linkage '21' and '22' that connects to a southern link west of the Survey Area

'23'. Given the lack of vegetation in the Survey Area its contribution to the linkage system is limited.

2.6 Biogeographic Regionalisation for Australia

The Biogeographic Regionalisation of Australia (IBRA7) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework (Department of the Environment 2015a).

The Survey Area lies within the Swan Coastal Plain Bioregion and Perth subregion (SWA2) of the IBRA. The Perth subregion is a low lying coastal plain composed of colluvial and aeolian sands, alluvial river flats and coastal limestone rising to duricrusted Mesozoic sediments in the east. Outwash plains are extensive only in the south, while a complex series of seasonal wetlands and swamps extends from north to south. Vegetation comprises heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvial soils, *Casuarina obesa* on out-wash plains, and paperbark (*Melaleuca* spp.) in wetland areas (Mitchell et al. 2001).

2.7 Broad Vegetation Types

Mapping of the vegetation of the Perth region of WA was completed on a broad scale (1:250,000) by Beard (1978). These vegetation units were re-assessed by Shepherd et al. (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

There are two Beard / Shepherd vegetation units in the Survey Area. The Shepherd et al. (2001) vegetation type (along with the corresponding Beard [1978] type in brackets) is described below, and its representation within the Survey Area, subregion, region and state is shown in Table 2.

- Spearwood_6 (e2, 4Mi) Medium woodland; Tuart and Jarrah; and
- Bassendean_1001 (e2MbcblLi): Medium very sparse woodland; Jarrah, with low woodland; Banksia and Casuarina.

Table 1: Broad Vegetation Type within the Survey Area and its State and Regional Representation (DPaW 2014)

	PRE- EUROPEAN AREA (HA)	CURRENT EXTENT (HA) 1	REMAINING (%)	CURRENT EXTENT % IN IUCN CLASS I-IV RESERVES1
Vegetation Types (Beard 1979/ Shepherd et al. 2001) in the state				
6 (e2,4Mi)	56,343	14,018	24.88	13.38
1001 (e2MbcbLi)	57,410	14,152	24.65	1.14
Vegetation Types (Beard 1979/ Shepherd et al. 2001) in the Swan Coastal Bioregion				
6 (e2,4Mi)	56,343	14,018	24.88	3.33
1001 (e2MbcbLi)	57,410	14,152	24.65	1.14
Vegetation Types (Beard 1979/ Shepherd et al. 2001) in the Perth Subregion				
6 (e2,4Mi)	56,343	14,018	24.88	3.33
1001 (e2MbcbLi)	57,410	14,152	24.65	1.14

Mapping by Heddle *et al.* (1980) based on relation to the landform-soil units determined by Churchward and McArthur (1980) identified one vegetation complex occurring in the Survey Area which is summarised in Table 2. The delineation of vegetation complexes is based on the concept of series of plant communities forming regularly repeating complexes associated with a particular soil unit. The Heddle *et al.* (1980) vegetation complex that occurs across the Survey Area is described below:

- Karrakatta – Central and/South: Predominantly open forest of *Eucalyptus gomphocephala* – *Eucalyptus marginata* – *Corymbia calophylla* and woodland of *E. marginata* and *Banksia* spp.

Table 2: Vegetation Complex within the Survey Area and its State and Regional Representation

	PRE- EUROPEAN AREA (HA)	CURRENT EXTENT (HA)	REMAINING (%)	CURRENT EXTENT % SECURE TENURE RESERVES
Vegetation Complexes (Heddle et al., 1980) in the System 6/part System 1 area (EPA 2006)				
Karrakatta – Central and/South	49,912	14,729	29.5	2.5
Vegetation (Heddle et al., 1980) in the Swan Coastal Bioregion (PBP 2013)				
Karrakatta – Central and/South	49,786	11,905	23.91	2.57

3 Methods

3.1 Background

The flora survey was consistent with a single season Level 2 survey as per the EPA requirements for environmental surveying and reporting for flora and vegetation in WA where practical and relevant, as set out in the following documents:

- EPA Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in WA No. 51 (EPA 2004a); and
- EPA Guidance for the Level of Assessment for Proposals affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 region. Guidance Statement No. 10 (EPA 2006).

3.2 Flora and Vegetation Survey Methods

3.2.1 Flora and Vegetation Database Review

The desktop study provided background information on the flora and vegetation of the Survey Area. This involved a search of the following sources:

- Reports from surrounding area;
- DPaW Threatened and Priority Flora database (DPaW 2015a);
- DPaW Threatened and Priority Ecological Communities database (DPaW 2015b); and
- Protected Matters Search Tool (DotE 2015b); and
- NatureMap (DPaW 2015d).

A request for a database search was submitted to the DPaW on 14 September 2015 (5 km buffer search around the Survey Area) to obtain a list of Declared Rare Flora/Threatened or Priority flora, and TECs and PECs in and near the Survey Area (Figure 4). These sources were used to compile a list of expected DRF or Priority species and TECs and PECs that may occur based on the landforms in the Survey Area.

3.2.2 Flora and Vegetation Field Survey

The field survey was conducted by one botanist, on 14 September and 7 October 2015. The survey included the assessment of one quadrat and two relevés and mapping notes. Quadrats are vegetation survey plots which are accurately measured out as 10 x 10 m (or an area equivalent to 100 m²) and marked at the SW corner using a handheld Garmin GPS unit.

The information recorded at the quadrat included landscape features, surface soil colour and texture, bare ground, litter cover, disturbance, fire age and aspect. Vegetation condition was mapped as per Bush Forever condition scales (Government of WA 2000). Each species of plant at each quadrat was recorded, including information on height and percentage cover.

3.2.3 Systematic Searches

In addition to the information collected from the quadrats, systematic traverses (transects across the Survey Area on foot) throughout the Survey Area were undertaken for significant flora. For each population of significant flora identified during the field survey, the following was recorded:

- Co-ordinate locations (using handheld GPS units);
- Description of vegetation association present; and
- Estimation of population size.

3.2.4 Taxonomy and Nomenclature

Where field identification of plant taxa was not possible, specimens were collected for later identification at the WA Herbarium (WAH).

The species list was checked against FloraBase (WAH 2015) to determine the species' conservation status. Threatened and Priority Flora were verified against the EPBC Act listing of threatened species to determine Commonwealth listing.

Introduced species were checked against the DPaW Weed Prioritisation Process (WPP) (DPaW 2013), to determine their ranking in terms of environmental impact. The BAM Act Declared Plants list was consulted to determine if any are Declared Plants, and the Weeds of National Significance list to determine any WONS (Commonwealth of Australia 2015).

3.2.5 Vegetation Mapping

The vegetation mapping units were described based on their structure and species composition, as defined by quadrat data and field observations. Vegetation was mapped in the field using handheld GPS (Garmin) units and high-resolution aerial photographs (1:3,402 scale), which in the office were digitised using GIS software (ArcGIS 9.3.1).

Vegetation condition was mapped in the field using handheld GPS (Garmin) units and high-resolution aerial photographs (1:10,000 scale), which in the office were digitised using GIS software (ArcGIS 9.3.1). Vegetation condition was assessed based on Bush Forever (Government of WA 2000) (Appendix D).

4 Results

4.1 Flora, Vegetation and Fauna Survey Limitations and Constraints

Survey constraints are often difficult to predict, as is the extent to which they influence survey effort. Survey limitations and constraints of the flora, vegetation and fauna survey are detailed in Table 3.

Table 3: Limitations and Constraints Associated with the Survey Area.

VARIABLE	IMPACT ON SURVEY OUTCOMES
Access	The whole Survey Area was accessed and traversed. Particular focus was given to areas expected to be impacted and or that may have species of conservation significance.
Experience	The personnel who executed these surveys were practitioners suitably qualified in their respective fields: • Coordinating Principal Botanist: Narelle Whittington; • Field Staff: Narelle Whittington; • Data Interpretation and Reporting: Narelle Whittington; and • Report Review: Felicity Jones.
Timing, weather, season	The survey was conducted during spring (see section 3.2.2) after three months of below average rainfall (refer to section 2.1). Flora composition changes with time, particularly seasonally as a result of seasonal conditions. Therefore, botanical surveys completed at different times will have varying results.
Scope: Life forms sampled	The scope of this project included the detailed surveying of flora and vegetation and searching for conservation significant species or communities.
Sources of information	The Swan Coastal Plain bioregion has been extensively surveyed; as a result, numerous published and unpublished flora surveys have been undertaken in the area. Relevant DPaW searches were undertaken for the study area and

	are listed in section 3.2
Completeness	The entire Survey Area was accessible; the time spent conducting the survey was considered adequate for the size (15.81 ha) and complexity of the site. The vegetation association was sufficiently surveyed; with one quadrat and two relevés being assessed.
Disturbances	The Survey Area contains multiple types of disturbance. Recent disturbance includes the installation of fire breaks, along with the presence of weed species and historical clearing and stockpiling of fill.

4.2 Flora Results

4.2.1 Database Results

The database searches identified 19 conservation significant flora potentially occurring in the vicinity of the Survey Area. Of these, 14 are classed as Threatened, two as Priority 1, one as Priority 3 and two as Priority 4.

The likelihood of these 19 conservation significant flora occurring in the Survey Area is shown in Table 3 (refer also to Figure 4).

A search of the DPaW database and EPBC PMST for TECs and PECs identified one State listed TEC as occurring within five kilometres of the Survey Area and two Priority communities (Figure 4), these are as follows:

- FCT SCP20a – *Banksia attenuata* woodlands over species rich dense shrublands (Endangered, DPaW);
- FCT SCP22 - *Banksia ilicifolia* woodlands (Priority 3, DPaW); and
- FCT SCP21c - Low lying *Banksia attenuata* woodlands or shrublands (Priority 3, DPaW).

Table 4: Assessment of the Likelihood of Occurrence of Significant Flora in the Survey Area

¹Closest record to Survey Area based on DPaW 2015.
Likely = Suitable habitat present and records less than 5 km from the Survey Area, Possible = Suitable habitat present and records between 5 km and 10 km from the Survey Area, Unlikely = No suitable habitat present and/or records greater than 20 km from the Survey Area. En = Listed as Endangered under the EBPC Act, Ce= Critically Endangered under the EBPC Act, P = Listed as Priority by the DPaW DRF = Declared Rare Flora as listed by the State.

CONSERVATION STATUS		DATA	SPECIES	HABITAT INFORMATION (WAH 2013)	
T		EPBC	<i>Andersonia gracilis</i>		Grey-white sand on swampy, seasonally wet sites.
T		EPBC	<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>		Grey sand, clay loam. Winter-wet depressions.
T		DPaW EPBC	<i>Caladenia huegelii</i>		Grows in deep sandy soil in Banksia-Eucalyptus marginata woodland (Brown et al. 2013).
T		DPaW (Naturemap)	<i>Calectasia cyanea</i>		White grey or yellow sand, gravel. Is not known to occur in the Perth Region.
T		EPBC	<i>Darwinia foetida</i>		No information available
T		EPBC	<i>Diuris micrantha</i>		Brown loamy clay. Winter-wet swamps, in shallow water
T		EPBC	<i>Diuris purdiei</i>		Grey-black sand, moist. Winter-wet swamps.
T		EPBC	<i>Drakaea elastica</i>		White or grey sand. Low-lying areas adjoining winter-wet swamps.
T		EPBC	<i>Drakaea micrantha</i>		White-grey sand.

CONSERVATION STATUS		DATA	SPECIES	HABITAT INFORMATION (WAH 2013)	
T		EPBC	<i>Grevillea curviloba</i> subsp. <i>incurva</i>		Sand, Sandy loam. Winter-wet heath.
T		EPBC	<i>Lepidosperma rostratum</i>		Peaty sand, clay.
T		EPBC	<i>Thelymitra dedmaniarum</i> (<i>Thelymitra manginii</i>)		The species is found in open <i>Eucalyptus wandoo</i> and <i>E. accedens</i> woodlands. Soil is red-brown sandy-loam associated with dolerite and granite outcrops (DEC 2012).
T		EPBC	<i>Thelymitra stellata</i>		Sand gravel, lateritic loam
T		EPBC	<i>Triethuria occidentalis</i>		Wet areas
P1		DPaW	<i>Amphibromus vickeryae</i>		Wet areas
P1		DPaW	<i>Drosera x sidjamesii</i>		Peaty sand, along lake margins close to winter high-water line.
P3		DPaW	<i>Cyathochaeta teretifolia</i>		Grey sand, sandy clay. Swamps, creek edges
P4		DPaW	<i>Drosera occidentalis</i> subsp. <i>occidentalis</i>		Sandy & clayey soils. Swamps & wet depressions
P4		DPaW	<i>Jacksonia sericea</i>		Calcareous and sandy soils.

4.1 Flora and Vegetation Field Results

4.1.1 Overview of Flora

A total of 58 taxa (including species, subspecies, varieties and forms) from 48 genera and 24 families were recorded in the Survey Area. The commonly occurring families were; Fabaceae (10 taxa), Asparagaceae (4 taxa) and Proteaceae and Poaceae (both with 5 taxa). The most frequently recorded genera were; *Lomandra*, *Hibbertia*, *Acacia* and *Daviesia* which were all represented by three taxa.

The flora inventory is provided in Appendix E and the site data sheets in Appendix F.

4.1.2 Flora of Conservation Significance

No Threatened species listed under the EPBC Act and/or gazetted as Declared Rare Flora (Threatened) pursuant to the WC Act were recorded during the survey. No species listed as Priority by DPaW were recorded during the survey.

4.1.3 Introduced Flora

A total of 13 introduced species were recorded during the survey. None of these are listed as Declared under the BAM Act or listed as a WONS.

Table 4: Introduced Flora Recorded in the Survey Area and their Ranking under the DPaW Weed Prioritisation Process (DPaW 2013a)

TAXON	(COMMON NAME)	DPaW WPP RANKING
* <i>Avena barbata</i>	Bearded oat	Low
* <i>Briza maxima</i>	Blowfly Grass	Low
* <i>Ehrharta calycina</i>	Perennial Veldtgrass, Perennial Veldt Grass	Low
* <i>Eragrostis curvula</i>	African lovegrass	Low
* <i>Euphorbia terracina</i>	Geraldton carnation weed	Moderate
* <i>Fumaria capreolata</i>	Climbing Fumitory, Whiteflower Fumitory	Low
* <i>Hypochaeris glabra</i>	Flatweed, Smooth Catsear	Low
* <i>Lysimachia arvensis</i>	Scarlet Pimpernel	Negligible
* <i>Oxalis pes-caprae</i>	Soursob	Low
* <i>Pelargonium capitatum</i>	Rose Pelargonium	Low
* <i>Sonchus oleraceus</i>	Sowthistle	Negligible

TAXON	(COMMON NAME)	DPAW WPP RANKING
* <i>Trachyandra divaricata</i>	Dune onion weed	Low
* <i>Ursinia anthemoides</i>	Ursinia	Negligible

*Denotes Introduced species

4.1.4 Vegetation Associations

Two natural vegetation associations were described for the Survey Area which covered 0.15 ha in area (Figure 5):

- BmMps- Low Open Woodland of *Banksia menziesii* over *Mesomelaena pseudostygia*, *Daviesia nudiflora* subsp. *nudiflora*, *Xanthorrhoea preissii*, *Eremaea pauciflora* var. *pauciflora*, *Stirlingia latifolia*, *Acacia pulchella* and *Daviesia triflora*.
- Em – Low Open Woodland of *Eucalyptus marginata* over *Mesomelaena pseudostygia*, *Jacksonia sternbergiana* and *Daviesia divaricata* subsp. *divaricata* (ms) over introduced species.

4.1.5 Vegetation Condition

Vegetation condition ranged from Excellent to Completely Degraded with the majority of the Survey Area considered to be in Completely Degraded condition (1.02 ha). All vegetation excluding a small pocket of vegetation in the north east corner of the Survey Area consists of non-endemic and/or garden variety species. The strip of vegetation along the southern boundary contains non-endemic Eucalypt species with an understorey of a few scattered native species dominated with introduced grasses. The only area considered to be in Excellent condition is the pocket of native vegetation mapped as BaMps. This area is very small and has been recently disturbed from the installation of a fire break and the removal of dead trees and shrubs (Plates 1 and 2).



Plate 1: New Firebreak.



Plate 2: Removal of dead *Banksia*.

Condition mapping is presented in Figure 6 and the extent described in Table 5. The average fire age of the vegetation was considered very old (>12 years since last fire).

Table 5: Vegetation Condition and Extent in the Survey Area

CONDITION	EXTENT (HA)
Excellent	0.09
Degraded	0.06
Degraded – Completely Degraded	0.22
Completely Degraded	1.02

4.1.6 Floristic Community Types

Statistical analysis (multivariate analysis) and data interpretation, as shown in Table 6 and 7 was undertaken to help determine the FCT represented by the vegetation in the project area. Due to the small area of native vegetation, two separate analyses were undertaken. The first involved comparing the data collected from the one quadrat established in the survey area to the 509 individual quadrats established by Gibson *et al.* (Table 6). The second analysis involved comparing the combined data collected from the native vegetation, inclusive of the quadrat, relevé and opportunistic collections, against the community data produced by Gibson *et al.* (Table 7).

Due to the poor condition and size of the *Eucalyptus marginata* vegetation association a quadrat was not established and therefore a FCT was inferred. This involves reviewing site data for other factors that are diagnostic of FCTs, including the presence of indicator species, soil types and landform position.

Table 6: FCT Quadrat Analysis

VEGETATION ASSOCIATION	FLORISTIC COMMUNITY TYPES ¹	SIMILARITY BASED ON STATISTICAL ANALYSIS	COMMENTS	INFERRED FLORISTIC COMMUNITY TYPE
BmMps	SCP20a – <i>Banksia attenuata</i> woodlands over species rich dense shrublands	30.3%	Even though the site lacked a dominance of <i>Banksia attenuata</i> , the understorey species present and the adjacent occurrence of the FCT supports the analysis results.	SCP20a – <i>Banksia attenuata</i> woodlands over species rich dense shrublands Based on surrounding

VEGETATION ASSOCIATION	FLORISTIC COMMUNITY TYPES ¹	SIMILARITY BASED ON STATISTICAL ANALYSIS	COMMENTS	INFERRED FLORISTIC COMMUNITY TYPE
	SCP23b – Northern <i>Banksia attenuata</i> – <i>B. menziesii</i> woodlands	29.8%	SCP 23b has a northern distribution between Melaleuca Park and Gingin so is unlikely to occur in the Survey Area.	occurrences, landform, soils and dominate species present (30.3% similarity)
	SCP20c – Eastern shrublands and woodlands	29.4%	Generally the FCT is restricted to the Forrestfield and Guildford units and is not known to occur in the area.	

Table 7: FCT Community Analysis

VEGETATION ASSOCIATION	GIBSON ET AL. QUADRAT & FCT	SIMILARITY BASED ON STATISTICAL ANALYSIS	COMMENTS	INFERRED FLORISTIC COMMUNITY TYPE
BmMps	KOON – 1 (20a)	39.2%	Given that the top two closest quadrats in similarity to the one established in the Survey Area are both FCT20a it is likely the results are accurate.	SCP20a – <i>Banksia attenuata</i> woodlands over species rich dense shrublands Based on the similarity results and the close proximity of the Gibson quadrat to the Survey Area. (39.2% & 38.8%)
	LAND - 1 (20a)	38.8%	As above	
	KING – 2 (28)	38.6%	As above.	

VEGETATION ASSOCIATION	COMMENTS	INFERRED FLORISTIC COMMUNITY TYPE
Em	This vegetation association was dominated by <i>Eucalyptus marginata</i> and lacked a diverse native understorey. Due to the location and the scattered species present it has been inferred as FCT SCP20a.	SCP20a – <i>Banksia attenuata</i> woodlands over species rich dense shrublands

4.1.7 Threatened and Priority Ecological Communities

The vegetation association, BmMps, has been identified as FCT SCP20a. SCP20a is described as '*Banksia attenuata* woodlands over species rich dense shrublands' and is listed as Endangered by the State.

Vegetation association Em has also been inferred as 20a even through it lacks community structure and the dominant species that typifies FCT SCP20a, such as *Banksia attenuata*. There are known occurrences of FCT SCP20a being dominated by *Eucalyptus marginata* and without the disturbances that have occurred in the Survey Area it is likely that associations BmMps and Em formed the same community type.

4.1.8 Regional Representation

Vegetation mapping units described in the Survey Area were correlated with the Beard (1978) and Shepherd *et al.* (2001) broad vegetation types as much as possible by examining similarities in vegetation descriptions. Differences exist with the terminology used in the descriptions as they are based on different methods of categorising and characterising vegetation types, and the different spatial scales of the analysis (i.e. region vs. local). Beard (1978) and Shepherd *et al.* (2001) Vegetation type 6 (e2, 4Mi) was determined to correspond with the vegetation associations in the Survey Area.

5 Discussion

5.1 Flora Context

A total of 58 taxa (including species, subspecies, varieties and forms) from 48 genera and 24 families were recorded in the Survey Area.

The flora species richness recorded for the remnant vegetation in the Survey Area is slightly below the average expected, when compared to the species richness recorded by Gibson *et al.* (1994) for the same FCT represented in the Survey Area. For example Gibson *et al.* (1994) recorded a mean species richness of 67.4 species within quadrats of SCP20a 'Banksia attenuata woodlands over species rich dense shrublands'. The slightly lower diversity can be accounted for by the high level of disturbance in the Survey Area and the isolation of the remnant vegetation from other bushland areas by roads and development.

5.2 Flora of Conservation Significance

No Threatened species pursuant to the EPBC Act or to the WC Act were recorded in the Survey Area during the field survey. *Caladenia huegelii*, listed as Threatened by the EPBC Act, and also listed under the WC Act, was identified as potentially occurring in the Survey Area due to suitable habitat occurring in the Survey Area and the nearest occurrence being 3.1 km away.

Caladenia huegelii is a tuberous, perennial orchid that grows to 0.6 m high and is easily recognizable during its flowering period from September to October (WAH 2015). The survey was undertaken in both September and October within the known flowering period of the orchid. Outside of this period *C. huegelii* remains as an underground tuber and is difficult to detect in the field. The species was not found on site during the survey.

A further five priority taxa were identified as potentially occurring in the Survey Area based on database searches. Of these, none are considered likely to occur based on the habitat preference of these species not occurring in the Survey Area.

5.3 Vegetation of Conservation Significance

A search of the DPaW TEC and PEC database identified One TEC and two PECs occurring within five km of the Survey Area (DPaW 2015c). The TEC, FCT SCP20a – *Banksia attenuata* woodlands over species rich dense shrublands has been identified as occurring on site.

Results from the statistical analysis (multivariate analysis) and data interpretation indicate that the vegetation association BmMps and Em are analogous to FCT SCP20a. The remnant, over time, has experienced some death of Banksia species, however, the understorey remains relatively intact and in Excellent condition. Regardless of this, however, the small size and isolation from other bushland

remnants increases the impacts of edge effects and is unlikely to be sustainable in the long term.

Possible impacts to TECs are taken into account by state assessment bodies when applications to develop or clear land are evaluated. Under the EP Act, any clearing of native vegetation requires a permit unless done for an exempt purpose. These exemptions do not apply in ESAs. TECs have been defined under the regulations as ESAs so the exemptions from requiring a clearing permit do not apply. Any such clearing proposal, therefore, must be undertaken under a specific permit and be assessed for any environmental impact.

5.4 Vegetation Condition and Introduced Flora

Vegetation condition ranged from Excellent to Completely Degraded with the majority of the Survey Area considered to be in Completely Degraded condition (1.02 ha). All vegetation excluding a small pocket of vegetation in the north east corner of the Survey Area consists of non-endemic and/or garden variety species. The lack of native vegetation on site can be attributed to the past and present land use of the Survey Area and the removal of vegetation for the installation of drainage sumps and the stockpiling of soil. There was also waste material from the various businesses that have encroached into bushland.

The strip of vegetation along the southern boundary contains non-endemic Eucalypt species with an understorey of a few scattered native species dominated with introduced grasses. The only area considered to be in Excellent condition is the pocket of native vegetation. A quadrat was established in the vegetation remnant using flagging tape instead of a permanent marker. The second visit discovered that due to bushfire management, a firebreak had been installed and dead trees removed. These activities have reduced the size of the remnant, encroached into the quadrat and prevented another quadrat being established. Instead a relevé was established next to the original quadrat to collect addition flora data.

The current land use and roads are an introduction source for weeds, rubbish and tracks. These will likely diminish the condition of the isolated pocket of vegetation.

A total of 13 introduced species were recorded during the survey, but none are listed as Declared under the BAM act or WONS. All of the weed species recorded are common bushland and agricultural weeds (Hussey *et al.* 2007).

5.5 Regional Representation

The Karrakatta Complex Central and/ South is estimated to have 29.5% native vegetation remaining based on the pre-European extent, with 2.5% in secure tenure (EPA 2006). More recently the Perth Biodiversity Project (PBP 2013) has mapped native vegetation extent by vegetation complex on the Swan Coastal Plain. It is estimated that

23.91% of Karrakatta Complex Central and/ South remains compared to its pre-European extent (PBP 2013).

The EPA recognises vegetation complexes that are not well represented as being significant. Vegetation complexes which have 10%-30% remaining may be considered regionally significant. Proposals that would affect a vegetation complex with 10% or less remaining are likely to be formally assessed by the EPA (EPA 2006).

5.6 Ecological Linkages

The Survey Area forms part of the Perth Biodiversity Project's Draft Regional Ecological linkage network. The Survey Area is part of a non-continuous linkage of bushland which is adjacent to a Bush Forever site on three sides. Recognised by the EPA, DPaW and local government, the retention of native vegetation and fauna habitat within the Regional Ecological Linkages aims to reduce the loss of biodiversity and key ecological functions across the South West. The EPA expects that in preparing plans and proposals for development, consideration will be given to both the site-specific biodiversity conservation values of patches of native vegetation, as well as the landscape function and core linkage significance of a patch in supporting the maintenance of an ecological linkage.

The vegetation in the Survey Area does very little in contributing to the linkage of bushland areas in the region due to its isolation and size. In addition to this, the various current land uses within the boundaries of the Survey Area limit the sustainability of the vegetation due to the stresses of firebreak maintenance and weed infestations on an already very small pocket of vegetation.

6 Conclusions

The targeted flora survey was undertaken at a time considered appropriate for the species of conservation significance considered likely to occur, and within the recommended season and flowering period for the south west botanical province. The Survey Area was sufficiently surveyed and as such the following conclusions can be made:

- A total of 58 taxa from 48 genera and 24 families were recorded in the Survey Area;
- No Threatened species are present on site;
- No Priority species are present on site;
- One TEC, FCT SCP20a – *Banksia attenuata* woodlands over species rich dense shrublands has been identified as occurring on site;
- TECs have been defined under the regulations as ESAs so the exemptions from requiring a clearing permit do not apply in these areas. Any such clearing proposal, therefore, must be undertaken under a specific permit and be assessed for any environmental impact; and
- The vegetation in the Survey Area does very little in contributing to the linkage of bushland areas in the region due to its isolation and size. The current land use and roads are an introduction source for weeds, rubbish and tracks. These will likely diminish the condition of the isolated pocket of vegetation.

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8 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

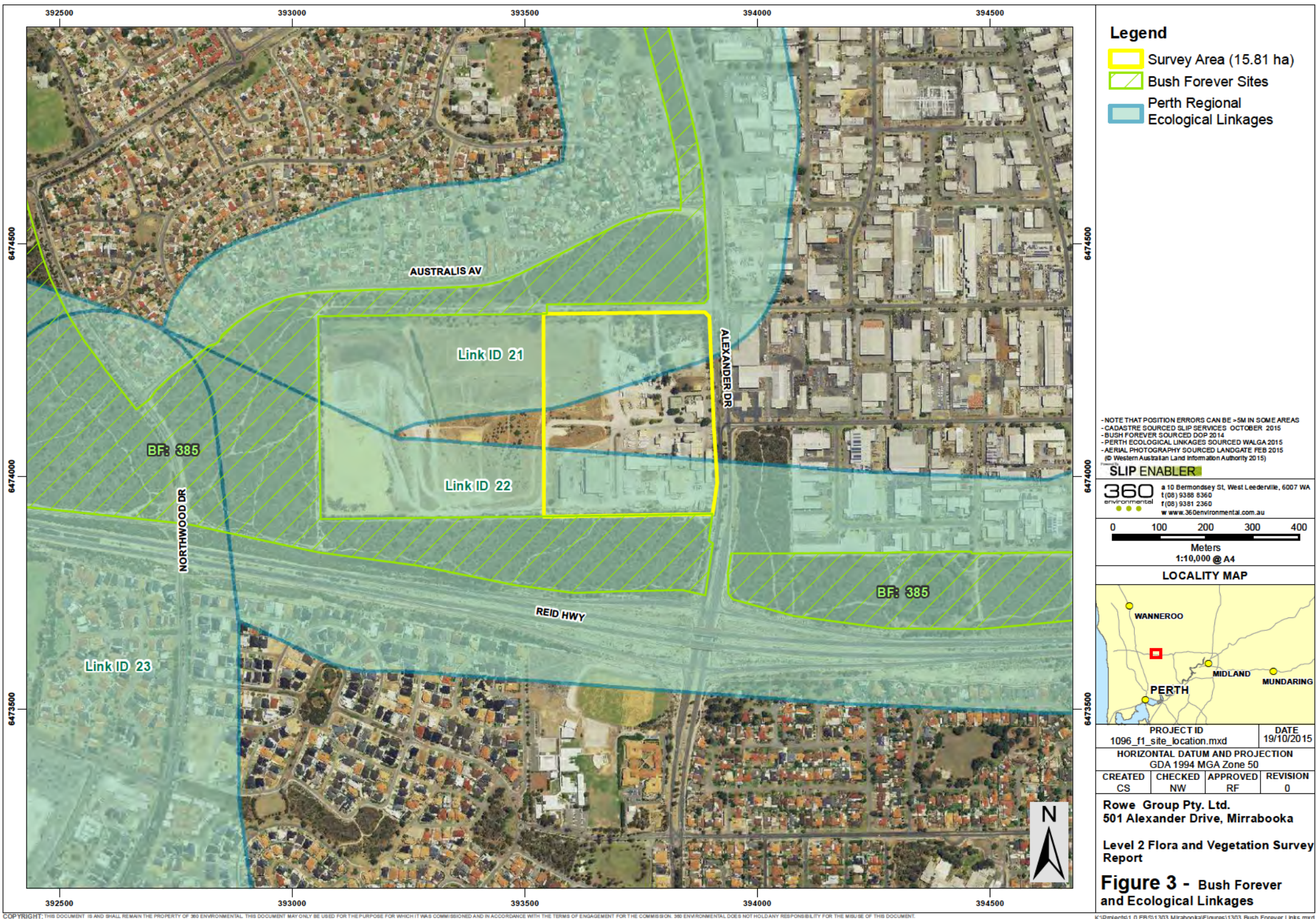
In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

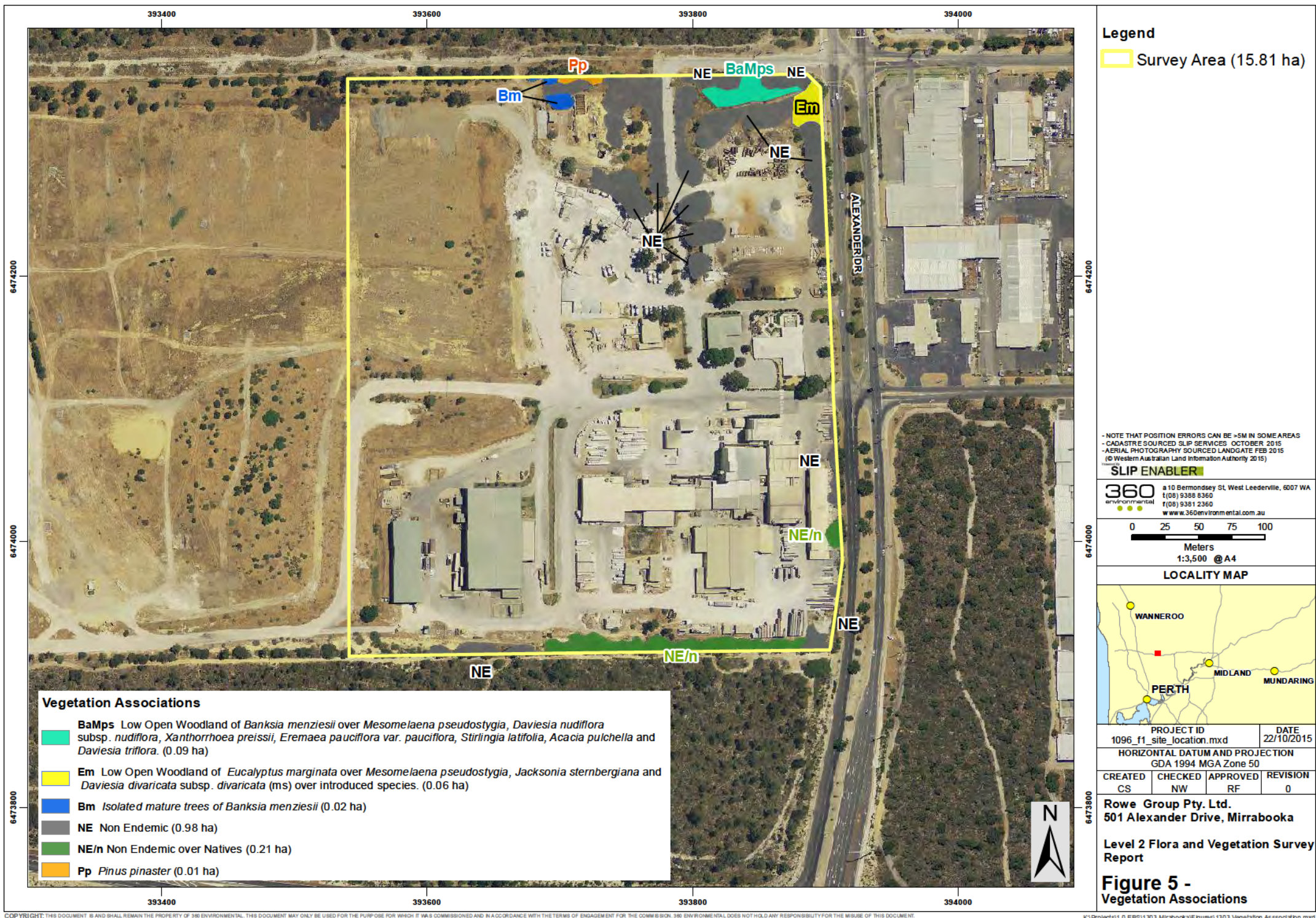
Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

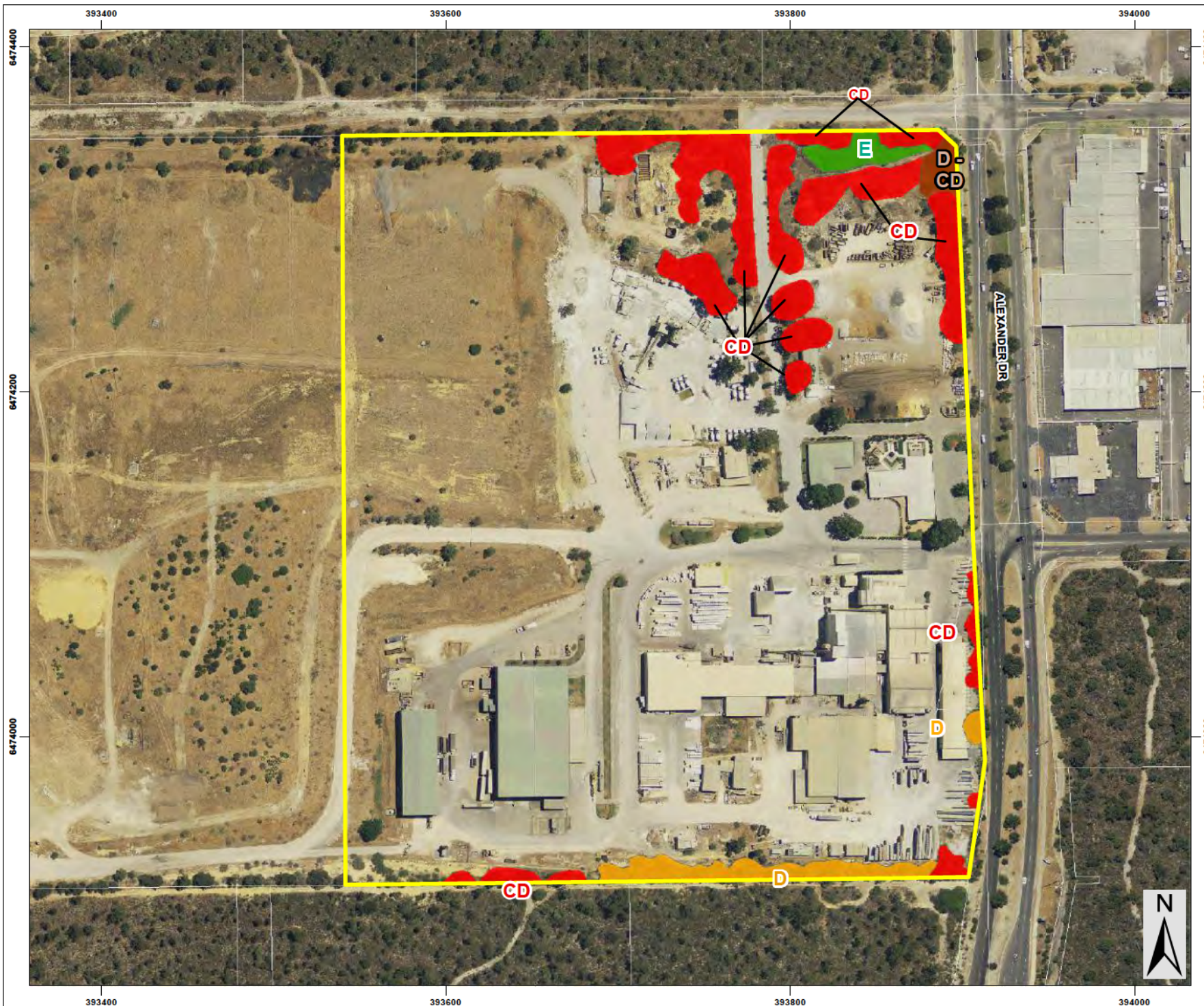
It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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FIGURES







Legend

Survey Area (15.81 ha)

Vegetation Conditions

Excellent (0.09 ha)

Degraded (0.06 ha)

Degraded - Completely Degraded (0.22 ha)

Completely Degraded (1.02 ha)

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - CADASTRE SOURCED SLIP SERVICES OCTOBER 2015
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2015
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Meters

1:3,000 @ A4

LOCALITY MAP

PROJECT ID			DATE	
1096_f1_site_location.mxd			19/10/2015	
HORIZONTAL DATUM AND PROJECTION				
GDA 1994 MGA Zone 50				
CREATED	CHECKED	APPROVED	REVISION	
CS	NW	RF	0	

Rowe Group Pty. Ltd.
 501 Alexander Drive, Mirrabooka

Level 2 Flora and Vegetation Survey Report

Figure 6 -
 Vegetation Conditions

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APPENDIX A

Definition of Declared Rare / Priority / Threatened Flora

Categories of Declared Rare Flora (WC act) and Priority listings (DPaW)

CONSERVATION CODE	DESCRIPTION
X	Presumed Extinct Flora (Declared Rare Flora – Extinct) “Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the <i>Wildlife Conservation Act 1950</i>).”
T	Threatened Flora (Declared Rare Flora – Extant) “Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the <i>Wildlife Conservation Act 1950</i>).” “Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild; EN: Endangered – considered to be facing a very high risk of extinction in the wild; VU: Vulnerable – considered to be facing a high risk of extinction in the wild.”
P1	Priority One: Poorly-known taxa “Taxa which are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.”
P2	Priority Two: Poorly-known taxa “Taxa which are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.”
P3	Priority Three: Poorly-known taxa “Taxa which are known from collections or sight records from several localities not under imminent threat, or few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.”

P4	Priority Four: Rare, Near Threatened and other taxa in need of monitoring a. Rare. "Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands." b. Near Threatened. "Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable." c. "Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy."
P5	Priority Five: Conservation Dependent taxa "Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years."

Source: Department of Parks and Wildlife (2013). Online: <http://florabase.dpaw.wa.gov.au>.

Categories of Threatened Flora under the EPBC Act

CONSERVATION CODE	DESCRIPTION
Ex	Extinct Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
ExW	Extinct in the Wild Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	Critically Endangered Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	Endangered Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
V	Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	Conservation Dependent Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a

	period of 5 years.
--	--------------------

Source: *Environment Protection and Biodiversity Conservation Act 1999*

APPENDIX B

Definition of Threatened and Priority Ecological Communities

Definitions of Threatened Ecological Communities as Endorsed by the Western Australian Minister for the Environment

Presumed Totally Destroyed (PD)

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B);

- A) Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats or
- B) All occurrences recorded within the last 50 years have since been destroyed.

Critically Endangered (CR)

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii)
 - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 5 years)
 - ii) modification throughout its range is continuing such that in the immediate future (within approximately 5 years) the community is unlikely to be capable of being substantially rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
 - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 5 years)
 - ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
 - iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes
- C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the immediate future (within approximately 5 years)

Endangered (EN)

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 70% and either or both of the following apply (i or ii)

- i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term (within approximately 10 years)
- ii) modification throughout its range is continuing such that in the short term future (within approximately 10 years) the community is unlikely to be capable of being substantially restored or rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
 - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 10 years)
 - ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
 - iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes
- C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the short term future (within approximately 10 years).

Vulnerable (VU)

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction in the medium to long term future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The ecological community exists largely as modified occurrences which are likely to be capable of being substantially restored or rehabilitated.
- B) The ecological community can be modified or destroyed and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
- C) The ecological community may still be widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Source: Department of Environment and Conservation (2010). Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Department of Environment and Conservation, Perth, Western Australia. Online: www.naturebase.net/

Definitions of Priority Ecological Communities as listed DPaW

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly known ecological communities

Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly known ecological communities

Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.

Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or;
- (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
- (iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened or that have been recently removed from the threatened list.

These communities require regular monitoring.

- (a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
- (c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities.

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Source: Department of Parks and Wildlife (2013). Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Department of Environment and Conservation, Perth, WA. Online: www.naturebase.net/

APPENDIX C

Environmental Weeds and Declared Plant Categories

Criteria used for Ranking Environmental Weeds

The Weed Prioritisation Process for DPaW contains criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity. These criteria are as follows:

Potential Distribution – Area of potential habitat in the Region that could be occupied or the area at risk of invasion by the weed.

Current Distribution - Area of habitat in the Region currently occupied by the weed, in relation to the habitat that it could invade.

Ecological Impact - Impact of species within the Region, from low impact (causes minimal disruption to ecological processes or loss of biodiversity) to high (causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure, composition and function of ecosystems).

Invasiveness – rate of spread of a weed in native vegetative, encompassing factors of establishment, reproduction and long distance dispersal (>100m).

Feasibility of Control - The longer a coordinated control program takes to achieve its desired goal, the more expensive and less feasible it becomes. Is it feasible to eradicate or at least contain the infestation?

Source: DPaW (2013). Weed Prioritisation Process for DPaW (formerly DEC) – “An integrated approach to Weed Management on DPaW-managed lands in WA”

Standard Meanings of Declared Plant Categories

Under the Biosecurity and Agriculture Management Act 2007 (the BAM Act), all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management).

C1 category (Exclusion) - Pests will be assigned to this category if they are not established in WA and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.

C2 category (Eradication) – Pests will be assigned to this category if they are present in WA in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.

C3 category (Management) – Pests will be assigned to this category if they are established in WA but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Source: Department of Agriculture and Food, WA. Online:
<http://www.biosecurity.wa.gov.au/western-australian-organism-list-waol>

APPENDIX D

Vegetation Condition Scale

CONDITION SCALE CODE	CONDITION SCALE
E	Excellent (1) Pristine or nearly so, no obvious signs of damage caused by the activities of European man.
VG	Very Good (2) Some relatively slight signs of damage caused by the activities of European man, e.g. some signs of damage to tree trunks caused by repeated fire and the presence of some relatively non-aggressive weeds or occasional vehicle tracks.
G	Good (3) More obvious signs of damage caused by the activities of European man, including some obvious impact on the vegetation structure such as caused by low levels of grazing. Weeds as above, possibly plus some more aggressive ones.
P	Poor (4) Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man such as grazing or partial clearing (chaining) or very frequent fires. Weeds as above, probably plus some more aggressive species.
VP	Very Poor (5) Severely impacted by grazing, fire, clearing or a combination of these activities. Scope for some regeneration but, not to a state approaching good condition without intensive management. Usually with a number of weed species including aggressive species.
CD	Completely Degraded (6) Areas that are completely or almost completely without native species in the structure of their vegetation, e.g. areas that are cleared or "parkland cleared" with their flora comprising weed or crop species with isolated native trees or shrubs.

Source: Trudgen (1991)

APPENDIX E

Flora Inventory

FAMILY	TAXA
Anarthriaceae	<i>Lyginia imberbis</i>
Asparagaceae	<i>Lomandra caespitosa</i>
	<i>Lomandra hermaphrodita</i>
	<i>Lomandra suaveolens</i>
	<i>Thysanotus dichotomus</i>
Asphodelaceae	* <i>Trachyandra divaricata</i>
Asteraceae	* <i>Hypochaeris glabra</i>
	* <i>Sonchus oleraceus</i>
	* <i>Ursinia anthemoides</i>
Colchicaceae	<i>Burchardia congesta</i>
Cyperaceae	<i>Lepidosperma leptostachyum</i>
	<i>Mesomelaena pseudostygia</i>
Dilleniaceae	<i>Hibbertia huegelii</i>
	<i>Hibbertia hypericoides</i>
	<i>Hibbertia recurvifolia</i>
Euphorbiaceae	* <i>Euphorbia terracina</i>
Fabaceae	<i>Acacia applanata</i>
	<i>Acacia cyclops</i>
	<i>Acacia pulchella</i>
	<i>Bossiaea eriocarpa</i>
	<i>Daviesia divaricata</i> subsp. <i>divaricata</i>
	<i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>
	<i>Daviesia triflora</i>
	<i>Gompholobium tomentosum</i>
	<i>Jacksonia floribunda</i>
	<i>Jacksonia sternbergiana</i>
Geraniaceae	* <i>Pelargonium capitatum</i>
Goodeniaceae	<i>Dampiera linearis</i>
	<i>Scaevola repens</i> var. <i>repens</i>
Haemodoraceae	<i>Anigozanthos humilis</i>
	<i>Conostylis aculeata</i>
	<i>Conostylis aculeata</i> subsp. <i>cygnorum</i>
	<i>Haemodorum</i> sp.

Iridaceae	<i>*Gladiolus caryophyllaceus</i>
Myrtaceae	<i>Eremaea pauciflora</i> var. <i>pauciflora</i>
	<i>Eucalyptus marginata</i>
	<i>Hypocalymma robustum</i>
Orchidaceae	<i>Diuris corymbosa</i>
Oxalidaceae	<i>*Oxalis pes-caprae</i>
Papaveraceae	<i>*Fumaria capreolata</i>
Poaceae	<i>Neurachne alopecuroidea</i>
	<i>*Avena barbata</i>
	<i>*Briza maxima</i>
	<i>*Ehrharta calycina</i>
	<i>*Eragrostis curvula</i>
Primulaceae	<i>*Lysimachia arvensis</i>
Proteaceae	<i>Banksia menziesii</i>
	<i>Conospermum stoechadis</i> subsp. <i>stoechadis</i>
	<i>Petrophile linearis</i>
	<i>Stirlingia latifolia</i>
	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>
Restionaceae	<i>Alexgeorgea nitens</i>
	<i>Chordifex sinuosus</i>
	<i>Desmocladius flexuosus</i>
	<i>Hypolaena exsulca</i>
Rutaceae	<i>Philothea spicata</i>
Violaceae	<i>Hybanthus calycinus</i>
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>

APPENDIX F

Quadrat Data Sheets

Mirrabooka
Described by NW
Date 14/09/2015
Type Q 10x10
Location East of Exit Road
MGA Zone 50 393820mE 6474337mN
Habitat mid slope
Soil Grey Sand
Vegetation Open Woodland of *Banksia menziesii*
 over diverse understorey
Veg Condition Very Good - Good
Fire Age Old (8-12)
Notes some banksia death

Site Q1



SPECIES LIST:

Name	Cover	Height
<i>Acacia applanata</i>	+	35
<i>Acacia cyclops</i>	3	400
<i>Acacia pulchella</i>	3	60
<i>Alexgeorgea nitens</i>	2	15
<i>Anagallis arvensis</i>	+	5
<i>Anigozanthos humilis</i>	+	15
<i>Avena barbata</i>	2	100
<i>Banksia menziesii</i>	5	600
<i>Buchardia congesta</i>	+	45
<i>Chordifex sinuosus</i>	+	25
<i>Conospermum stoechadis</i> subsp. <i>stoechadis</i>	1.5	70
<i>Conostylis aculeata</i> subsp. <i>cygnorum</i>	+	40
<i>Daviesia divaricata</i> subsp. <i>divaricata</i>	4	85
<i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>	+	50
<i>Daviesia triflora</i>	1.5	90
<i>Desmocladius flexuosus</i>	+	15
<i>Ehrharta calycina</i>	1	80
<i>Eremaea pauciflora</i> var. <i>pauciflora</i>	2.5	65
<i>Euphorbia terracina</i>	1	35
<i>Fumaria capreolata</i>	3	
<i>Gladiolus caryophyllaceus</i>	+	90
<i>Gompholobium tomentosum</i>	1	60
<i>Haemodorum</i> sp.	+	60
<i>Hibbertia hypericoides</i>	1	50
<i>Hibbertia subvaginata</i>	+	30
<i>Hybanthus calycinus</i>	1.5	30
<i>Hypocalymma robustum</i>	1.5	55
<i>Hypochaeris glabra</i>	+	1
<i>Hypolaena exsulca</i>	1.5	30
<i>Lepidosperma leptostachyum</i>	+	40
<i>Lomandra caespitosa</i>	+	35
<i>Lomandra hermaphrodita</i>	+	35
<i>Lomandra suaveolens</i>	+	35
<i>Lyginia imberbis</i>	1.5	45
<i>Mesomelaena pseudostygia</i>	4.5	60
<i>Neurachne alopecuroides</i>	+	45
<i>Pelargonium capitatum</i>	+	35
<i>Scaevola repens</i> var. <i>repens</i>	1	5
<i>Sonchus oleraceus</i>	+	25

<i>Stirlingia latifolia</i>	2	85
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>	1.5	50
<i>Ursinia anthemoides</i>	+	15
<i>Xanthorrhoea preissii</i>	4.5	110

Mirrabooka
Described by NW
Date 14/09/2015
Type R
Location Cnr of Alexander Drive and Victor
MGA Zone 50 368369 mE 6474323 mN
Habitat altered midslope
Soil Yellow brown sand
Vegetation Low Open Woodland of *Eucalyptus marginata*
over *Jacksonia sternbergiana*, *Mesomelaena*
pseudostygia and introduced species.
Veg Condition D-CD
Fire Age >12

Site R1



SPECIES LIST:

Name	Cover	Height
<i>Avena barbata</i>	10	40
<i>Briza maxima</i>	2	30
<i>Conostylis aculeata</i> subsp. <i>cygnorum</i>	+	30
<i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>	1	110
<i>Ehrharta calycina</i>	5	100
<i>Eragrostis curvula</i>	2	110
<i>Eucalyptus marginata</i>	6	700
<i>Euphorbia terracina</i>	1.5	40
<i>Jacksonia sternbergiana</i>	3	180
<i>Mesomelaena pseudostygia</i>	6	400
<i>Oxalis pes-caprae</i>	+	20
<i>Pelargonium capitatum</i>	6	40
<i>Stirlingia latifolia</i>	1	100
<i>Thysanotus dichotomus</i>	1	70
<i>Trachyandra divaricata</i>	1	35

Mirrabooka
 Described by NW
 Date 5/10/2015
 Type R
 MGA Zone 50 393837 mE 6474337 mN
 Soil Grey sand

Site R2



Vegetation Shrubland of *Acacia pulchella*,
Eremaea pauciflora var. *pauciflora*, *Stirlingia*
latifolia, *Daviesia divaricata* subsp. *divaricata* (ms),
Xanthorrhoea preissii and *Mesomelaena pseudostygia*
 with scattered *Banksia attenuata* and *Banksia menziesii*.

Veg Condition E

Fire Age 8-12

Notes ph 1438 - 1439 areas of localised disturbance caused by removing dead trees

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
<i>Acacia pulchella</i>	15		120		
<i>Alexgeorgea nitens</i>	+		15		
<i>Bossiaea eriocarpa</i>	+		40		
<i>Briza maxima</i>	+		25		
<i>Conostylis aculeata</i>	+		35		
<i>Dampiera linearis</i>	+		25		
<i>Daviesia divaricata</i> subsp. <i>divaricata</i>	5		130		
<i>Daviesia triflora</i>	2		60		
<i>Desmocladius flexuosus</i>	+		15		
<i>Ehrharta calycina</i>	4		100		
<i>Eremaea pauciflora</i> var. <i>pauciflora</i>	6		100		
<i>Euphorbia terracina</i>	+		30		
<i>Fumaria capreolata</i>	1		C		
<i>Gompholobium tomentosum</i>	+		45		
<i>Hibbertia huegelii</i>	1.5		40		
<i>Hibbertia hypericoides</i>	1		60		
<i>Hybanthus calycinus</i>	1		45		
<i>Jacksonia floribunda</i>	1		130		
<i>Jacksonia sternbergiana</i>	1		120		
<i>Lepidosperma leptostachyum</i>	+		45		
<i>Lomandra caespitosa</i>	+		30		
<i>Mesomelaena pseudostygia</i>	2		45		
<i>Pelargonium capitatum</i>	+		15		
<i>Petrophile linearis</i>	+		30		
<i>Philothea spicata</i>	+		55		
<i>Scaevola repens</i> var. <i>repens</i>	+		10		
<i>Stirlingia latifolia</i>	3		85		
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>	1		50		
<i>Ursinia anthemoides</i>	+		15		
<i>Xanthorrhoea preissii</i>	1.5		180		

Opportunistic Species

Taxa

Diuris corymbosa

Hypolaena exsulca

APPENDIX G

Desktop Searches

FID_	PopId	NameId	Taxon	ConsStatus	WARank	PopNumber	SubPopCode	Gda94Lat	Gda94Long	PopStatus	Location	District	Vesting	Purpose1	Purpose2	CountDate	Method	MatureCoun	JuvenileCo	SeedlingCo	LiveTotal	PlantTypeC	AreaOccupi	inFlower	Population
84948.000000000000	1596.000000000000		Caladenia huegelii	T	CR	52.000000000000		-31.867389000000	115.911556000000	U	**Species correct ID not confirmed**Freehold land, lot 100, located at Lightning Swamp, Malaga. West of Reid Hwy and Tonkin Hwy junction, north of Matthews Cl.	SWAN COASTAL	LGA			18/10/2004		0.000000000000			0.000000000000			N	
93198.000000000000	16245.000000000000		Cyathochaeta teretifolia	3		14.000000000000		-31.875194000000	115.912472000000		Shire Reserve (42592). NW cnr of Della and ?Marshall(Benara - more likely)Rd's, Beechboro, Della Reserve. Plants in wettest area of sumpland.	SWAN COASTAL	LGA	REC		8/12/1995		0.000000000000			0.000000000000			N	
90830.000000000000	13191.000000000000		Drosera occidentalis subsp. occidentalis	4		2.000000000000		-31.855723000000	115.909814000000		Private Property. 13 m S of Marshall Rd at 1.5 km W of Beechboro Rd, Malaga. 50 W of the track running N-S, between the power lines and the first row of high voltage lines.	SWAN COASTAL	PRI			6/01/1986	ESTMT	100.000000000000			100.000000000000			N	
90837.000000000000	13191.000000000000		Drosera occidentalis subsp. occidentalis	4		3.000000000000		-31.857112000000	115.923703000000		Private Property. SW corner of Marshall and Beechboro Rds, Malaga. 250 m S of Marshall Rd and 10 W of Beechboro Rd.	SWAN COASTAL	PRI			6/01/1986		0.000000000000			0.000000000000			N	

FID_Sheet	NameID	Taxon	Cont_Code	Plant_Desc	Site_Descr	Vegetation	Frequency	Other_Note	Locality
6053297.000000000000	1596.000000000000	Caladenia huagelli	T	Orchid 0.6 m high x 0.1 m wide.	Plain. Organic litter, grey sand over sand.	Low Forest A. Banksia menziesii, B. attenuata.	occasional.		Lightning Swamp, Malaga
6053785.000000000000	4027.000000000000	Jacksonia sericea	4	Spreading shrub 0.4 m high x 1 m wide.	Gentle slope. Organic litter. Grey Bassendean sand.	Open Low Woodland A. Acacia saligna, Banksia menziesii.	occasional.		Fauna Rehabilitation Centre, E of Camboon Road and N of Red
7793189.000000000000	4027.000000000000	Jacksonia sericea	4		Well drained site on gentle slope with E aspect. Cream sand with pale yellow suburface sand.	Banksia attenuata & menziesii. Allocasuarina fraseriana Low Woodland to Low Open Woodland with scattered emergent Eucalyptus marginata over species rich shrubland over mixed Sedgeland, Herbland and Grassland.			Section KOON H in Koondoola Regional Bushland, Koondoola Alexander Drive. Beach Road and Koondoola Avenue. Section on Avenue and on SE by Water Corp Water Tower Boundary.
7833016.000000000000	4027.000000000000	Jacksonia sericea	4	Shrub perennial.	Flat, residential.	Parkland.		Potential threats from weeds, disease and recreational activities.	Heritage Park
7684096.000000000000	4027.000000000000	Jacksonia sericea	4		Slope. Grey sand.	Disturbed area dominated by Adenanthos cygnorum, Jacksonia furcellata and Melaleuca preissiana. Associated species: Eriharta calycina, Verticordia ? densiflora, Lyginia imberbis, Acacia stenoptera, Hypolaena exsulca, Thysanotus multiflorus.		Healthy population.	Near substation, W of Bullfinch Drive

Taxon	Status	Rank	IUCNCriter EPBC	DPaWRegion	DPaWDistrict	Distribution	FloweringPeriod	RecoveryPlan
Amphibromus vickeryae		1		SWAN	SWAN COASTAL	Beechboro Gingin-Pinjarra, Palgarup, Darling Range, Kenwick, Wattle Grove, Beechboro	Dec	
Drosera occidentalis subsp. occidentalis		4		SWAN,SWST	BLACKWOOD,PERTH HILLS,SWAN COASTAL,WELLINGTON		Nov-Dec	
Drosera x sidjamesii		1		SWAN	SWAN COASTAL	Gnangarra, Wanneroo, Beechboro	Nov-Mar	

NatureMap Species Report

Created By Guest user on 08/10/2015

Current Names Only Yes

Core Datasets Only Yes

Method 'By Circle'

Centre 115°52' 31" E, 31°51' 47" S

Buffer 5km

Group By Family

Family	Species	Records
Acanthizidae	5	89
Accipitridae	4	19
Actinopodidae	1	8
Agamidae	2	3
Amanitaceae	1	1
Amaranthaceae	2	7
Amaryllidaceae	1	1
Anarthriaceae	2	13
Anatidae	8	107
Anhingidae	1	1
Anystidae	1	1
Apiaceae	8	14
Apocynaceae	1	1
Araceae	1	1
Araliaceae	1	2
Araneidae	4	11
Arcyriaceae	1	2
Ardeidae	3	26
Artamidae	1	8
Asparagaceae	22	46
Asphodelaceae	1	1
Asteraceae	26	40
Barychelidae	2	19
Bothriuridae	2	3
Brassicaceae	2	5
Buthidae	3	3
Campanulaceae	5	7
Campephagidae	1	61
Canidae	2	2
Caprifoliaceae	1	1
Caryophyllaceae	2	3
Castniidae	1	49
Casuarinaceae	1	6
Charadriidae	1	1
Colchicaceae	3	9
Colletidae	1	1
Columbidae	5	214
Commelinaceae	1	1
Cortinariaceae	2	2
Corvidae	1	127
Cracticidae	3	178
Crassulaceae	2	3
Cribrariaceae	1	2
Cuculidae	2	15
Cupressaceae	1	1
Cyperaceae	19	38
Dasyopogonaceae	3	9
Desidae	1	1
Dicaeidae	1	3
Dicruridae	2	219
Dilleniaceae	6	34
Diplodactylidae	2	5
Droseraceae	8	18
Echinosteliaceae	1	1
Elaeocarpaceae	2	8
Elapidae	11	74
Ericaceae	13	41
Euphorbiaceae	8	13
Fabaceae	44	135
Falconidae	6	27
Felidae	1	1
Fringillidae	1	1
Garypinidae	1	1
Gekkonidae	1	2
Gentianaceae	1	1
Geraniaceae	3	4
Goodeniaceae	7	27
Gyrostemonaceae	1	1
Haemodoraceae	12	50
Halcyonidae	3	33
Haloragaceae	3	5
Hemerocallidaceae	8	14
Hirundinidae	1	46
Hyaloscyphaceae	1	1
Hylidae	1	34
Idiopidae	1	19
Iridaceae	9	19



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 08/10/15 19:28:15

[Summary](#)

[Details](#)

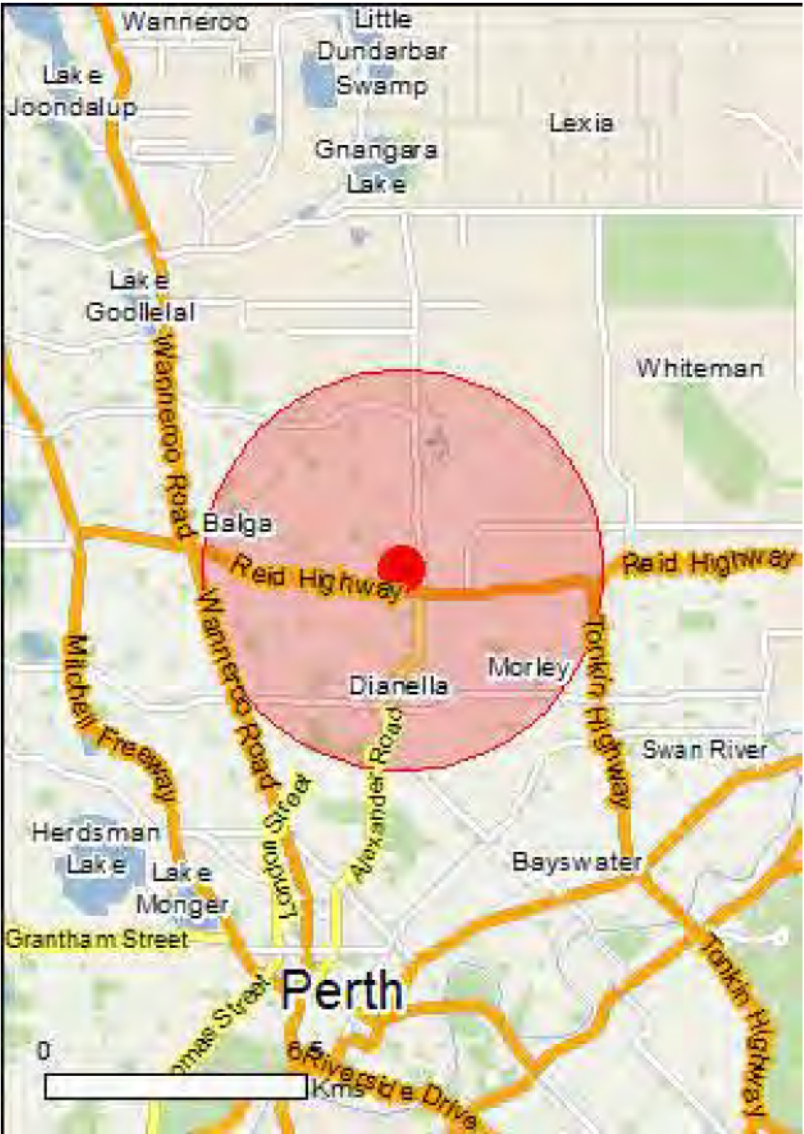
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

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[Coordinates](#)

[Buffer: 5.0Km](#)



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	19
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	41
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Darwinia foetida Muchea Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Drakaea elastica Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Thelymitra manginii K.Dixon & Batty ms. [67443]	Endangered	Species or species habitat may occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area
Trithuria occidentalis Swan Hydatella [42224]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land

[Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		

Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area

Extra Information

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur

Name	Status	Type of Presence
Protasparagus plumosus		within area
Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla		
Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus		
Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.86361 115.87393

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Parks and Wildlife Commission NT, Northern Territory Government](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

Iulomorphidae	1	1
Ixodidae	1	4
Julidae	1	1
Juncaceae	1	1
Lamiaceae	5	11
Lamponidae	4	11
Lauraceae	1	1
Liceaceae	1	1
Limncharidae	1	2
Limnodynastidae	2	9
Loganiaceae	2	2
Loranthaceae	1	2
Lycosidae	6	15
Macropodidae	2	6
Maluridae	1	14
Marsileaceae	1	2
Meliphagidae	9	288
Menyanthaceae	1	2
Meropidae	1	26
Micropholcommatidae	2	6
Mimetidae	1	2
Miturgidae	1	6
Molluginaceae	1	6
Muridae	1	1
Myobatrachidae	2	25
Myrtaceae	37	80
Nemesiidae	2	25
Neopilionidae	1	6
Neosittidae	1	4
Nicodamidae	1	3
Onagraceae	3	4
Orchidaceae	20	34
Orobanchaceae	1	1
Oxalidaceae	3	3
Pachycephalidae	1	26
Papaveraceae	1	1
Paradoxosomatidae	2	8
Pararchaeidae	2	3
Pardalotidae	2	35
Paxillaceae	1	1
Pelecenidae	1	1
Peramelidae	2	7
Petroicidae	1	3
Phalacrocoracidae	3	10
Phanerochaetaceae	1	1
Pholcidae	2	20
Phrymaceae	1	1
Phyllanthaceae	2	2
Phytolaccaceae	1	1
Pittosporaceae	1	2
Plantaginaceae	2	2
Poaceae	21	37
Podargidae	2	3
Podicipedidae	2	52
Polygalaceae	2	2
Polygonaceae	1	1
Polyporaceae	1	1
Portulacaceae	3	7
Potamogetonaceae	1	1
Potoroidae	1	21
Pottiaceae	1	2
Procellariidae	2	3
Prodidomidae	1	5
Proteaceae	21	58
Psittacidae	6	165
Pygopodidae	5	53
Pythiaceae	1	12
Rallidae	4	36
Restionaceae	9	28
Rubiaceae	1	2
Russulaceae	1	1
Rutaceae	4	9
Salticidae	1	1
Salvinaceae	1	1
Santalaceae	2	2
Scincidae	14	123
Scolopendridae	1	1
Scrophulariaceae	1	1
Solanaceae	4	7
Sparassidae	3	10
Stemonitidaceae	6	13
Strigidae	2	8
Stylidiaceae	14	36
Sylviidae	1	2
Tachyglossidae	1	2
Theridiidae	2	5
Threskiornithidae	2	38
Thymelaeaceae	2	8
Urodacidae	2	38
Varanidae	1	3
Vespertilionidae	1	3
Violaceae	1	9
Xanthorrhoeaceae	2	2
Zamiaceae	1	1
Zodariidae	3	10
Zosteropidae	1	46
Zygophyllaceae	1	1
TOTAL	629	3599

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Acanthizidae				
1.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
2.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
3.	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
4.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
5.	30948 <i>Smicromis brevirostris</i> (Weebill)			
Accipitridae				
6.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
7.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
8.	24282 <i>Accipiter fasciatus subsp. fasciatus</i> (Brown Goshawk)			
9.	24288 <i>Circus approximans</i> (Swamp Harrier)			
Actinopodidae				
10.	<i>Missulena occatoria</i>			
Agamidae				
11.	30899 <i>Ctenophorus adelaidensis</i> (Southern Heath Dragon, Western Heath Dragon)			
12.	24907 <i>Pogona minor subsp. minor</i> (Dwarf Bearded Dragon)			
Amanitaceae				
13.	38756 <i>Amanita umbrinella</i>			
Amaranthaceae				
14.	2742 <i>Ptilotus manglesii</i> (Pom Poms, Mulamula)			
15.	2751 <i>Ptilotus polystachyus</i> (Prince of Wales Feather)			
Amaryllidaceae				
16.	44496 <i>Narcissus tazetta subsp. italicus</i>	Y		
Anarthriaceae				
17.	1097 <i>Lyginia barbata</i>			
18.	18049 <i>Lyginia imberbis</i>			
Anatidae				
19.	24312 <i>Anas gracilis</i> (Grey Teal)			
20.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
21.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
22.	24318 <i>Aythya australis</i> (Hardhead)			
23.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
24.	24322 <i>Cygnus atratus</i> (Black Swan)			
25.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
26.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
Anhingidae				
27.	25553 <i>Anhinga melanogaster</i> (Darter)			
Anystidae				
28.	<i>Erythracus decoris</i>			
Apiaceae				
29.	6203 <i>Actinotus glomeratus</i>			
30.	6214 <i>Centella asiatica</i>			
31.	6219 <i>Eryngium pinnatifidum</i> (Blue Devils)			
32.	6221 <i>Foeniculum vulgare</i> (Fennel)	Y		
33.	6222 <i>Homaloscium homalocarpum</i>			
34.	6249 <i>Platysace compressa</i> (Tapeworm Plant)			
35.	6253 <i>Platysace filiformis</i>			
36.	6289 <i>Xanthosia huegelii</i>			
Apocynaceae				
37.	6587 <i>Gomphocarpus fruticosus</i> (Narrowleaf Cottonbush)	Y		
Araceae				
38.	1049 <i>Zantedeschia aethiopica</i> (Arum Lily)	Y		
Araliaceae				
39.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
Araneidae				
40.	<i>Argiope protensa</i>			
41.	<i>Austracantha minax</i>			
42.	<i>Eriophora biapicata</i>			
43.	<i>Paraplectanoides crassipes</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Arcyriaceae					
44.	38973	<i>Arcyria pomiformis</i>			
Ardeidae					
45.	41324	<i>Ardea modesta</i> (Eastern Great Egret)		IA	
46.	24341	<i>Ardea pacifica</i> (White-necked Heron)			
47.	25564	<i>Nycticorax caledonicus</i> (Rufous Night Heron)			
Artamidae					
48.	25566	<i>Artamus cinereus</i> (Black-faced Woodswallow)			
Asparagaceae					
49.	8779	<i>Asparagus asparagoides</i> (Bridal Creeper)	Y		
50.	1280	<i>Chamaescilla corymbosa</i> (Blue Squill)			
51.	16091	<i>Lachenalia bulbifera</i>	Y		
52.	1307	<i>Laxmannia ramosa</i> (Branching Lily)			
53.	11911	<i>Laxmannia ramosa</i> subsp. <i>ramosa</i>			
54.	11464	<i>Laxmannia sessiliflora</i> subsp. <i>australis</i>			
55.	1309	<i>Laxmannia squarrosa</i>			
56.	1223	<i>Lomandra caespitosa</i> (Tufted Mat Rush)			
57.	1228	<i>Lomandra hermaphrodita</i>			
58.	1234	<i>Lomandra nigricans</i>			
59.	1239	<i>Lomandra preissii</i>			
60.	1246	<i>Lomandra suaveolens</i>			
61.	1312	<i>Sowerbaea laxiflora</i> (Purple Tassels)			
62.	1318	<i>Thysanotus arbuscula</i>			
63.	1319	<i>Thysanotus arenarius</i>			
64.	1338	<i>Thysanotus manglesianus</i> (Fringed Lily)			
65.	1339	<i>Thysanotus multiflorus</i> (Many-flowered Fringe Lily)			
66.	1343	<i>Thysanotus patersonii</i>			
67.	1348	<i>Thysanotus rectantherus</i>			
68.	1351	<i>Thysanotus sparteus</i>			
69.	1357	<i>Thysanotus thyrsoides</i>			
70.	1358	<i>Thysanotus triandrus</i>			
Asphodelaceae					
71.	1364	<i>Asphodelus fistulosus</i> (Onion Weed)	Y		
Asteraceae					
72.	7838	<i>Arctotheca calendula</i> (Cape Weed)	Y		
73.	7867	<i>Brachyscome bellidioides</i>			
74.	7937	<i>Cirsium vulgare</i> (Spear Thistle)	Y		
75.	7941	<i>Conyza parva</i>	Y		
76.	7947	<i>Cotula turbinata</i> (Funnel Weed)	Y		
77.	18307	<i>Dimorphotheca ecklonis</i>	Y		
78.	7961	<i>Dittrichia graveolens</i> (Stinkwort)	Y		
79.	16311	<i>Gazania linearis</i>	Y		
80.	8086	<i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
81.	8095	<i>Lactuca saligna</i> (Wild Lettuce)	Y		
82.	18585	<i>Lagenophora huegelii</i>			
83.	8105	<i>Millotia myosotidifolia</i>			
84.	29418	<i>Monoculus monstrosus</i>	Y		
85.	8133	<i>Olearia elaeophila</i>			
86.	8165	<i>Pithocarpa pulchella</i> (Beautiful Pithocarpa)			
87.	8182	<i>Podotricha angustifolia</i> (Sticky Longheads)			
88.	8183	<i>Podotricha chrysantha</i> (Yellow Podotricha)			
89.	13255	<i>Pterochaeta paniculata</i>			
90.	8195	<i>Quinetia urvillei</i>			
91.	20663	<i>Senecio multicaulis</i> subsp. <i>multicaulis</i>			
92.	8225	<i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
93.	8231	<i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
94.	38388	<i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
95.	8257	<i>Vellereophyton dealbatum</i> (White Cudweed)	Y		
96.	8282	<i>Waitzia suaveolens</i> (Fragrant Waitzia)			
97.	13333	<i>Waitzia suaveolens</i> var. <i>suaveolens</i>			
Barychelidae					
98.		<i>Idiommata blackwalli</i>			
99.		<i>Synothele mullaloo</i>			
Bothriuridae					
100.		<i>Cercophonius granulosus</i>			
101.		<i>Cercophonius sulcatus</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Brassicaceae				
102.	18555 <i>Cardamine</i> sp. Jandakot (P. Luff s.n. 4/7/1969)	Y		
103.	3016 <i>Heliophila pusilla</i>	Y		
Buthidae				
104.	<i>Isometroides vescus</i>			
105.	<i>Urodacus armatus</i>			
106.	<i>Urodacus hartmeyeri</i>			
Campanulaceae				
107.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
108.	7402 <i>Lobelia gibbosa</i> (Tall Lobelia)			
109.	7408 <i>Lobelia tenuior</i> (Slender Lobelia)			
110.	7384 <i>Wahlenbergia capensis</i> (Cape Bluebell)	Y		
111.	7389 <i>Wahlenbergia preissii</i>			
Campephagidae				
112.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
Canidae				
113.	30883 <i>Canis lupus subsp. familiaris</i> (Dog)	Y		
114.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
Caprifoliaceae				
115.	7368 <i>Scabiosa atropurpurea</i> (Purple Pincushion)	Y		
Caryophyllaceae				
116.	19825 <i>Petrorhagia dubia</i>	Y		
117.	15972 <i>Silene gallica</i> var. <i>gallica</i>	Y		
Castniidae				
118.	33992 <i>Synemon gratiosa</i> (Graceful Sunmoth)		P4	
Casuarinaceae				
119.	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
Charadriidae				
120.	24379 <i>Erythrogonys cinctus</i> (Red-kneed Dotterel)			
Colchicaceae				
121.	1383 <i>Burchardia bairdiae</i>			
122.	12770 <i>Burchardia congesta</i>			
123.	1385 <i>Burchardia multiflora</i> (Dwarf Burchardia)			
Colletidae				
124.	33977 <i>Hylaeus globuliferus</i> (bee)		P3	
Columbidae				
125.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
126.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
127.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
128.	25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove)	Y		
129.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
Commelinaceae				
130.	1162 <i>Cartonema philydroides</i>			
Cortinariaceae				
131.	38774 <i>Cortinarius archeri</i>			
132.	38791 <i>Hebeloma crustuliniforme</i>			
Corvidae				
133.	25592 <i>Corvus coronoides</i> (Australian Raven)			
Cracticidae				
134.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
135.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
136.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
Crassulaceae				
137.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
138.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
Cribrariaceae				
139.	39003 <i>Cribraria minutissima</i>			
Cuculidae				
140.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
141.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i> (Shining Bronze Cuckoo)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Cupressaceae				
142.	96 <i>Callitris preissii</i> (Rottnest Island Pine, Maro)			
Cyperaceae				
143.	741 <i>Baumea articulata</i> (Jointed Rush)			
144.	743 <i>Baumea juncea</i> (Bare Twigrush)			
145.	16245 <i>Cyathochaeta teretifolia</i>		P3	
146.	806 <i>Cyperus polystachyos</i> (Bunchy Sedge)	Y		
147.	831 <i>Eleocharis sphacelata</i> (Tall Spikerush, Djabren)			
148.	894 <i>Fimbristylis velata</i>			
149.	917 <i>Isolepis marginata</i> (Coarse Club-rush)			
150.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
151.	940 <i>Lepidosperma pubisquameum</i>			
152.	944 <i>Lepidosperma scabrum</i>			
153.	945 <i>Lepidosperma squamatum</i>			
154.	946 <i>Lepidosperma striatum</i>			
155.	955 <i>Mesomelaena pseudostygia</i>			
156.	968 <i>Schoenoplectus pungens</i> (Sharpleaf Rush)			
157.	979 <i>Schoenus caespititius</i>			
158.	984 <i>Schoenus curvifolius</i>			
159.	992 <i>Schoenus grandiflorus</i> (Large Flowered Bogrush)			
160.	1018 <i>Schoenus subfascicularis</i>			
161.	1036 <i>Tetraria octandra</i>			
Dasypogonaceae				
162.	1213 <i>Calectasia cyanea</i> (Blue Tinsel Lily)		T	
163.	19309 <i>Calectasia narragara</i>			
164.	1218 <i>Dasypogon bromeliifolius</i> (Pineapple Bush)			
Desidae				
165.	<i>Badumna insignis</i>			
Dicaeidae				
166.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
Dicruridae				
167.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
168.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
Dilleniaceae				
169.	5108 <i>Hibbertia acerosa</i> (Needle Leaved Guinea Flower)			
170.	5112 <i>Hibbertia aurea</i>			
171.	5134 <i>Hibbertia huegelii</i>			
172.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
173.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
174.	5173 <i>Hibbertia subvaginata</i>			
Diplodactylidae				
175.	24939 <i>Diplodactylus polyophthalmus</i>			
176.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
Droseraceae				
177.	3095 <i>Drosera erythrorhiza</i> (Red Ink Sundew)			
178.	13217 <i>Drosera erythrorhiza</i> subsp. <i>erythrorhiza</i>			
179.	3098 <i>Drosera glanduligera</i> (Pimpernel Sundew)			
180.	3109 <i>Drosera menziesii</i> (Pink Rainbow)			
181.	13216 <i>Drosera menziesii</i> subsp. <i>penicillaris</i>			
182.	13191 <i>Drosera occidentalis</i> subsp. <i>occidentalis</i>		P4	
183.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
184.	3124 <i>Drosera pulchella</i> (Pretty Sundew)			
Echinosteliaceae				
185.	39029 <i>Echinostelium minutum</i>			
Elaeocarpaceae				
186.	4524 <i>Platytheca galioides</i>			
187.	4535 <i>Tetratheca hirsuta</i> (Black Eyed Susan)			
Elapidae				
188.	42380 <i>Brachyuropsis fasciolatus</i> subsp. <i>fasciolatus</i> (Narrow-banded Shovel-nosed Snake)			
189.	42381 <i>Brachyuropsis semifasciatus</i> (Southern Shovel-nosed Snake)			
190.	25251 <i>Echiopsis curta</i> (Bardick)			
191.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
192.	25249 <i>Neelaps calonotos</i> (Black-striped Snake)		P3	
193.	25252 <i>Notechis scutatus</i> (Tiger Snake)			
194.	25253 <i>Parasuta gouldii</i>			

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195.	25255	<i>Parasuta nigriceps</i>			
196.	25259	<i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite)			
197.	25263	<i>Pseudonaja modesta</i> (Ringed Brown Snake)			
198.	25266	<i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
Ericaceae					
199.	6334	<i>Astroloma pallidum</i> (Kick Bush)			
200.	6339	<i>Astroloma xerophyllum</i>			
201.	6347	<i>Conostephium minus</i> (Pink-tipped Pearl flower)			
202.	6348	<i>Conostephium pendulum</i> (Pearl Flower)			
203.	6349	<i>Conostephium preissii</i>			
204.	6374	<i>Leucopogon conostephioides</i>			
205.	6402	<i>Leucopogon hirsutus</i>			
206.	6420	<i>Leucopogon oldfieldii</i>			
207.	6427	<i>Leucopogon parviflorus</i> (Coast Beard-heath)			
208.	6434	<i>Leucopogon polymorphus</i>			
209.	6436	<i>Leucopogon propinquus</i>			
210.	40803	<i>Leucopogon squarrosus</i> subsp. <i>squarrosus</i>			
211.	34736	<i>Lysinema pentapetalum</i>			
Euphorbiaceae					
212.	4587	<i>Amperea protensa</i>			
213.	4627	<i>Euphorbia helioscopia</i> (Sun Spurge)	Y		
214.	4638	<i>Euphorbia peplus</i> (Petty Spurge)	Y		
215.	4648	<i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
216.	4662	<i>Monotaxis grandiflora</i> (Diamond of the Desert)			
217.	19585	<i>Monotaxis grandiflora</i> var. <i>grandiflora</i>			
218.	4695	<i>Ricinocarpos glaucus</i>			
219.	19942	<i>Ricinocarpos undulatus</i>			
Fabaceae					
220.	15466	<i>Acacia applanata</i>			
221.	3374	<i>Acacia huegelii</i>			
222.	18217	<i>Acacia iteaphylla</i>	Y		
223.	17861	<i>Acacia longifolia</i>	Y		
224.	15481	<i>Acacia pulchella</i> var. <i>glaberrima</i>			
225.	30032	<i>Acacia saligna</i> subsp. <i>saligna</i>			
226.	3541	<i>Acacia sessilis</i>			
227.	3557	<i>Acacia stenoptera</i> (Narrow Winged Wattle)			
228.	3688	<i>Aotus gracillima</i>			
229.	3692	<i>Aotus procumbens</i>			
230.	41824	<i>Aotus</i> sp. <i>Diffusa</i> (W.E. Blackall & C.A. Gardner 1739)			
231.	3710	<i>Bossiaea eriocarpa</i> (Common Brown Pea)			
232.	3807	<i>Daviesia divaricata</i> (Marno)			
233.	18560	<i>Daviesia divaricata</i> subsp. <i>divaricata</i>			
234.	3824	<i>Daviesia nudiflora</i>			
235.	3832	<i>Daviesia physodes</i>			
236.	3845	<i>Daviesia triflora</i>			
237.	3872	<i>Euchilopsis linearis</i> (Swamp Pea)			
238.	3880	<i>Eutaxia virgata</i>			
239.	20475	<i>Gastrolobium capitatum</i>			
240.	20473	<i>Gastrolobium ebracteolatum</i>			
241.	20483	<i>Gastrolobium linearifolium</i>			
242.	10909	<i>Gompholobium confertum</i>			
243.	11083	<i>Gompholobium scabrum</i>			
244.	3957	<i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
245.	3961	<i>Hardenbergia comptoniana</i> (Native Wisteria)			
246.	3966	<i>Hovea pungens</i> (Devil's Pins, Puyenak)			
247.	3968	<i>Hovea trisperma</i> (Common Hovea)			
248.	12859	<i>Hovea trisperma</i> var. <i>trisperma</i>			
249.	3992	<i>Isotropis cuneifolia</i> (Granny Bonnets)			
250.	19700	<i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			
251.	4010	<i>Jacksonia floribunda</i> (Holly Pea)			
252.	4012	<i>Jacksonia furcellata</i> (Grey Stinkwood)			
253.	4027	<i>Jacksonia sericea</i> (Waldjumi)		P4	
254.	4029	<i>Jacksonia sternbergiana</i> (Stinkwood, Kapur)			
255.	4044	<i>Kennedia prostrata</i> (Scarlet Runner)			
256.	4059	<i>Lotus angustissimus</i> (Narrowleaf Trefoil)	Y		
257.	4114	<i>Ornithopus pinnatus</i> (Slender Serradella)	Y		
258.	17114	<i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>			
259.	4181	<i>Pultenaea reticulata</i>			
260.	17542	<i>Trifolium arvense</i> var. <i>arvense</i>			

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261.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
262.	4298 <i>Trifolium hirtum</i> (Rose Clover)	Y		
263.	11474 <i>Vicia sativa</i> subsp. <i>nigra</i>	Y		
Falconidae				
264.	25621 <i>Falco berigora</i> (Brown Falcon)			
265.	25622 <i>Falco cenchroides</i> (Australian Kestrel)			
266.	25623 <i>Falco longipennis</i> (Australian Hobby)			
267.	24474 <i>Falco longipennis</i> subsp. <i>longipennis</i> (Australian Hobby)			
268.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
269.	24475 <i>Falco peregrinus</i> subsp. <i>macropus</i> (Australian Peregrine Falcon)		S	
Felidae				
270.	24041 <i>Felis catus</i> (Cat)	Y		
Fringillidae				
271.	25625 <i>Carduelis carduelis</i> (Goldfinch, European Goldfinch)	Y		
Garypinidae				
272.	<i>Protogarypinus giganteus</i>			
Gekkonidae				
273.	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
Gentianaceae				
274.	6539 <i>Centaureum erythraea</i> (Common Centaury)	Y		
Geraniaceae				
275.	4332 <i>Erodium botrys</i> (Long Storksbill)	Y		
276.	4333 <i>Erodium cicutarium</i> (Common Storksbill)	Y		
277.	4343 <i>Pelargonium capitatum</i> (Rose Pelargonium)	Y		
Goodeniaceae				
278.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
279.	7538 <i>Goodenia pulchella</i>			
280.	19286 <i>Goodenia pulchella</i> subsp. <i>Coastal Plain A (M. Hislop 634)</i>			
281.	7568 <i>Lechenaultia biloba</i> (Blue Leschenaultia)			
282.	7574 <i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)			
283.	13181 <i>Scaevola repens</i> var. <i>angustifolia</i>			
284.	13182 <i>Scaevola repens</i> var. <i>repens</i>			
Gyrostemonaceae				
285.	2788 <i>Gyrostemon subnudus</i>			
Haemodoraceae				
286.	1409 <i>Anigozanthos humilis</i> (Catspaw)			
287.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
288.	1411 <i>Anigozanthos manglesii</i> (Mangles Kangaroo Paw, Kurulbrang)			
289.	11261 <i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>			
290.	11513 <i>Conostylis aculeata</i> subsp. <i>cygnorum</i>			
291.	1423 <i>Conostylis aurea</i> (Golden Conostylis)			
292.	1436 <i>Conostylis juncea</i>			
293.	1454 <i>Conostylis setigera</i> (Bristly Cottonhead)			
294.	11597 <i>Conostylis setigera</i> subsp. <i>setigera</i>			
295.	1468 <i>Haemodorum laxum</i>			
296.	1475 <i>Haemodorum spicatum</i> (Mardja)			
297.	1478 <i>Phlebocarya ciliata</i>			
Halcyonidae				
298.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
299.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
300.	24309 <i>Todiramphus sanctus</i> subsp. <i>sanctus</i> (Sacred Kingfisher)			
Haloragaceae				
301.	6160 <i>Gonocarpus paniculatus</i>			
302.	6161 <i>Gonocarpus pithyoides</i>			
303.	6199 <i>Myriophyllum tillaeoides</i>			
Hemerocallidaceae				
304.	1264 <i>Arnocrinum preissii</i>			
305.	1277 <i>Caesia occidentalis</i>			
306.	1285 <i>Corynotheca micrantha</i> (Sand Lily)			
307.	11283 <i>Corynotheca micrantha</i> var. <i>micrantha</i>			
308.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
309.	1295 <i>Johnsonia acaulis</i>			
310.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			

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311.	1363 <i>Tricoryne tenella</i>			
Hirundinidae				
312.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
Hyaloscyphaceae				
313.	38803 <i>Lachnum virgineum</i>			
Hylidae				
314.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
Idiopidae				
315.	<i>Idiosoma sigillatum</i>			
Iridaceae				
316.	18279 <i>Babiana angustifolia</i>	Y		
317.	1513 <i>Chasmanthe floribunda</i> (African Cornflag)	Y		
318.	18392 <i>Freesia alba</i> x <i>leichtlinii</i>	Y		
319.	1520 <i>Gladiolus caryophyllaceus</i> (Wild Gladiolus)	Y		
320.	1546 <i>Patersonia juncea</i> (Rush Leaved Patersonia)			
321.	1550 <i>Patersonia occidentalis</i> (Purple Flag, Koma)			
322.	30472 <i>Patersonia occidentalis</i> var. <i>occidentalis</i>			
323.	1554 <i>Romulea flava</i>	Y		
324.	11544 <i>Romulea rosea</i> var. <i>australis</i> (Guildford Grass)	Y		
Iulomorphidae				
325.	<i>Dinocambala ingens</i>			
Ixodidae				
326.	<i>Amblyomma triguttatum</i>			
Julidae				
327.	<i>Ommatoiulus moreleti</i>			
Juncaceae				
328.	1188 <i>Juncus pallidus</i> (Pale Rush)			
Lamiaceae				
329.	16934 <i>Hemiandra glabra</i> subsp. <i>glabra</i>			
330.	6838 <i>Hemiandra linearis</i> (Speckled Snakebush)			
331.	6839 <i>Hemiandra pungens</i> (Snakebush)			
332.	41020 <i>Hemiphora bartlingii</i> (Woolly Dragon)			
333.	38324 <i>Lavandula dentata</i> var. <i>candicans</i>	Y		
Lamponidae				
334.	<i>Lampona cylindrata</i>			
335.	<i>Paralampona marangaroo</i>			
336.	<i>Prionosternum nitidiceps</i>			
337.	<i>Prionosternum scutatum</i>			
Lauraceae				
338.	2952 <i>Cassytha glabella</i> (Tangled Dodder Laurel)			
Liceaceae				
339.	39041 <i>Licea kleistobolus</i>			
Limnocharidae				
340.	<i>Limnochara australica</i>			
Limnodynastidae				
341.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
342.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
Loganiaceae				
343.	16825 <i>Phyllangium divergens</i>			
344.	16177 <i>Phyllangium paradoxum</i>			
Loranthaceae				
345.	2401 <i>Nuytsia floribunda</i> (Christmas Tree, Mudja)			
Lycosidae				
346.	<i>Artoria linnaei</i>			
347.	<i>Artoriopsis expolita</i>			
348.	<i>Dingosa serrata</i>			
349.	<i>Hogna crispipes</i>			
350.	<i>Lycosa gilberta</i>			
351.	<i>Venator immansueta</i>			
Macropodidae				
352.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			

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353.	24133	<i>Macropus irma</i> (Western Brush Wallaby)		P4	
Maluridae					
354.	25654	<i>Malurus splendens</i> (Splendid Fairy-wren)			
Marsileaceae					
355.	77	<i>Marsilea mutica</i>			
Meliphagidae					
356.	24559	<i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
357.	24560	<i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
358.	24561	<i>Anthochaera carunculata</i> (Red Wattlebird)			
359.	24562	<i>Anthochaera lunulata</i> (Western Little Wattlebird)			
360.	25659	<i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
361.	25661	<i>Lichmera indistincta</i> (Brown Honeyeater)			
362.	25663	<i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
363.	25669	<i>Phylidonyris nigra</i> (White-cheeked Honeyeater)			
364.	24596	<i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
Menyanthaceae					
365.	36177	<i>Ornduffia albiflora</i>			
Meropidae					
366.	24598	<i>Merops ornatus</i> (Rainbow Bee-eater)		IA	
Micropholcommatidae					
367.		<i>Raveniella cirrata</i>			
368.		<i>Raveniella peckorum</i>			
Mimetidae					
369.		<i>Ero aphana</i>			
Miturgidae					
370.		<i>Mituliodon tarantulinus</i>			
Molluginaceae					
371.	2839	<i>Macarthuria australis</i>			
Muridae					
372.	24223	<i>Mus musculus</i> (House Mouse)	Y		
Myobatrachidae					
373.	25400	<i>Crinia insignifera</i> (Squelching Froglet)			
374.	25420	<i>Myobatrachus gouldii</i> (Turtle Frog)			
Myrtaceae					
375.	20350	<i>Astartea affinis</i>			
376.	20283	<i>Astartea scoparia</i>			
377.	36441	<i>Babingtonia camphorosmae</i> (Camphor Myrtle)			
378.	5382	<i>Beaufortia elegans</i>			
379.	5415	<i>Calothamnus lateralis</i>			
380.	5428	<i>Calothamnus rupestris</i> (Mouse Ears)			
381.	5429	<i>Calothamnus sanguineus</i> (Silky-leaved Blood flower, Pindak)			
382.	5439	<i>Calytrix angulata</i> (Yellow Starflower)			
383.	5458	<i>Calytrix flavescens</i> (Summer Starflower)			
384.	5460	<i>Calytrix fraseri</i> (Pink Summer Calytrix)			
385.	5498	<i>Chamelaucium uncinatum</i> (Geraldton Wax)			
386.	13949	<i>Eremaea asterocarpa</i>			
387.	5541	<i>Eremaea pauciflora</i>			
388.	14104	<i>Eremaea pauciflora</i> var. <i>pauciflora</i>			
389.	5542	<i>Eremaea purpurea</i>			
390.	5708	<i>Eucalyptus marginata</i> (Jarrah, Djara)			
391.	13547	<i>Eucalyptus marginata</i> subsp. <i>marginata</i> (Jarrah)			
392.	5763	<i>Eucalyptus rudis</i> (Flooded Gum, Kulurda)			
393.	5790	<i>Eucalyptus todtiana</i> (Coastal Blackbutt)			
394.	35070	<i>Hypocalymma angustifolium</i> subsp. <i>Swan Coastal Plain</i> (G.J. Keighery 16777)			
395.	5825	<i>Hypocalymma robustum</i> (Swan River Myrtle)			
396.	15498	<i>Kunzea glabrescens</i> (Spearwood)			
397.	5850	<i>Leptospermum laevigatum</i> (Coast Teatree)	Y		
398.	5857	<i>Leptospermum spinescens</i>			
399.	5926	<i>Melaleuca lateritia</i> (Robin Redbreast Bush)			
400.	5952	<i>Melaleuca preissiana</i> (Moonah)			
401.	5959	<i>Melaleuca raphiophylla</i> (Swamp Paperbark)			
402.	5964	<i>Melaleuca serata</i>			
403.	6006	<i>Pericalymma ellipticum</i> (Swamp Teatree)			
404.	16478	<i>Pericalymma ellipticum</i> var. <i>floridum</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
405.	6011	<i>Pileanthus peduncularis</i> (Coppercups)			
406.	6012	<i>Regelia ciliata</i>			
407.	6033	<i>Scholtzia involucreta</i> (Spiked Scholtzia)			
408.	15432	<i>Verticordia densiflora</i> var. <i>densiflora</i>			
409.	6077	<i>Verticordia drummondii</i> (Drummond's Featherflower)			
410.	12422	<i>Verticordia eriocephala</i> (Common Cauliflower)			
411.	6101	<i>Verticordia nitens</i> (Morrison Featherflower, Kodjeningara)			
Nemesiidae					
412.		<i>Aname mainae</i>			
413.		<i>Aname tepperi</i>			
Neopilionidae					
414.		<i>Ballarra longipalpus</i>			
Neosittidae					
415.	25673	<i>Daphoenositta chrysoptera</i> (Varied Sittella)			
Nicodamidae					
416.		<i>Nicodamus mainae</i>			
Onagraceae					
417.	44680	<i>Ludwigia repens</i>	Y		
418.	6138	<i>Oenothera drummondii</i> (Beach Evening Primrose)	Y		
419.	35416	<i>Oenothera lindheimeri</i>	Y		
Orchidaceae					
420.	15330	<i>Caladenia arenicola</i>			
421.	15348	<i>Caladenia flava</i> subsp. <i>flava</i>			
422.	1596	<i>Caladenia huegelii</i> (Grand Spider Orchid)		T	
423.	18019	<i>Caladenia vulgata</i>			
424.	11049	<i>Diuris corymbosa</i>			
425.	12939	<i>Diuris magnifica</i>			
426.	1643	<i>Elythranthera brunonis</i> (Purple Enamel Orchid)			
427.	15410	<i>Eriochilus dilatatus</i> subsp. <i>dilatatus</i>			
428.	15412	<i>Eriochilus dilatatus</i> subsp. <i>multiflorus</i>			
429.	1653	<i>Leporella fimbriata</i> (Hare Orchid)			
430.	15419	<i>Microtis media</i> subsp. <i>media</i>			
431.	20460	<i>Pheladenia deformis</i>			
432.	1676	<i>Prasophyllum hians</i> (Yawning Leek Orchid)			
433.	1680	<i>Prasophyllum parvifolium</i> (Autumn Leek Orchid)			
434.	10853	<i>Prasophyllum plumiforme</i>			
435.	17267	<i>Pterostylis brevisepala</i>			
436.	1693	<i>Pterostylis recurva</i> (Jug Orchid)			
437.	12217	<i>Pterostylis sanguinea</i>			
438.	1698	<i>Pterostylis vittata</i> (Banded Greenhood)			
439.	16367	<i>Pyrorchis nigricans</i> (Red beaks, Elephants ears)			
Orobanchaceae					
440.	7122	<i>Orobanche minor</i> (Lesser Broomrape)	Y		
Oxalidaceae					
441.	4352	<i>Oxalis glabra</i>	Y		
442.	4356	<i>Oxalis pes-caprae</i> (Soursob)	Y		
443.	4358	<i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
Pachycephalidae					
444.	25680	<i>Pachycephala rufiventris</i> (Rufous Whistler)			
Papaveraceae					
445.	2969	<i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
Paradoxosomatidae					
446.		<i>Antichiropus variabilis</i>			
447.		<i>Antichiropus whistleri</i>			
Pararchaeidae					
448.		<i>Ozarchaea westraliensis</i>			
449.		<i>Westrarchaea spinosa</i>			
Pardalotidae					
450.	25681	<i>Pardalotus punctatus</i> (Spotted Pardalote)			
451.	25682	<i>Pardalotus striatus</i> (Striated Pardalote)			
Paxillaceae					
452.	38816	<i>Omphalotus nidiformis</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Pelecanidae				
453.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
Peramelidae				
454.	25478 <i>Isodon obesulus</i> (Southern Brown Bandicoot)		P5	
455.	24153 <i>Isodon obesulus</i> subsp. <i>fusciventer</i> (Quenda, Southern Brown Bandicoot)		P5	
Petroicidae				
456.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
Phalacrocoracidae				
457.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
458.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
459.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
Phanerochaetaceae				
460.	44729 <i>Porostereum crassum</i>			
Pholcidae				
461.	<i>Pholcus phalangioides</i>			
462.	<i>Smeringopus natalensis</i>			
Phrymaceae				
463.	7060 <i>Glossostigma diandrum</i>			
Phyllanthaceae				
464.	4689 <i>Poranthera ericoides</i> (Heath Poranthera)			
465.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
Phytolaccaceae				
466.	2793 <i>Phytolacca octandra</i> (Red Ink Plant)	Y		
Pittosporaceae				
467.	25788 <i>Billardiera fraseri</i> (Elegant Pronaya)			
Plantaginaceae				
468.	14282 <i>Gratiola pubescens</i>			
469.	7075 <i>Linaria maroccana</i>	Y		
Poaceae				
470.	184 <i>Aira caryophyllea</i> (Silvery Hairgrass)	Y		
471.	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
472.	200 <i>Amphipogon turbinatus</i>			
473.	17234 <i>Austrostipa compressa</i>			
474.	17241 <i>Austrostipa hemipogon</i>			
475.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
476.	234 <i>Avena fatua</i> (Wild Oat)	Y		
477.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
478.	245 <i>Briza minor</i> (Shivery Grass)	Y		
479.	258 <i>Cenchrus ciliaris</i> (Buffel Grass)	Y		
480.	277 <i>Cortaderia selloana</i> (Pampas Grass)	Y		
481.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
482.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
483.	376 <i>Eragrostis curvula</i> (African Lovegrass)	Y		
484.	452 <i>Hyparrhenia hirta</i> (Tambookie Grass)	Y		
485.	485 <i>Microlaena stipoides</i> (Weeping Grass)			
486.	492 <i>Neurachne alopecuroides</i> (Foxtail Mulga Grass)			
487.	527 <i>Paspalum dilatatum</i>	Y		
488.	40422 <i>Pentameris pallida</i>	Y		
489.	40426 <i>Rytidosperma occidentale</i>			
490.	724 <i>Vulpia myuros</i> (Rat's Tail Fescue)	Y		
Podargidae				
491.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
492.	24679 <i>Podargus strigoides</i> subsp. <i>brachypterus</i> (Tawny Frogmouth)			
Podicipedidae				
493.	24681 <i>Poliiocephalus poliocephalus</i> (Hoary-headed Grebe)			
494.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
Polygalaceae				
495.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
496.	4564 <i>Comesperma virgatum</i> (Milkwort)			
Polygonaceae				
497.	2409 <i>Emex australis</i> (Doublegee)	Y		
Polyporaceae				

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
498.	38802	<i>Laccocephalum tumulosum</i>			
Portulacaceae					
499.	2848	<i>Calandrinia corrigioloides</i> (Strap Purslane)			
500.	2854	<i>Calandrinia granulifera</i> (Pygmy Purslane)			
501.	2856	<i>Calandrinia liniflora</i> (Parakeelya)			
Potamogetonaceae					
502.	109	<i>Potamogeton crispus</i> (Curly Pondweed)			
Potoroidae					
503.	24162	<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> (Woylie, Brush-tailed Bettong)		T	
Pottiaceae					
504.	32315	<i>Barbula calycina</i>			
Procellariidae					
505.	24689	<i>Halobaena caerulea</i> (Blue Petrel)			
506.	24703	<i>Pterodroma lessonii</i> (White-headed Petrel)			
Prodidomidae					
507.		<i>Myandra bicincta</i>			
Proteaceae					
508.	1775	<i>Adenanthos cygnorum</i> (Common Woollybush)			
509.	1791	<i>Adenanthos obovatus</i> (Basket Flower)			
510.	1800	<i>Banksia attenuata</i> (Slender Banksia, Piara)			
511.	32580	<i>Banksia dallanneyi</i> var. <i>dallanneyi</i>			
512.	1822	<i>Banksia ilicifolia</i> (Holly-leaved Banksia)			
513.	1834	<i>Banksia menziesii</i> (Firewood Banksia)			
514.	32203	<i>Banksia nivea</i> subsp. <i>nivea</i>			
515.	15607	<i>Conospermum acerosum</i> subsp. <i>acerosum</i>			
516.	1882	<i>Conospermum stoechadis</i> (Common Smokebush)			
517.	15520	<i>Conospermum stoechadis</i> subsp. <i>sclerophyllum</i>			
518.	15611	<i>Conospermum stoechadis</i> subsp. <i>stoechadis</i> (Common Smokebush)			
519.	2032	<i>Grevillea leucopteris</i> (White Plume Grevillea)			
520.	2197	<i>Hakea prostrata</i> (Harsh Hakea)			
521.	2203	<i>Hakea ruscifolia</i> (Candle Hakea)			
522.	2216	<i>Hakea varia</i> (Variable-leaved Hakea)			
523.	2273	<i>Persoonia saccata</i> (Snottygobble)			
524.	2299	<i>Petrophile linearis</i> (Pixie Mops)			
525.	2301	<i>Petrophile macrostachya</i>			
526.	2316	<i>Stirlingia latifolia</i> (Blueboy)			
527.	2329	<i>Synaphea spinulosa</i>			
528.	15532	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>			
Psittacidae					
529.	25716	<i>Cacatua sanguinea</i> (Little Corella)			
530.	24731	<i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black-Cockatoo)		T	
531.	24733	<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)		T	
532.	24734	<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)		T	
533.	24738	<i>Neophema elegans</i> (Elegant Parrot)			
534.	25723	<i>Trichoglossus haematodus</i> (Rainbow Lorikeet)			
Pygopodidae					
535.	24991	<i>Aprasia repens</i> (Sand-plain Worm-lizard)			
536.	25766	<i>Delma fraseri</i> (Fraser's Legless Lizard)			
537.	24999	<i>Delma grayii</i>			
538.	25005	<i>Lialis burtonis</i>			
539.	25007	<i>Pletholax gracilis</i> subsp. <i>gracilis</i> (Keeled Legless Lizard)			
Pythiaceae					
540.		<i>Phytophthora cinnamomi</i>			
Rallidae					
541.	25727	<i>Fulica atra</i> (Eurasian Coot)			
542.	25729	<i>Gallinula tenebrosa</i> (Dusky Moorhen)			
543.	25731	<i>Porphyrio porphyrio</i> (Purple Swamphen)			
544.	24771	<i>Porzana tabuensis</i> (Spotless Crane)			
Restionaceae					
545.	1056	<i>Alexgeorgea nitens</i>			
546.	17706	<i>Chordifex sinuosus</i>			
547.	17691	<i>Desmocladus fasciculatus</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
548.	16595	<i>Desmocladius flexuosus</i>			
549.	1070	<i>Hypolaena exsulca</i>			
550.	18074	<i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
551.	1090	<i>Lepyrodia muii</i>			
552.	17677	<i>Meeboldina roycei</i>			
553.	17843	<i>Meeboldina tephрина</i>			
Rubiaceae					
554.	18255	<i>Opercularia vaginata</i> (Dog Weed)			
Russulaceae					
555.	38836	<i>Russula erumpens</i>			
Rutaceae					
556.	17665	<i>Boronia purdieana</i> subsp. <i>purdieana</i>			
557.	11381	<i>Boronia ramosa</i> subsp. <i>anethifolia</i>			
558.	18529	<i>Philotheca spicata</i> (Pepper and Salt)			
559.	18547	<i>Rhadinothamnus anceps</i>			
Salticidae					
560.		<i>Ocrisiona leucocomis</i>			
Salviniaceae					
561.	79	<i>Salvinia molesta</i> (Salvinia)	Y		
Santalaceae					
562.	10765	<i>Exocarpos sparteus</i> (Broom Ballart, Djuk)			
563.	2350	<i>Leptomeria pauciflora</i> (Sparse-flowered Currant Bush)			
Scincidae					
564.	30893	<i>Cryptoblepharus buechananii</i>			
565.	25020	<i>Cryptoblepharus plagiocephalus</i>			
566.	25027	<i>Ctenotus australis</i>			
567.	25039	<i>Ctenotus fallens</i>			
568.	25096	<i>Egernia kingii</i> (King's Skink)			
569.	25119	<i>Hemiergis quadrilineata</i>			
570.	25133	<i>Lerista elegans</i>			
571.	25148	<i>Lerista lineopunctulata</i>			
572.	25165	<i>Lerista praepedita</i>			
573.	25184	<i>Menetia greyii</i>			
574.	25191	<i>Morethia lineoocellata</i>			
575.	25192	<i>Morethia obscura</i>			
576.	25204	<i>Tiliqua rugosa</i> subsp. <i>aspera</i>			
577.	25207	<i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
Scolopendridae					
578.		<i>Ethmostigmus rubripes</i>			
Scrophulariaceae					
579.	7055	<i>Dischisma capitatum</i> (Woolly-headed Dischisma)	Y		
Solanaceae					
580.	10900	<i>Lycopersicon esculentum</i>	Y		
581.	6987	<i>Salpichroa origanifolia</i> (Pampas Lily of the Valley)	Y		
582.	7022	<i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
583.	7035	<i>Solanum sisymbriifolium</i> (Viscid Nightshade)	Y		
Sparassidae					
584.		<i>Eodelena convexa</i>			
585.		<i>Isopeda leishmanni</i>			
586.		<i>Pediana occidentalis</i>			
Stemonitidaceae					
587.	38984	<i>Collaria arcyronema</i>			
588.	38986	<i>Comatricha elegans</i>			
589.	38987	<i>Comatricha ellae</i>			
590.	39030	<i>Enerthenema papillatum</i>			
591.	39056	<i>Paradiacheopsis fimbriata</i>			
592.	40882	<i>Stemonitopsis hyperopta</i>			
Strigidae					
593.	25748	<i>Ninox novaeseelandiae</i> (Boobook Owl)			
594.	24820	<i>Ninox novaeseelandiae</i> subsp. <i>boobook</i> (Boobook Owl)			
Stylidiaceae					
595.	7676	<i>Levenhookia pusilla</i> (Midget Stylewort)			
596.	7677	<i>Levenhookia stipitata</i> (Common Stylewort)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
597.	7679 <i>Stylidium adpressum</i> (Trigger-on-stilts)			
598.	30278 <i>Stylidium androsaceum</i>			
599.	7693 <i>Stylidium brunonianum</i> (Pink Fountain Triggerplant)			
600.	7696 <i>Stylidium calcaratum</i> (Book Triggerplant)			
601.	7699 <i>Stylidium carnosum</i> (Fleshy-leaved Triggerplant)			
602.	7710 <i>Stylidium cygnorum</i>			
603.	7713 <i>Stylidium dichotomum</i> (Pins-and-needles)			
604.	25829 <i>Stylidium neurophyllum</i>			
605.	7774 <i>Stylidium piliferum</i> (Common Butterfly Triggerplant)			
606.	7785 <i>Stylidium repens</i> (Matted Triggerplant)			
607.	25806 <i>Stylidium scariosum</i>			
608.	7798 <i>Stylidium schoenoides</i> (Cow Kicks)			
Sylviidae				
609.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
Tachyglossidae				
610.	24207 <i>Tachyglossus aculeatus</i> (Short-beaked Echidna)			
Theridiidae				
611.	<i>Crustulina bicrucata</i>			
612.	<i>Latrodectus hasseltii</i>			
Threskiornithidae				
613.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
614.	24844 <i>Threskiornis molucca</i> (Australian White Ibis)			
Thymelaeaceae				
615.	5254 <i>Pimelea leucantha</i>			
616.	5268 <i>Pimelea sulphurea</i> (Yellow Banjine)			
Urodacidae				
617.	<i>Urodacus novaehollandiae</i>			
618.	<i>Urodacus planimanus</i>			
Varanidae				
619.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
Vespertilionidae				
620.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
Violaceae				
621.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
Xanthorrhoeaceae				
622.	14544 <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i>			
623.	1256 <i>Xanthorrhoea preissii</i> (Grass tree, Palga)			
Zamiaceae				
624.	18119 <i>Macrozamia fraseri</i>			
Zodariidae				
625.	<i>Masasteron tuart</i>			
626.	<i>Phenasteron longiconductor</i>			
627.	<i>Phenasteron machinosum</i>			
Zosteropidae				
628.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silveryeye)			
Zygophyllaceae				
629.	4383 <i>Tribulus terrestris</i> (Caltrop)	Y		

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.



APPENDIX 3

TRANSPORT ASSESSMENT



ROWE GROUP

TRANSPORT
ASSESSMENT

LOT 1 (#501)
ALEXANDER DRIVE,
MIRRABOOKA

Porter

The bottom half of the cover features several large, empty yellow squares of various sizes, some of which are partially cut off by the edges of the page.

Report Prepared For:

ATLAS GROUP PTY LTD

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Checked: S. Myls

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APPENDICES

- 1. MRWA Crash Data**
- 2. Proposed Local Structure Plan**
- 3. Proposed Internal Transport Network**
- 4. Internal Network Suggestions**

1.0 INTRODUCTION

Porter Consulting Engineers has been engaged by Atlas Group Pty Ltd through their partnership with the Rowe Group to provide a transport assessment for a proposed Local Structure Plan over Lot 1 Alexander Drive, Mirrabooka (the Site). This report assesses the redevelopment of an existing landfill which includes rezoning of a portion of land on the western side of the site to Mixed Business.

The purpose of this report is to examine transport aspects, in particular the land use / transport integration with respect to accessibility, circulation and safety for all transport modes. Assessment is made of the strategic transport aspects of land use / transport integration for the developable land, including:

- Traffic volumes and street hierarchy.
- Street cross-sections.
- Traffic management.
- Public transport.
- Pedestrians and cyclists.

This report has been prepared in accordance with the intentions of the Western Australian Planning Commission (WAPC) draft Guidelines for Developments, Volume 2 – Structure Plans, August 2006.

2.0 SCOPE OF REPORT

The scope of this report is primarily to review and address the following:

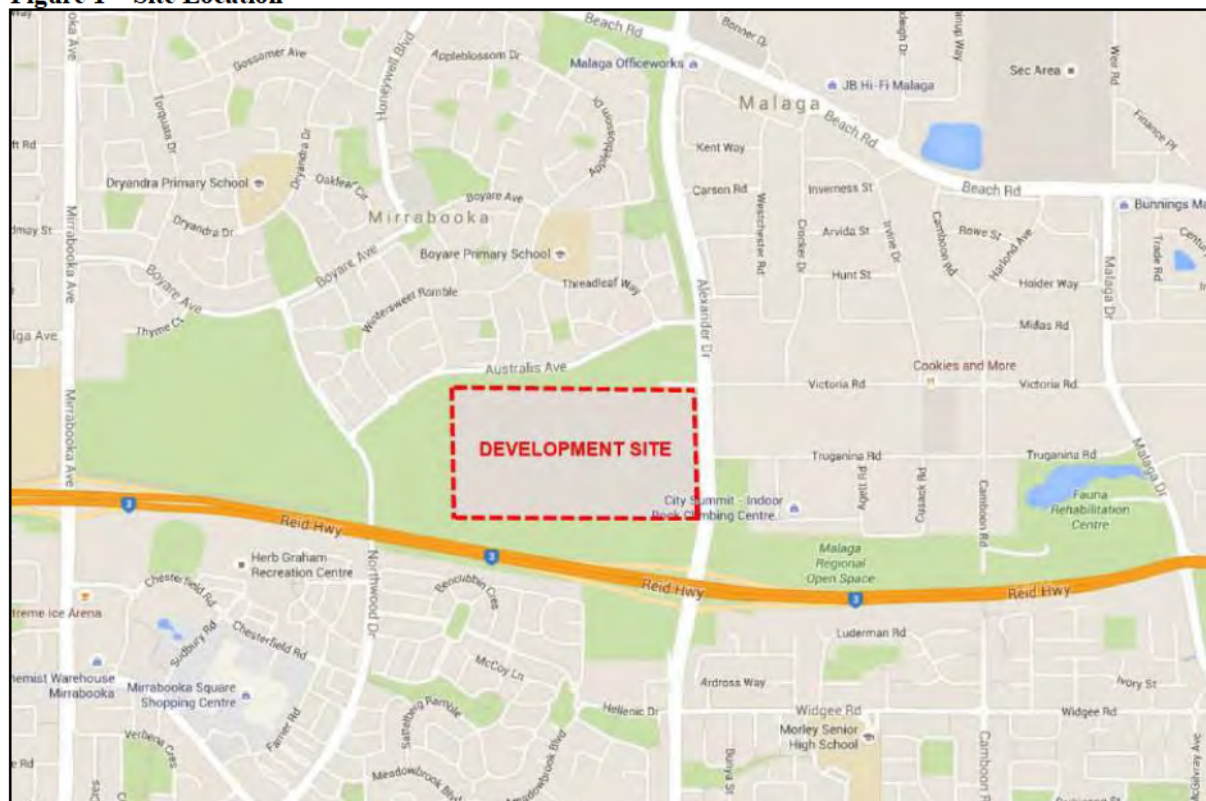
- Proposed development traffic generation and road network operation.
- Assess traffic impacts on the surrounding environment.
- Assess traffic impact on the surrounding road network for both safety and efficiency.

3.0 EXISTING SITE AND ACCESS

3.1 Development Location

The Site on Alexander Drive is located in the suburb of Mirrabooka within the City of Stirling as shown in **Figure 1**. The Site is bounded by Victoria Road to the north, Alexander Drive to the east, vacant land / Reid Highway to the south and State Government land to the west. The Site is located within Maps 4 and 8 of the City of Stirling Town Planning Scheme No 3. The site is approximately 350,000m².

Figure 1 – Site Location



(Google)

Main Roads Western Australia (MRWA) provides details of the Functional Road Hierarchy Classification for the Rural and Metropolitan road network. Details of the roads surrounding the development site according to the MRWA Urban Road Hierarchy are listed in the table below.

Table 1 - Surrounding Roads

Road	Classification	Speed Limit	Capacity veh/hr/lane	Geometry	Capacity Daily Flow
Reid Highway	Primary Distributor (State Road)	100	1,600 at LoS C	4 lane median-divided dual carriageway	50,000
Alexander Drive	District Distributor A	60	950 at LoS C	4 lane median-divided dual carriageway	19,000
Victoria Road	Local Distributor	60	950 at LoS C	Undivided two way single carriageway	19,000
Truganina Road	Access Road	50	800 at LoS C	Undivided two way single carriageway	6,000

3.2 Alexander Drive

Alexander Drive on the eastern side of the development area is a median-divided dual-carriageway. This road is classified as a District Distributor A under the MRWA Road Hierarchy with a posted speed zone of 70km/hr. Alexander Drive is intended to perform the function of carrying inter and intra-regional traffic. This allows frequent connections to local streets with a low percentage of trucks and a bus route.

The Site currently has two access points off Alexander Drive.

Traffic Counts were conducted at the intersection of Alexander Drive and Truganina Road on 3rd September 2015. Recorded traffic volumes are shown in **Table 2**.

Table 2 - Alexander Drive Traffic Counts

Location	Northbound vehicles/hour	Southbound vehicles/hour
Alexander Drive	1,167	1,680

MRWA has provided traffic count data for the intersection of Alexander Drive / Victoria Road and the intersection of Alexander Drive / Reid Highway. The traffic count data is shown within Table 3.

Table 3 - Alexander Drive – SCATS data

Intersection	Daily Traffic Volume	Northbound		Southbound	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Alexander Drive / Victoria Road	39,454	905	1,654	1,640	1,160
Alexander Drive / Reid Highway	44,946	1,599	1,925	1,805	1,710

3.3 Truganina Road

Truganina Road terminates at the intersection with Alexander Drive. This road is a single lane carriageway with an approximate 22m wide road reserve and 10m wide pavement with kerbing. Truganina Road is an access road with its predominant purpose being for the provision of vehicle access to abutting properties.

Traffic counts were conducted by the City of Swan west of the intersection of Alexander Drive and Truganina Road on 9 September 2014. Recorded counts are shown in **Table 4**.

Table 4 - Truganina Road Traffic Counts

Location	Eastbound vehicles/hour		Westbound vehicles/hour		Daily Counts
	AM	PM	AM	PM	
Truganina Road	447	275	206	429	3,518

3.4 Victoria Road

Victoria Road extends across both sides of Alexander Drive and along the northern boundary of the Site. This road is a Local Distributor and allows movement of traffic within local areas and connects access roads to higher order distributors. Victoria Road has approximately 20m width of road reserve a 7m wide seal and kerbing.

The Site currently has one access point off Victoria Road which has been temporarily modified to be used as an exit only.

MRWA has provided traffic count data for the intersection of Alexander Drive & Victoria Road. The Traffic Count data provided is shown in **Table 5**.

Table 5 - Victoria Road Traffic Counts

Location	Eastbound vehicles/hour		Westbound vehicles/hour		Daily Counts
	AM	PM	AM	PM	
Victoria Road	33	21	0	3	349

3.5 MRWA Traffic Crash Data

Main Roads WA interactive web site provides summary crash data. In the 5 years from 2010 to 2014 the following table shows the number of crashes recorded at the connecting intersections.

Table 6 – MRWA Traffic Crash Data

Intersection	Number of Crashes
Alexander Drive / Truganina Road	38
Alexander Drive / Victoria Road	34

Alexander Drive / Victoria Road

MRWA crash data for the intersection of Alexander Drive and Victoria Road shows a series of crashes for the last 5 recorded years. A summary is provided below in **Table 7**. The worst crash type recorded was rear end collisions of vehicles travelling southbound on Alexander

Drive. This implies that vehicles turning into Victoria Road eastbound cause unexpected deceleration of vehicles on Alexander Drive leading to a high frequency of crashes.

The frequency of this vehicle crash type could be reduced by the construction a left turn auxiliary slip lane into Victoria Road. Additionally a similar left turn auxiliary slip lane could reduce the incidence of rear end collisions due to vehicles slowing down to turn left into Victoria Road westbound.

Table 7 - MRWA Crash Data - Alexander Drive / Victoria Road

Crash Type	Number of Crashes
Rear end southbound on Alexander Drive	9
Rear end northbound on Alexander Drive	10
Rear end northbound turning right into Victoria Road	4
Right turn eastbound on Victoria Road with southbound vehicles	3
Other / Not recorded	8

Alexander Drive / Truganina Road

The intersection of Alexander Drive and Truganina Road has had a large number of vehicle accidents. A summary of these accidents are shown in **Table 8** below.

This data outlines an area of concern with the left turn movement out of Truganina Road southbound onto Alexander Drive and the nine right angle type crashes. The large volumes of traffic turning right into Truganina Road are likely inhibiting the right turn movement out. There are likely significant delays which could frustrate motorists who may then make a higher risk movement out of the intersection more so than they normally would, which could result in a collision.

Motorists wishing to turn left into Alexander Drive from Truganina Road may have their vision obscured by the right turning vehicles which in turn could promote risk taking and causing increases in the incidence of collisions. This matter is for the City of Swan and City of Stirling to resolve together. It is recommended that a Senior Road Safety Officer undertake an audit of the intersection to best determine the cause of the crashes and seek amelioration measures.

Table 8 - MRWA Crash Data - Alexander Drive / Truganina Road

Crash Type	Number of Crashes
Rear end southbound on Alexander Drive	2
Rear end northbound on Alexander Drive	2
Right Angled crashes	9
Rear end westbound on Truganina Road	18
Other / Not recorded	7

A copy of the MRWA Traffic Crash Data is located within **Appendix 1**.

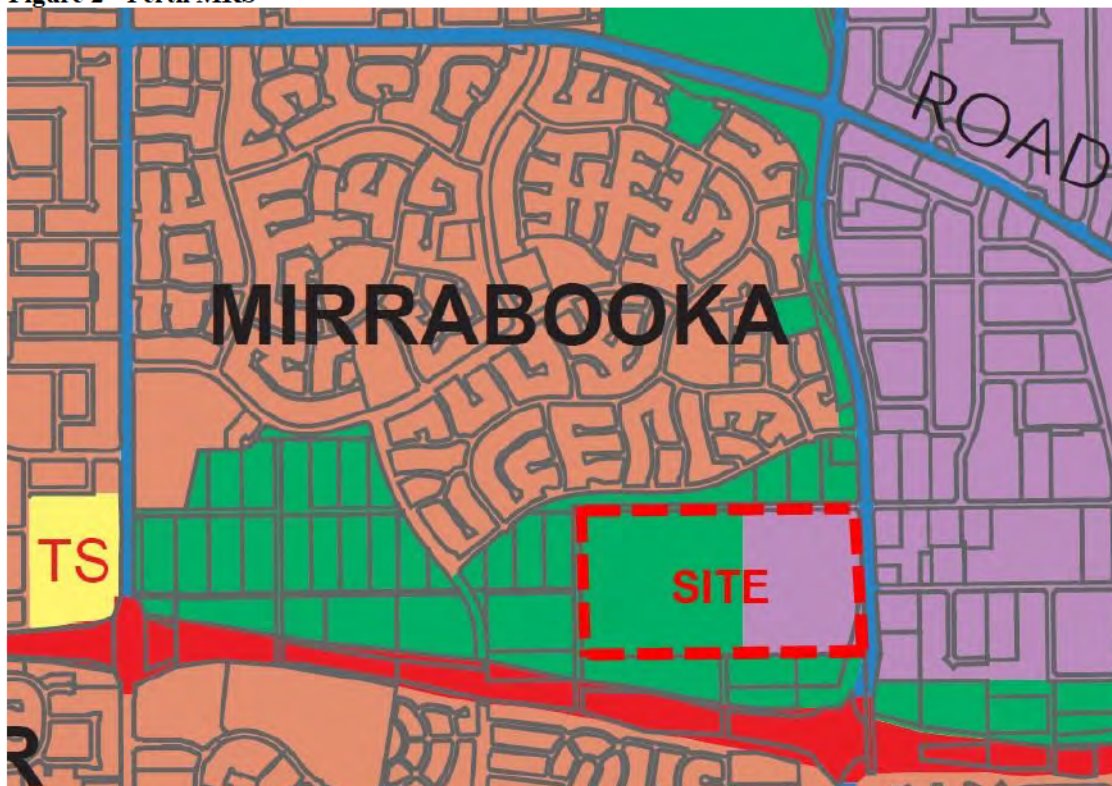
4.0 PROPOSED DEVELOPMENT

This section of the report details the investigations required to estimate the potential for traffic impact by the development.

4.1 Existing Scheme Zone

According to the City of Stirling Town Planning Scheme, the site has no current Local Scheme Zone associated with the Site. The Perth Metropolitan Regional Scheme (MRS) classifies the Site as a combination of Regional Open Space and Industrial. The site is split with Regional Open Space allocated to the western portion of the Site and Industrial to the Eastern Portion. A copy of the Perth MRS is shown within **Figure 2**. The subject site was rezoned from 'Private Institutions' to the 'Development' zone as part of Town Planning Scheme Amendment No. 42 which was approved by City of Stirling on 14 October 2014 and the Minister for Planning on 4 March 2015, however is yet to be published in the Government Gazette.

Figure 2 - Perth MRS



4.2 Proposed Local Structure Plan

The proposed Local Structure Plan (LSP) for the Site will reflect the current Metropolitan Regional Scheme with the western portion to be allocated as Parks and Recreation and the

eastern portion as Mixed Business. A copy of the proposed LSP is located within **Appendix 2**.

This document has been prepared with a general understanding of the proposed land use and limited specifics regarding the quantum of each land use type proposed.

5.0 INTERNAL TRANSPORT NETWORK

The proposed Indicative Layout Plan for the road network is intended to accommodate all internal traffic movements between lots and connection with major roads in the existing network. Access Roads connect each site with the Local Distributor and the District Distributor. These Access Roads should provide access to each internal development and a safe low speed environment.

The general proposed internal transport network is located within **Appendix 3**.

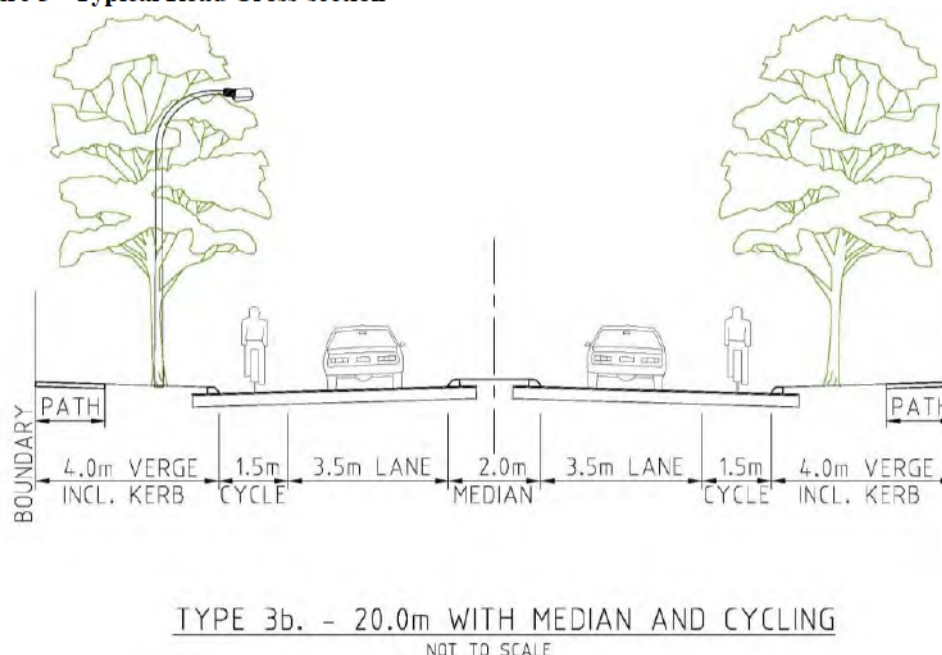
The proposed traffic network should be modified to include the following comments:

- The link between the internal eastbound Access Road and the major north south route is proposed as a left-right staggered intersection. The main access road that is connected with Victoria Road should be constructed with a roundabout instead of a 'T' intersection as shown on PCE sketch located within **Appendix 4**. Full 4 way access off this roundabout will allow vehicles to flow and not cause issues by construction of a left right staggered intersection.
- Access to each building should be positioned away from potential queued traffic. Queued traffic will likely form at the intersection of the proposed Access Road and Alexander Drive, Left-in Left-out. Additionally, access should be limited on the approach and departure of the suggested roundabout location. PCE has identified locations where access to buildings should be banned as shown on PCE sketch located within **Appendix 4**.
- Access to the Site is provided off Alexander Drive to the east of the Site and Victoria Road to the North. Existing access to the western portion of the site should be provided from Victoria Road. No access should be allowed through the Mixed Business Site.

Generally the internal road reserve widths of this commercial precinct should conform to the minimum widths outlined within WAPC Policy 4.1, Industrial Subdivisions. This Policy states that the minimum road reserve should be 20m wide.

The site should be constructed using the typical access road cross section shown in **Figure 3**.

Figure 3 - Typical Road Cross-section



5.1 Internal Traffic Management

Management of traffic flows on roads and at intersections within the proposed road network is a necessary requirement to maintain safe operation of the road network by minimising risk. T-junctions must be provided with adequate sight distance and where that is available the intersection requires only normal Give Way control. However where sight distance is restricted then a Stop Sign control may be more appropriate.

High traffic speeds exceeding the designated Speed Limit should not occur within the road network under the proposed cross-sections and where there are relatively short road lengths between controlled intersections.

The use of roundabouts at intersections offers multiple benefits including managing traffic speed, controlling intersection operation and potentially minimising limitations of access to the abutting the properties.

Alternately, mid-block traffic management devices may be considered, however depending on the location of the device and the width of property frontage such devices can inhibit property access and will reduce the width of verge thereby inhibiting the provision of footpaths, cycle paths, services, etc. Generally mid-block devices are not suitable for industrial roads.

6.0 EXTERNAL TRANSPORT NETWORK

The proposed Local Structure Plan includes the modifications of the following intersections:

- Alexander Drive / Victoria Road upgrade to allow greater access.
- Alexander Drive / Truganina Road modification of the Site access to allow Left in / Left out only on to Alexander Drive.

6.1 Intersection of Alexander Drive and Victoria Road

The intersection of Alexander Drive and Victoria Road has been modelled using the software package SIDRA 5.1. This program is capable of determining the key intersection performance indicators such as Degree of Saturation (DOS), Level of Service (LOS), Average Delay and 95% Queue.

- *Degree of Saturation (DOS)*; is the ratio of the arriving traffic to the theoretical capacity of the intersection of movement approach. DOS ranges from zero to one where one represents an intersection at full capacity.
- *Level of Service (LOS)*; represents a quantitative ranking of the traffic operational conditions experienced by users of a facility under specified conditions. LOS rank from A to F where A represents the best operational experience and F represents the worst.
- *Average Delay*; is the average of all vehicle delays for each movement or the entire intersection.
- *95% Queue*; is 95% of the average of maximum queue lengths experienced at an intersection for a particular movement.

These indicators can be used to measure the performance of an intersection for comparison before a development occurs and after the development is completed. This modelling allows a level of understanding of the likely impacts of a development and compare development scenarios to improve designs and performance.

Intersection Modelling results for the intersection of Alexander Drive and Victoria Road are shown below in **Table 9** and **Table 10**. This modelling was undertaken using the traffic count data provided by MRWA. The modelling shows that the existing intersection is currently operating near capacity during the AM with a degree of saturation of approximately **0.887** in the AM and **0.861** in the PM.

Figure 4 - SIDRA - Alexander Drive / Victoria Road – Existing Form

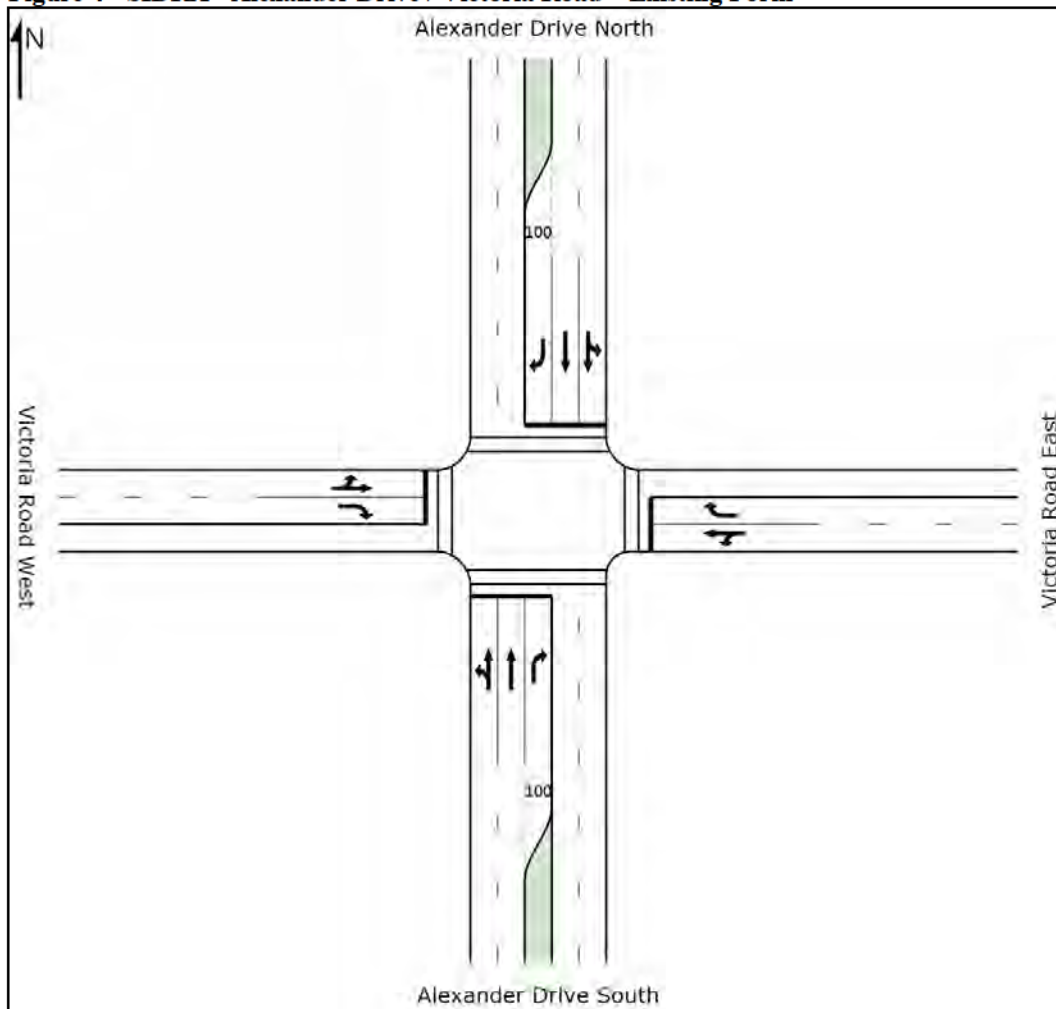


Table 9 -SIDRA - Alexander Drive / Victoria Road – Existing Results – AM

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
South: Alexander Drive South											
1	L	1	0.0	0.349	12.8	LOS B	10.9	76.5	0.31	1.03	45.6
2	T	1071	0.0	0.349	4.6	LOS A	10.9	76.5	0.31	0.28	51.6
3	R	157	0.0	1.046	182.8	LOS F	23.3	163.1	1.00	1.30	9.9
Approach		1229	0.0	1.046	27.5	LOS C	23.3	163.1	0.40	0.41	33.6
East: Victoria Road East											
4	L	148	0.0	0.635	76.6	LOS E	10.6	74.3	1.00	0.81	19.3
5	T	1	0.0	0.635	68.4	LOS E	10.6	74.3	1.00	0.81	19.4
6	R	34	0.0	0.176	72.3	LOS E	2.2	15.7	0.93	0.74	20.0
Approach		183	0.0	0.635	75.8	LOS E	10.6	74.3	0.99	0.80	19.4
North: Alexander Drive North											
7	L	83	0.0	0.559	14.2	LOS B	22.8	159.3	0.41	0.99	44.5
8	T	1643	0.0	0.559	6.0	LOS A	22.9	160.0	0.41	0.38	49.7
9	R	1	0.0	0.003	14.4	LOS B	0.0	0.1	0.29	0.66	42.9
Approach		1727	0.0	0.559	6.4	LOS A	22.9	160.0	0.40	0.41	49.4
West: Victoria Road West											
10	L	11	0.0	0.112	70.2	LOS E	0.7	5.2	0.91	0.68	20.5
11	T	1	0.0	0.112	62.0	LOS E	0.7	5.2	0.91	0.62	20.7
12	R	24	0.0	0.271	85.6	LOS F	1.8	12.6	0.99	0.72	17.9
Approach		36	0.0	0.271	80.4	LOS F	1.8	12.6	0.97	0.70	18.6
All Vehicles		3176	0.0	1.046	19.4	LOS B	23.3	163.1	0.44	0.43	38.3

Table 10 - SIDRA - Alexander Drive / Victoria Road – Existing Results – PM

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance		per veh	km/h
South: Alexander Drive South											
1	L	1	0.0	0.795	23.7	LOS C	25.3	176.9	0.86	0.98	38.7
2	T	1726	0.0	0.795	15.6	LOS B	25.3	176.9	0.86	0.83	39.7
3	R	182	0.0	0.874	52.8	LOS D	8.6	60.2	0.99	1.12	24.4
Approach		1909	0.0	0.874	19.1	LOS B	25.3	176.9	0.87	0.85	37.5
East: Victoria Road East											
4	L	279	0.0	0.555	32.4	LOS C	8.4	59.0	0.91	0.83	31.7
5	T	1	0.0	0.555	24.2	LOS C	8.4	59.0	0.91	0.76	32.2
6	R	214	0.0	0.513	32.2	LOS C	6.4	44.8	0.90	0.82	31.8
Approach		494	0.0	0.555	32.3	LOS C	8.4	59.0	0.90	0.82	31.7
North: Alexander Drive North											
7	L	64	0.0	0.562	19.0	LOS B	13.4	93.7	0.69	0.93	41.4
8	T	1154	0.0	0.562	10.8	LOS B	13.5	94.2	0.69	0.62	43.8
9	R	3	0.0	0.024	33.1	LOS C	0.1	0.6	0.81	0.67	31.4
Approach		1221	0.0	0.562	11.3	LOS B	13.5	94.2	0.69	0.64	43.7
West: Victoria Road West											
10	L	15	0.0	0.031	28.4	LOS C	0.4	2.8	0.76	0.70	33.7
11	T	1	0.0	0.031	20.2	LOS C	0.4	2.8	0.76	0.54	35.0
12	R	7	0.0	0.034	36.8	LOS D	0.2	1.6	0.89	0.67	29.9
Approach		23	0.0	0.034	30.7	LOS C	0.4	2.8	0.80	0.68	32.5
All Vehicles		3647	0.0	0.874	18.3	LOS B	25.3	176.9	0.82	0.77	38.3

6.2 Intersection of Alexander Drive and Truganina Road

6.2 Intersection of Alexander Drive and Truganina Road

The intersection of Alexander Drive and Truganina Road has been modeled with SIDRA using the existing traffic data provided by MRWA and count data collected. The results of this analysis are shown within **Table 11**.

Figure 5 - Alexander Drive and Truganina Road - Existing Intersection Form

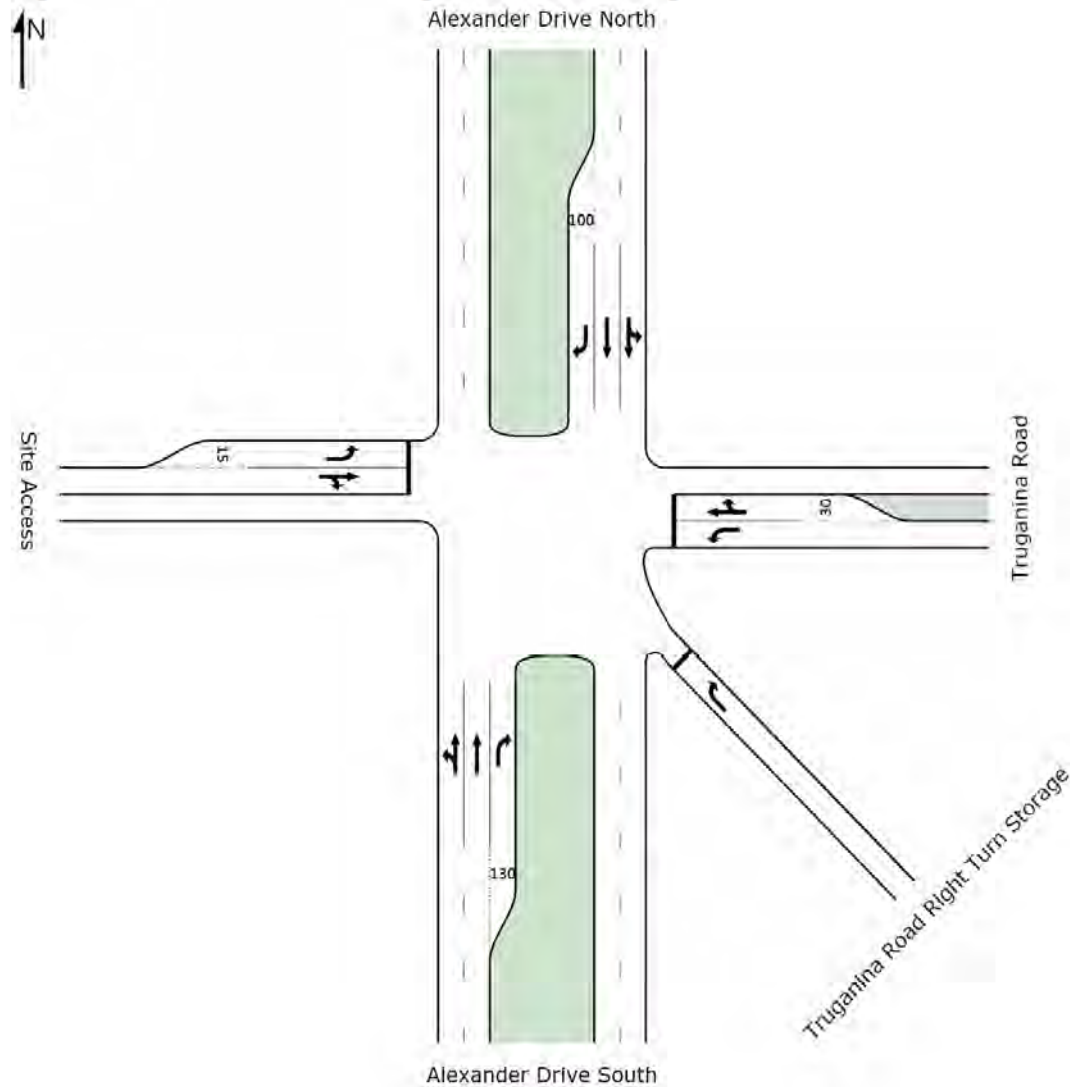


Table 11 - SIDRA - Alexander Drive & Truganina Road - Existing Traffic Results - AM

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Alexander Drive South											
1	L	12	0.0	0.318	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
2	T	1228	0.0	0.318	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	312	15.6	0.958	46.8	LOS E	7.7	61.5	0.99	1.80	26.5
Approach		1552	3.1	0.958	9.5	NA	7.7	61.5	0.20	0.37	47.7
South East: Truganina Road Right Turn Storage											
23	R	17	0.0	0.078	25.2	LOS D	0.2	1.7	0.83	1.00	36.8
Approach		17	0.0	0.078	25.2	LOS D	0.2	1.7	0.83	1.00	36.8
East: Truganina Road											
4	L	162	15.6	2.702	1621.2	LOS F	71.0	563.5	1.00	3.47	1.3
5	T	1	0.0	1.000 ³	639.8	LOS F	3.4	27.1	0.99	1.17	3.3
6	R	17	15.6	1.000 ³	639.0	LOS F	3.4	27.1	0.99	1.24	3.3
Approach		180	15.5	2.702	1522.8	LOS F	71.0	563.5	1.00	3.25	1.4
North: Alexander Drive North											
7	L	77	15.6	0.476	8.8	LOS A	0.0	0.0	0.00	1.06	49.0
8	T	1768	0.0	0.476	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	134	0.0	0.626	35.0	LOS E	2.7	19.2	0.93	1.12	30.7
Approach		1979	0.6	0.626	2.7	NA	2.7	19.2	0.06	0.12	55.9
West: Site Access											
10	L	2	0.0	0.010	25.2	LOS D	0.0	0.2	0.82	0.96	36.4
11	T	1	0.0	1.000 ⁴	3758.4	LOS F	4.1	28.9	1.00	1.02	0.6
12	R	1	0.0	1.000 ⁴	3756.7	LOS F	4.1	28.9	1.00	1.02	0.6
Approach		4	0.0	1.000	1891.4	LOS F	4.1	28.9	0.91	0.99	1.1
All Vehicles		3732	2.4	2.702	81.1	NA	71.0	563.5	0.17	0.38	18.6

Results of this analysis show that the existing intersection is currently operating at capacity during the AM Peak hour.

7.0 PROPOSED INTERSECTION OPERATION 2025

The following assumptions have been made to determine the traffic distribution at the intersection of Alexander Drive and Victoria Road once the Site is completely developed:

- Traffic travelling northbound on Alexander Drive would use the intersection of Alexander Drive and Truganina Road to access the Site.
- 10% of traffic travelling southbound on Alexander Drive would turn left onto Victoria Road.
- 50% of traffic would arrive or depart the Site via Reid Highway.
- General office buildings would generate traffic at a rate of 1.67 trips/m² in the **AM** with 88% entering and 12% exiting.
- General office buildings would generate traffic at a rate of 1.60 trips/m² in the **PM** with 17% entering and 83% exiting.
- Bulky goods (electronics superstore) would generate traffic at a rate of 3.72 trips/m² in the **AM** with 53% entering and 47% exiting.

- Bulky goods (electronics superstore) would generate traffic at a rate of 4.84/m² in the PM with 49% entering and 51% exiting.
- 50% of the Site will be general office buildings and 50% will be bulky goods.

Using the above assumptions SIDRA modelling was used to assess the traffic signals at Alexander Drive and Victoria Road for the increased traffic generated by the proposed mixed business development only. This scenario does not include any potential for commercial/residential development by others that may occur and contribute additional traffic generation along Alexander Drive.

Under this scenario it is assumed that the development will be completed in its entirety and no further traffic generating development will occur on the Site. **Table 12** below estimates the additional traffic potential for this intersection at saturation.

Table 12 - Alexander Drive & Victoria Road - Possible Additional Development Traffic

	Movement	Additional Possible Traffic Generation
<i>AM Peak Hour</i>	Alexander Drive right turn into the Site	250 vehicles per hour
	Victoria Road west combined left / through / right movements	150 vehicles per hour
<i>PM Peak Hour</i>	Alexander Drive right turn into the Site	200 vehicles per hour
	Victoria Road west combined left / through / right movements	300 vehicles per hour

The intersection of Alexander Drive and Victoria Road would be impacted by the proposed development. Traffic generation from the Site would utilise the traffic networks internal to the site as shown on the Indicative Layout Plan. This traffic would likely enter and exit the site via Alexander Drive / Victoria Road or Alexander Drive / Truganina Road as per the assumption made earlier in this report.

The Intersection of Alexander Drive and Victoria Road could operate without failure with the following traffic generating land uses as shown in **Table 13**.

Table 13 - Potential Maximum Land Use

Land Use	Maximum Gross Floor Area
General office building	35,000m ²
Bulky goods store	35,000m ²

SIDRA results intersection of Alexander Drive and Victoria Road for the 2025 development scenario are shown within **Table 14**

Table 14 – 2025 Development Scenario – Alexander Drive & Victoria Road

Movement Performance – Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alexander Drive South											
1	L	1	0.0	0.570	42.7	LOS D	25.6	179.2	0.81	0.93	28.9
2	T	942	0.0	0.570	34.5	LOS C	25.9	181.0	0.81	0.72	29.6
3	R	286	0.0	0.889	86.0	LOS F	23.2	162.1	1.00	0.95	17.8
Approach		1229	0.0	0.889	46.5	LOS D	25.9	181.0	0.86	0.77	25.6
East: Victoria Road East											
4	L	148	0.0	0.862	90.4	LOS F	12.0	83.7	1.00	0.92	17.2
5	T	1	0.0	0.862	82.2	LOS F	12.0	83.7	1.00	0.92	17.3
6	R	34	0.0	0.194	77.2	LOS E	2.3	16.3	0.96	0.73	19.2
Approach		183	0.0	0.862	87.9	LOS F	12.0	83.7	0.99	0.89	17.5
North: Alexander Drive North											
7	L	83	0.0	0.912	57.1	LOS E	65.0	455.0	1.00	1.00	24.3
8	T	1643	0.0	0.912	48.9	LOS D	65.2	456.7	1.00	1.00	24.5
9	R	211	0.0	0.620	61.7	LOS E	13.3	93.2	0.92	0.82	22.2
Approach		1937	0.0	0.912	50.6	LOS D	65.2	456.7	0.99	0.98	24.2
West: Victoria Road West											
10	L	47	0.0	0.502	79.3	LOS E	3.4	23.9	0.98	0.74	18.8
11	T	1	0.0	0.502	71.1	LOS E	3.4	23.9	0.98	0.73	19.0
12	R	137	0.0	0.850	90.1	LOS F	10.9	76.1	1.00	0.91	17.2
Approach		185	0.0	0.850	87.2	LOS F	10.9	76.1	0.99	0.87	17.6
All Vehicles		3535	0.0	0.912	53.0	LOS D	65.2	456.7	0.94	0.90	23.8

8.0 PEDESTRIANS AND CYCLISTS

Planning guidelines recommend provision of a footpath along every street with a developed frontage. Footpaths should be a minimum of 2m wide in front of commercial centres. A Principal Shared Path (PSP) should be constructed along the development frontage to Alexander Drive and Victoria Road.

On-Street cycle lanes should be constructed throughout the Site as shown within **Figure 3** earlier in this report. This internal cycle network could connect to the PSP along Victoria Road and Alexander Drive.

The Perth Bicycle Network surrounding the site is shown within **Figure 6** below. There are existing shared paths along the western side of the Alexander Drive road reserve that connect to the wider network.

Figure 6 - Perth Bicycle Network



9.0 PUBLIC TRANSPORT

The following Transperth Bus Routes operate along Alexander Drive past the proposed development Site:

- Transperth bus routes 886 & 887 operates between the Roe Street Bus Station (Perth CBD) and Alexander Heights Shopping Centre.
- Transperth bus route 889 operates between the Roe Street Bus Station (Perth CBD) to Lassen Park off Guadalupe Drive (Ballajura)

Bus Stop No. 12844 is located on the western side of the Alexander Drive road reserve north of Truganina Road.

Figure 7 - Transport Bus Routes



10.0 SUMMARY

Estimated traffic generation and arrangements for operation of the proposed Local Structure Plan road network have been assessed. Traffic generation by the proposed development area is anticipated to be in accordance with permitted land use as described by current practice trip generation rate guidelines.

For the proposed Local Structure Plan the following has been identified:

- The proposed development internal street network layout and operation will be sufficient provided that a roundabout is installed and access is restricted adjacent to intersections as shown within **Appendix 4**.
- Provision of a high quality pedestrian and bicycle network interconnected with the existing network will be sufficient to meet the needs of the proposed land development area.
- The intersection of Alexander Drive/Victoria Road has capacity that could potentially allow for 35,000m² of General Office Gross Floor area and 35,000m² of Bulky Goods Shops Gross Floor area. This intersection will likely need to be upgraded should any further development occur on the Site.
- It is recommended that a more detailed traffic management assessment is undertaken when exact land use areas are determined.
- The intersection of Alexander Drive/Truganina Road is currently near capacity and could not accommodate additional traffic without upgrading to a signalised intersection. This intersection will also require modification to only allow left in/left out movements from the Site until it has been upgraded to signalised control.
- It is recommended that a Senior Road Safety Auditor conduct an audit and review the intersections of Alexander Drive/Victoria Road and Alexander Drive/Truganina Road to determine the cause and possible solutions to the vehicle crashes recorded over the previous five years from 2009 to 2014.

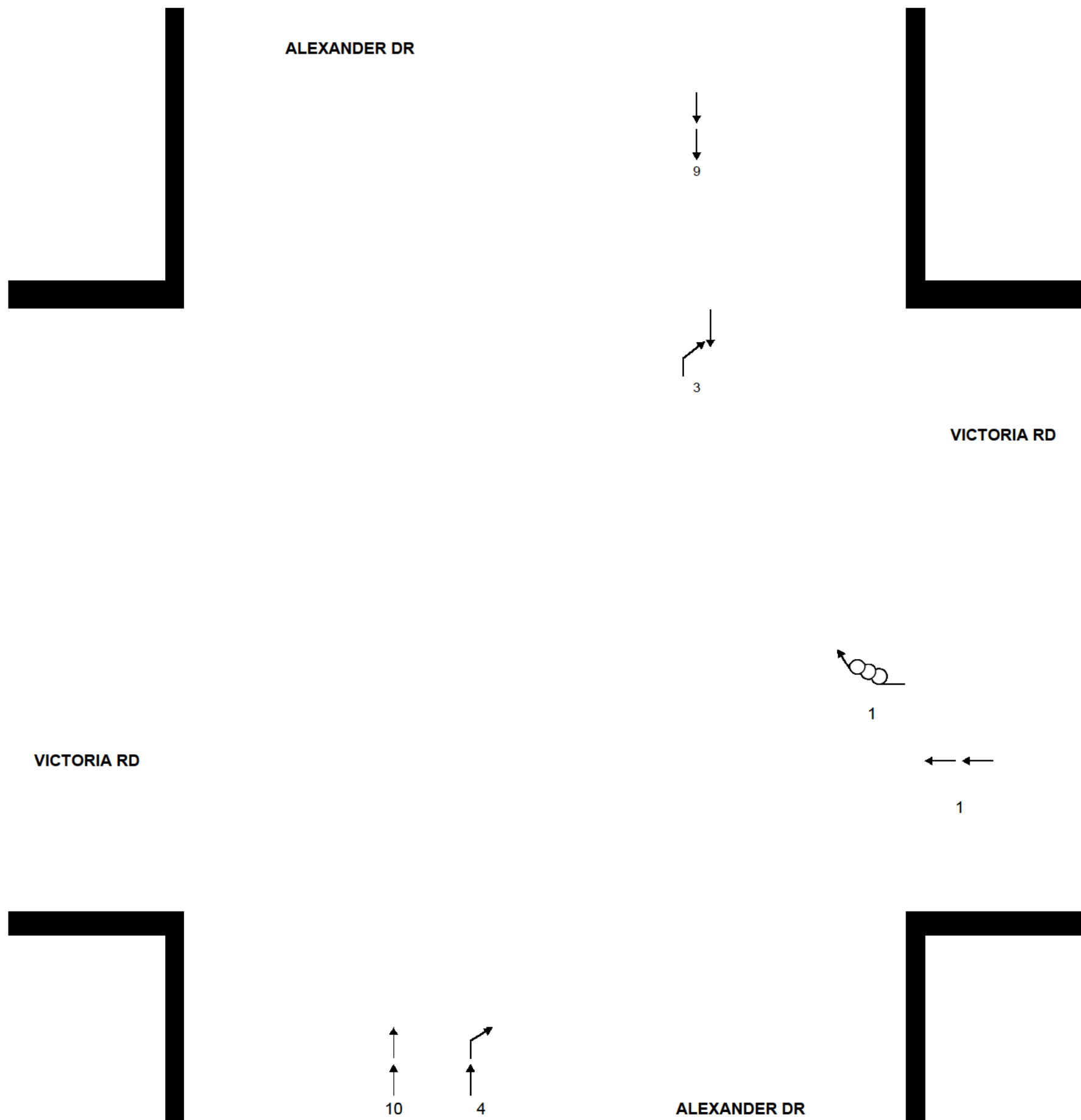
APPENDIX 1
MRWA Crash Data

Collision Diagram Report

Parameter	Value
Job Id	121285520
Intersection	55283 - VICTORIA RD & ALEXANDER DR
From Date	2010
To Date	2014
Accident Type	All
Severity	All
Atmospheric Conditions	All
Horizontal Geometry	All
Vertical Geometry	All
Surface Type	All
Gender Of Driver	All
Road User Type	All
Crash Type	All
Rum Series	All
Crash Location	All
Traffic Control	All
Day of Week	All
Time of Day	All
Light Conditions	All
Hit Object Crashes	All
Approach Leg	All

Collision Diagram Report

Intersection: 55283 - VICTORIA RD & ALEXANDER DR



Note

The crashes depicted above are placed figuratively, the exact location of the crashes is not indicated in this diagram.

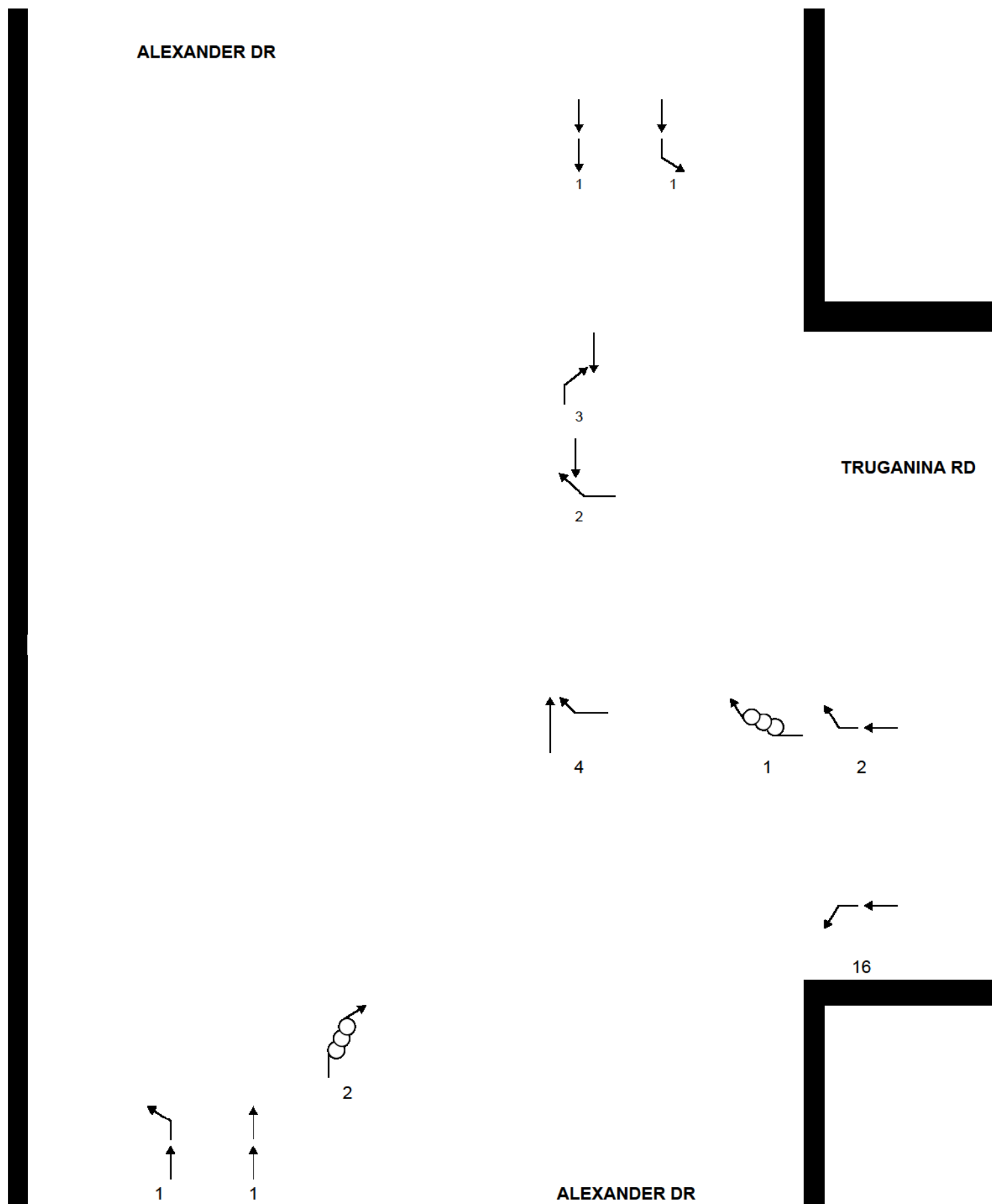
Only RUM codes 11-19, 22, 31, 32, 33 ,76 & 77 display within the collision diagram

Collision Diagram Report

Parameter	Value
Job Id	120881391
Intersection	59511 - TRUGANINA RD & ALEXANDER DR
From Date	2010
To Date	2014
Accident Type	All
Severity	All
Atmospheric Conditions	All
Horizontal Geometry	All
Vertical Geometry	All
Surface Type	All
Gender Of Driver	All
Road User Type	All
Crash Type	All
Rum Series	All
Crash Location	All
Traffic Control	All
Day of Week	All
Time of Day	All
Light Conditions	All
Hit Object Crashes	All
Approach Leg	All

Collision Diagram Report

Intersection: 59511 - TRUGANINA RD & ALEXANDER DR



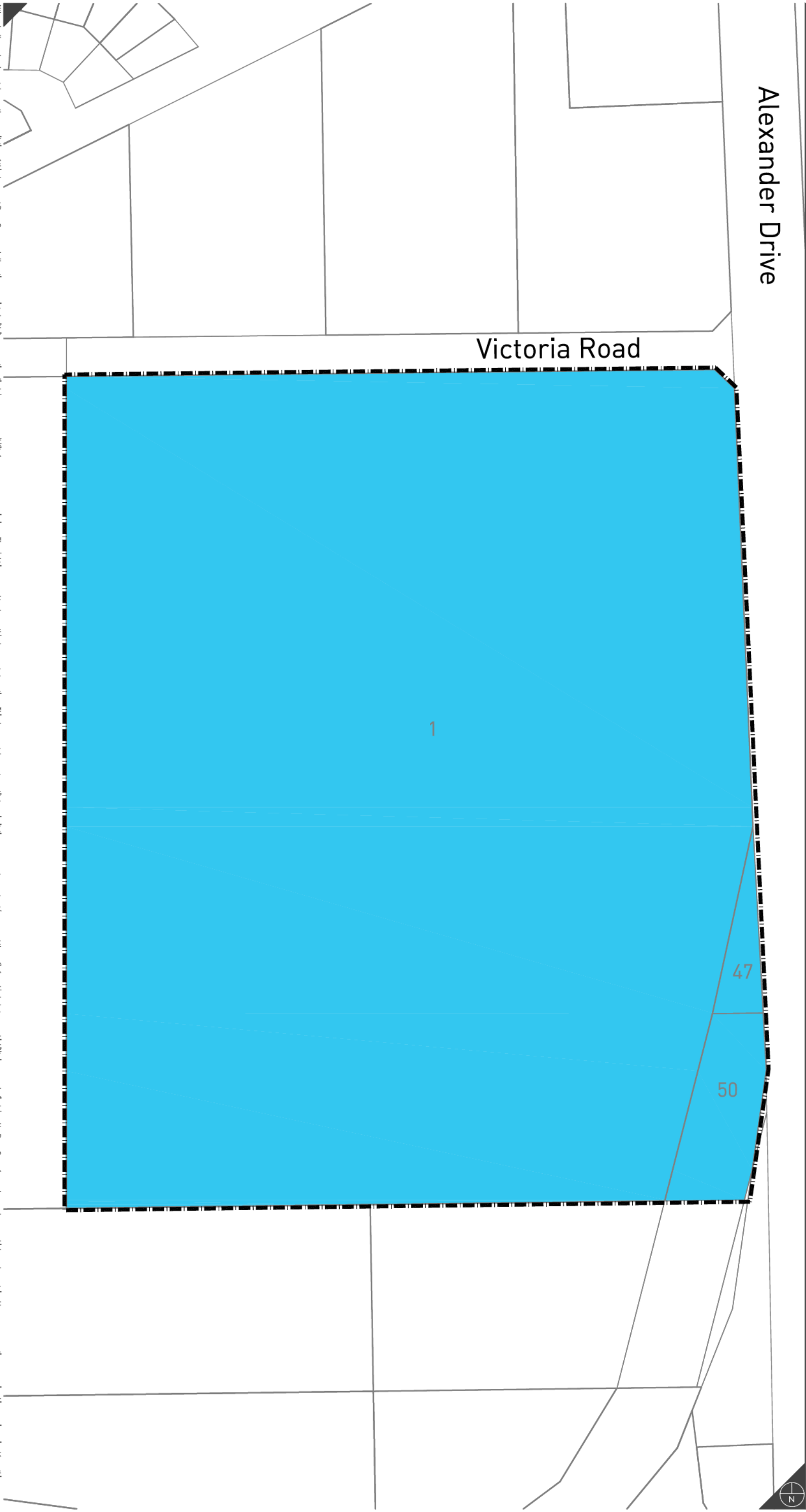
Note

The crashes depicted above are placed figuratively, the exact location of the crashes is not indicated in this diagram.

Only RUM codes 11-19, 22, 31, 32, 33 ,76 & 77 display within the collision diagram

APPENDIX 2
Proposed Local Structure Plan

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Planning Design Delivery



- LEGEND
- 7 Existing Lot Numbers
 - Existing Boundaries
 - MIXED USE
 - Mixed Business
 - OTHER
 - Structure Plan Boundary

0 50 100 Metres

REVISIONS

Rev	Date	Drawn
A	2014.08.27	M. Sullivan



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PLANNING DESIGN DELIVERY

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p: 08 9221 1991

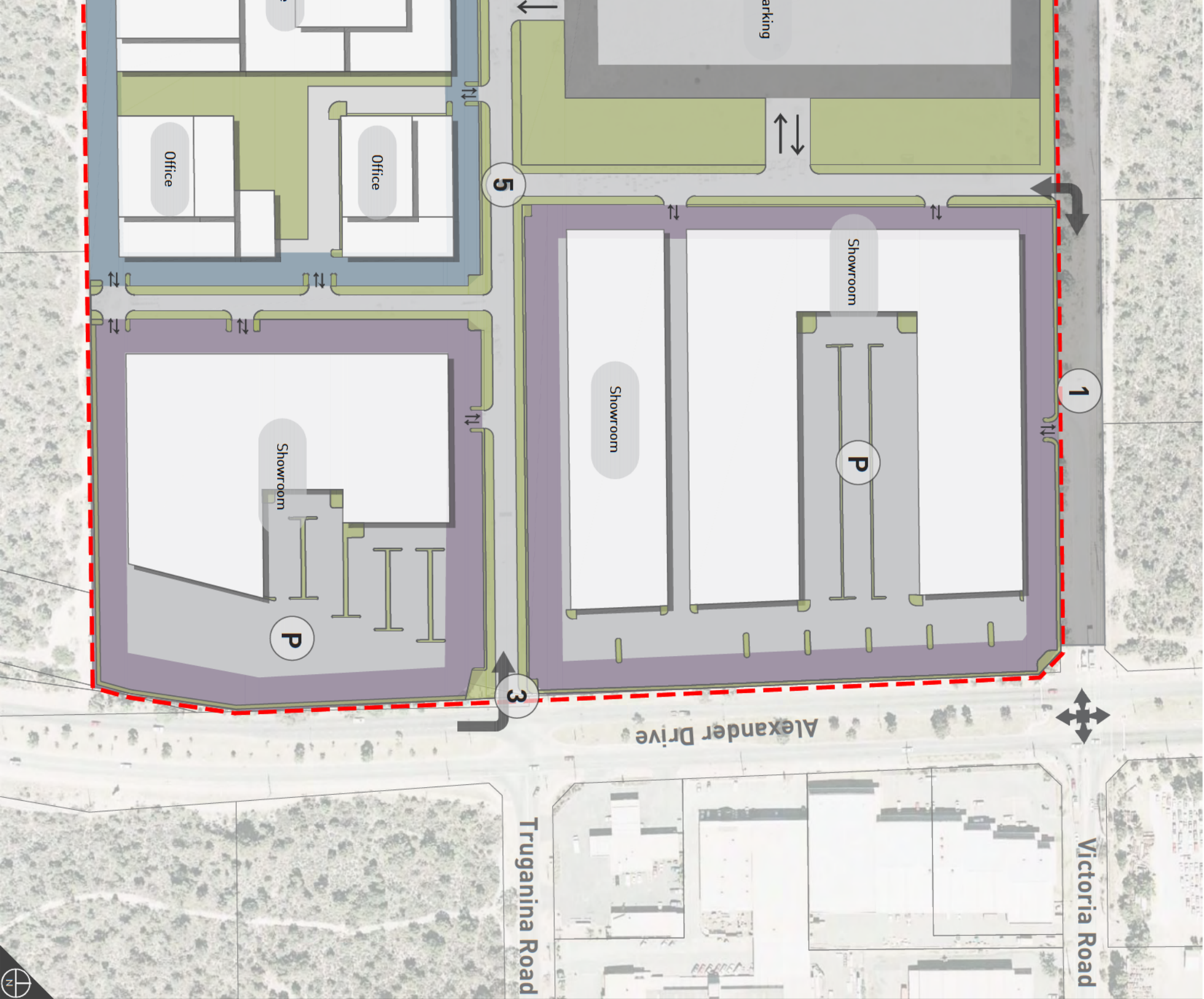
Date Drawn:	2014-08-27
Job Ref:	1878
Scale:	1:2000 @ A3
Client:	Atlas Bricks
Designer:	P. Fitzgerald
Drawn:	M. Sullivan
Projection:	MGA50 GDA94
Plan ID:	1878-LSP-01-A

Cadastre supplied by JUROVICH SURVEYING

Local Structure Plan

Portion of Lot 1 Alexander Drive,
Mirrabooka
Plan 1

APPENDIX 3
Proposed Internal Transport Network



Lot 1 (No. 501) Alexander Drive
Mirrabooka
Figure 7

Planning Design Delivery



LEGEND

- Subject Site
- Commercial - Showrooms
- Commercial - Offices
- Carparking
- Landscaping

- Victoria Road to be upgraded for the length of the LSP boundary.
- Access to landfill and excavation area to be maintained for Atlas Brick
- Left in access only
- Proposed future 'parks and recreation'. Landfill and excavation to continue until a time as agreed between the Western Australian Planning Commission and the landowner.
- Indicative Roundabout Location
- Indicative Open Car Parking
- Existing Signalized Intersection (4-way movement)

Note: Proposed development scenario shown is indicative only and subject to further detailed design at subdivision/development stage.

0 75 150 Metres

REVISIONS

Rev	Date	Drawn
E	2015.11.06	W. Clements
F	2015.11.12	W. Clements



W: www.rowegroup.com.au
e: info@rowegroup.com.au
P: 08 9221 1991

Date Drawn: 2015.10.12
Job Ref: 1878
Scale: 1:2000 @ A3
Client: Atlas Group Pty Ltd
Designer: R. Dial
Drawn: W. Clements
Projection: MGA50 GDA94
Plan ID: 1878-FIG-11-F
Aerial Photography captured and supplied by Neemap

APPENDIX 4

Internal Network Suggestions

-  Subject Site
-  Commercial - Showrooms
-  Commercial - Offices
-  Carparking
-  Landscaping

- 1 Victoria Road to be upgraded for the length of the LSP boundary.
 - 2 Access to landfill and excavation area to be maintained for Atlas Brick
 - 3 Left in access only
 - 4 Proposed future 'parks and recreation'. Landfill and excavation to continue until a time as agreed between the Western Australian Planning Commission and the landowner.
 - P Indicative Open Car Parking
-  Existing Signalized Intersection (4-way movement)

0 75 150 Metres

Rev	Date	Drawn
A	2015.10.12	W. Clements
B	2015.10.21	W. Clements
C	2015.10.29	W. Clements
D	2015.11.02	W. Clements



W: www.rowegroup.com.au
E: info@rowegroup.com.au
P: 08 9221 1991

Date Drawn: 2015.10.12
Job Ref: 1878
Scale: 1:2000 @ A3
Client: Atlas Group Pty Ltd
Designer: R. Dial
Drawn: W. Clements
Projection: MGA50 GD494
Plan ID: 1878-FIG-11-D

Aerial Photography captured and supplied by Hexagon



Indicative Layout Plan

NITTON PLANNING/100-1991/ET/DRAFTING-JACAD/1078_F0110_20251102 MIRAGSOWA ENDICATIVE LAYOUT PLAN LOWE
 883 East 9th Avenue 2 November 2015

Lot 1 (No. 501) Alexander Drive
Mirrabooka
Figure 7



Level 2 Kishorn Court
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APPENDIX 4

SERVICING REPORT



ROWE GROUP

SERVICING REPORT

**LOT 1 (#501)
ALEXANDER DRIVE,
MIRRABOOKA**

Porter



Report Prepared For:

ATLAS GROUP PTY LTD

Report Prepared By:

PORTER CONSULTING ENGINEER

PO Box 1036

CANNING BRIDGE WA 6153

Phone: (08) 9315 9955

Fax: (08) 9315 9959

Email: office@portereng.com.au

Job No: 15-07-105

Date: 25/11/2015

Our Ref: R59D.15

Rev: D

Checked: S. Myls

CONTENTS

1.0	INTRODUCTION	1
2.0	PROPOSED DEVELOPMENT	2
2.1	Existing Scheme Zone	2
2.2	Proposed Local Structure Plan	2
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3.3	Sewer	6
3.4	Power	7
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4.0	SUMMARY OF COSTS.....	11

APPENDICES

- 1. Local Structure Plan**
- 2. DBYD Data**
- 3. Proposed Indicative Development Layout**

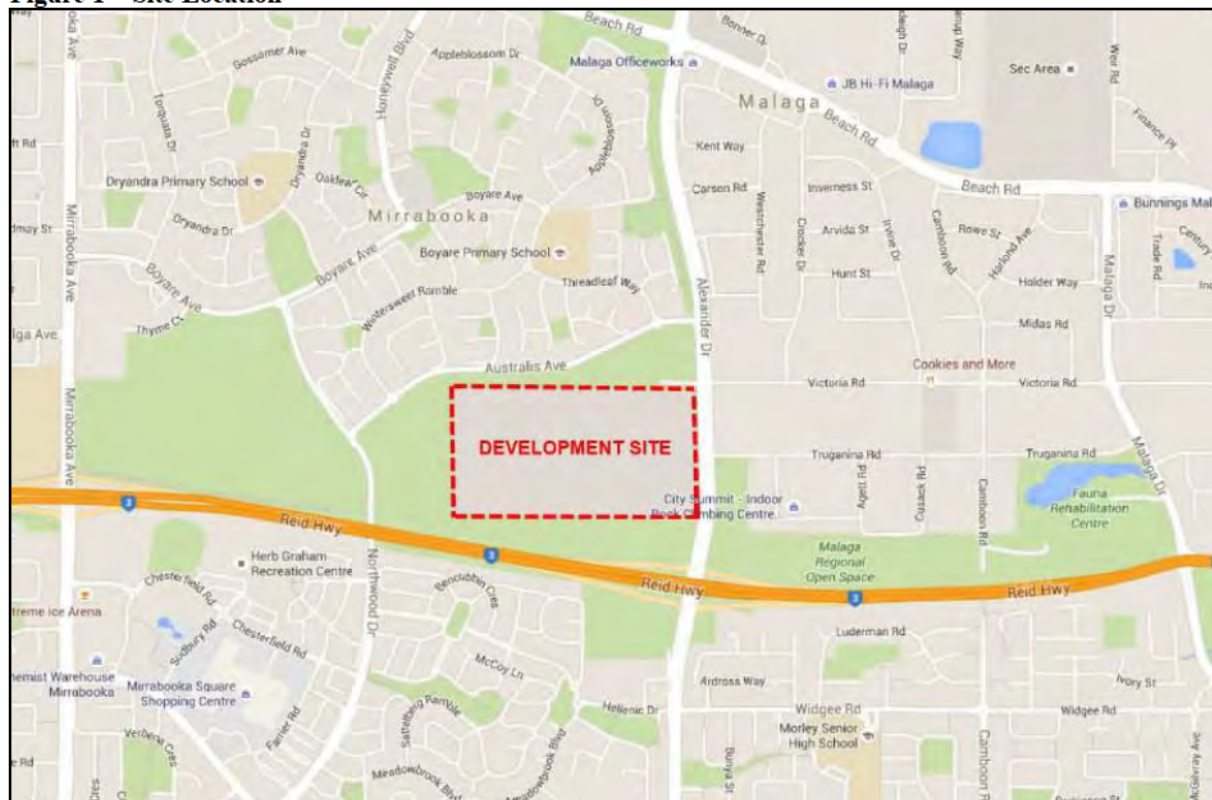
1.0 INTRODUCTION

Porter Consulting Engineers (PCE) has been engaged by the Atlas Group Pty Ltd to investigate the infrastructure and servicing requirements for the proposed redevelopment of the existing Atlas Group Brickworks at Lot 1 (#501) Alexander Drive, Mirrabooka (the Site). This investigation is to support a Local Structure Plan for the Site and future subdivision.

The purpose of this report is to examine infrastructure aspects of the Site, in particular the servicing for water, sewer, power, gas and telecommunications. Additional to servicing constraint investigations we have also determined the likely drainage requirements of the Site including groundwater and existing geology implications to the proposed development.

The Site is located in the Suburb of Mirrabooka within the City of Stirling as shown within **Figure 1**. The Site is bounded by Victoria Road to the north, Alexander Drive to the east, vacant land / Reid Highway to the south and State Government land to the west. The site is approximately 35ha in area.

Figure 1 – Site Location



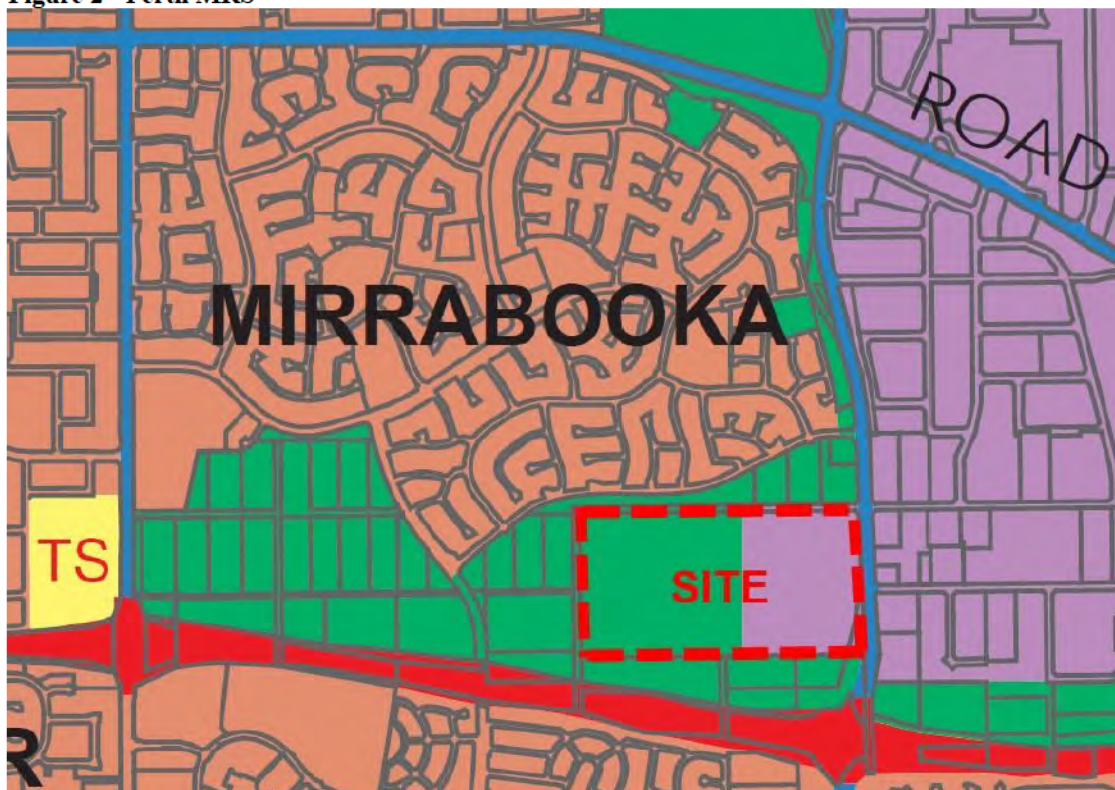
(Google)

2.0 PROPOSED DEVELOPMENT

2.1 Existing Scheme Zone

According to the City of Stirling Town Planning Scheme No.3, the site has no current Local Scheme Zone associated with the Site. The subject site was rezoned from ‘Private Institutions’ to the ‘Development’ zone as part of Town Planning Scheme Amendment No. 42 which was approved by City of Stirling on 14 October 2014 the Minister for Planning on 4 March 2015, however is yet to be published in the Government Gazette. The Perth Metropolitan Regional Scheme (MRS) classifies the Site as a combination of Regional Open Space and Industrial. The site is split with Regional Open Space allocated to the western portion of the Site and Industrial to the eastern portion. A copy of the Perth MRS is shown in **Figure 2**.

Figure 2 - Perth MRS



2.2 Proposed Local Structure Plan

The proposed Local Structure Plan (LSP) for the Site will reflect the current Metropolitan Regional Scheme with the western portion to be allocated as Parks and Recreation and the eastern portion as Mixed Business. A copy of the proposed LSP is located within **Appendix 1**.

This document has been prepared with a general understanding of the proposed land use and limited specifics regarding the quantum of each land use type proposed.

3.0 SERVICES

There are currently services located adjacent to the development within the Alexander Road reserve. Porter Consulting Engineers submitted Dial Before You Dig (DBYD) requests on 14 August 2015. The data collected from this request is shown in **Appendix 2**.

3.1 Earthworks / Drainage

The Site has been identified by the Department of Mines and Petroleum, Perth Metropolitan Region Environmental Geology Series mapping as showing a combination of geology over the site. Predominately the Site is comprised of two types of sand, Tamala and Bassendean sands. Both sands are highly permeable and suitable for water infiltration.

The Site is currently used as a brickworks, concrete works, soils stockyard, sand quarry and landfill site with operations commencing in the 1960's. The Site's natural topography falls from east to west with significant earthworks throughout the site. An earthworks area exists on the eastern portion of the Site where current brick manufacturing works occurs, including building and support infrastructure. The site varies in height between RL 74m AHD at the north east corner to the lowest point RL 38 AHD in the north western corner with the manufacturing operations occurring around RL 44m AHD.

There are currently five existing basin located on the site. These basins have the following estimated storage volume:

Northern Basin	3,000m ³ - 4,000m ³
South Eastern Basin	500m ³ - 1,000m ³
Western Basin	1,500m ³ - 2,500m ³
Brickworks Basin	800m ³ - 1,200m ³
Temporary Basin	200m ³ - 300m ³
Total Storage	6,000m³ - 9,000m³

The Site has an existing high level overflow into the Alexander Drive road reserve, south of Truganina Road.

Some of the existing basins on the Site have been lined with fine materials from the processing facilities onsite. It is recommended that these fines be removed. This will increase the permeability of the basins. **Figure 3** shows the fine particles deposited in the basin from the brickworks area.

Figure 3 - Existing South Western Basin



The Institute of Public Works Engineering Australian (IPWEA) publication, Local Government Guidelines for Subdivisional Development should be applied to the drainage design of the proposed development. The following key aspects should be highlighted when preparing the design of the development:

- The development Site should have a piped drainage network with capacity to cater for storm events up to and including the 1 in 10 year event.
- All development buildings finished floor levels should be constructed 500mm above the 1 in 100 year event.
- Stormwater basins should be constructed to detain the 1 in 10 year storm event.

Groundwater

The following publications have records of the groundwater levels for the Site:

- Perth Groundwater Atlas (1997) states the Maximum Recorded Groundwater Levels for the Site range between RL 28 to 30m AHD.
- Perth Groundwater Atlas (2004) the Average Maximum Groundwater Levels for the Site range between RL 26 and 27m AHD.

Groundwater bores are located on the Site. These bores currently supply the brickwork manufacturing process and surrounding garden areas. Once the current operations on the Site are completed these bores should be decommissioned. The *National Uniform Drillers Licensing Committee*, supported by the *Australian Government National Water Commission*, has prepared guidelines on decommissioning bores titled Minimum Contraction Requirements for Water Bores in Australia. These guidelines should be followed when decommissioning the bores on the Site.

Figure 4 - Western Bore



Development

Development of the Site will need to process onsite stormwater in accordance with standard IPWEA Guidelines. Processing of the 1 in 10 year ARI event will require the use of Stormwater Basins and/or Soakage pits and pit network. Due to the size of the proposed development it is likely the best method of processing Stormwater would be through the use of Stormwater Basins. A 1 in 10 year storm event would generate approximately 7,000 – 9,000m³ of water over a 1 hour period. A Stormwater basin of this size or a series equaling this size should be provide on Site depending on the final development.

Required Basin Size	7,000 – 9,000m ³
---------------------	-----------------------------

3.2 Water

The Water Corporation is the State Authority that controls the supply and distribution of water within the Perth metropolitan area. The following water infrastructure is located adjacent to the Site:

- 200mm diameter asbestos cement water reticulation main exists on the eastern side of the Alexander Drive road reserve.
- 375mm diameter asbestos cement distribution main located on the north corner of the intersection of Alexander Drive and Victoria Drive.

The Site has an existing water connection off the 200mm reticulation main. This connection is located adjacent to the intersection of Alexander Drive and Truganina Road.

Figure 5 - Existing Water Connection



The Site has an existing 150mm diameter PVC fire service with water connection from the 375mm distribution main. A fire booster is located adjacent to the Alexander Drive road reserve. An internal 150mm PVC fire mains has been installed throughout the site with hydrants located as required.

Figure 6 - Fire Booster



3.3 Sewer

The Water Corporation is the State Authority responsible for the collection and processing of wastewater within the Perth Metropolitan area. Water Corporation has the following infrastructure within the area of the Site:

- 225mm diameter gravity sewer reticulation main located within Victoria Road approximately 150m from the Site. This service has a recorded Invert Level (IL) of 35.32m AHD. Sewer connection to the Site from this service would require installation at a grade of 1:200 unless the hydraulics consultant could confirm that the peak flow is greater than 3L/s. At 1:200 grade the sewer IL level would be 36.57m AHD to reach the Site.

- 225mm diameter gravity sewer reticulation main located within Truganina Road approximately 200m from the Site. This service has a recorded Invert Level (IL) of 37.16m AHD. Sewer connection to the Site from this service would require installation at a grade of 1:200 unless the hydraulics consultant could confirm that the peak flow is greater than 3L/s. At 1:200 grade the sewer IL level would be 38.16m AHD to reach the Site.
- The existing wastewater pipes in the vicinity of the Site gravity feed into the Harris Road Pump Station on Harris Road.

Development

The most likely method to service the Site would be to extend the existing Truganina Road sewer through the centre of the site. Should this occur, the likely minimum height the proposed buildings finished floor levels would need to be is RL 45 to 46 m AHD. This level could potentially be reduced at detailed design stages and once the final development is known.

Once the details of the proposed development are known then the Water Corporation will need to be contacted to confirm the capacity of the existing downstream pump station to handle the additional wastewater generated from the development. PCE has contacted Water Corporation to get an understanding of the existing capacity of the pump station. Water Corporation confirmed that at last revision of the future planning of the pump station the pump was operating with an average of 7.9L/s flow. Water Corporation have confirmed that future planning shows the pump station pump rate at 10.6 L/s. Water.

3.4 Power

Porter Consulting Engineers understand that LMS Energy Pty Ltd provides power to the Site and all the industrial operations, however LMS Energy has an agreement with Western Power to supply power into the Western Power electrical grid and Western Power service the Site in case of power generation failure onsite.

Landfill Gas

The existing operations of the Site include collection of methane gas from the landfill and burning it to generate electricity. This electricity is used for the industrial operations onsite. LMS Energy is a private company that collects the gas from the landfill, processes the gas into energy and distributes it to the Western Power network. LMS Energy has a power generator on the Site and emergency burn towers if required.

Figure 7 – LMS Energy – Power Generation Operations



Methane gas quantities generated from the landfill operations will reduce over time. Power generation operations will need to continue on the Site until the methane levels are low enough so that the site can be decommissioned. This is expected to take many years. Existing gas and associated High Voltage (HV) infrastructure will need to be maintained and likely pose as constraint to any development of the Site until decommissioning.

Figure 8 – LMS Energy - Methane Burn Towers



Western Power

Western Power is the State Authority in control of power supply to the Perth Metropolitan area. Western Power currently has the following infrastructure adjacent to the development:

- Underground Low Voltage (LV) power lines that are located within the Alexander Road median adjacent to the Site.
- Underground LV power that crosses Victoria Road.
- Underground High Voltage (HV) power that is located along the southern and eastern boundaries of the Site connecting to the existing power transformer.
- Overhead 33KVA power lines located on the north side of the Victoria Road road reserve adjacent to the Site.
- Overhead 33KVA power lines located on the east side of the Alexander Drive road reserve adjacent to the Site.
- Overhead HV power lines located on the western side of the Alexander Drive road reserve adjacent to the Site.

Figure 9 - Existing Site Transformer



Development

Future development of the Site will require the extension of the existing HV network throughout the proposed development with Transformer Sites supplying power to each development.

The exact requirements to service the Site will not be known until a Design Information Package is requested from Western Power. However, PCE has completed an investigation of the site using the Western Power Online Network Capacity Mapping Tool. The results of this investigation showed that there is over 30MVA of capacity available within the area. Therefore, there is capacity within the system to provide power to site without need to upgrade any transmission infrastructure.

3.5 Gas

According to Atco Gas Australia, the following gas infrastructure is within the area of the Site:

- 250mm diameter steel 1920kPa High Pressure (HP) gas main is located within Alexander Road.
- 155mm diameter polyvinyl chloride (PVC) Median Pressure 70kPa gas main adjacent to the existing HP main in Alexander Drive.
- Gas delivery point is located on the Site adjacent to Alexander Drive, including a Meter and Meter Set refer **Figure 10**.

Figure 10 - Existing Gas Meter Set



Development

Due to the existing gas infrastructure located within the Site, gas supply to the development is not anticipated to be an issue.

3.6 Telecommunications

Telstra has confirmed that there are existing telecommunication services within Alexander Drive and Truganina Road.

The closest telecommunication exchange to the Site is the Ballajura Exchange located at Lot 1 Action Road, Ballajura. This exchange is located approximately 2,000m straight or 2,800 of cable length away. Due to the location of the existing telecommunication infrastructure it is expected that a telecommunications service would be available to the proposed development.

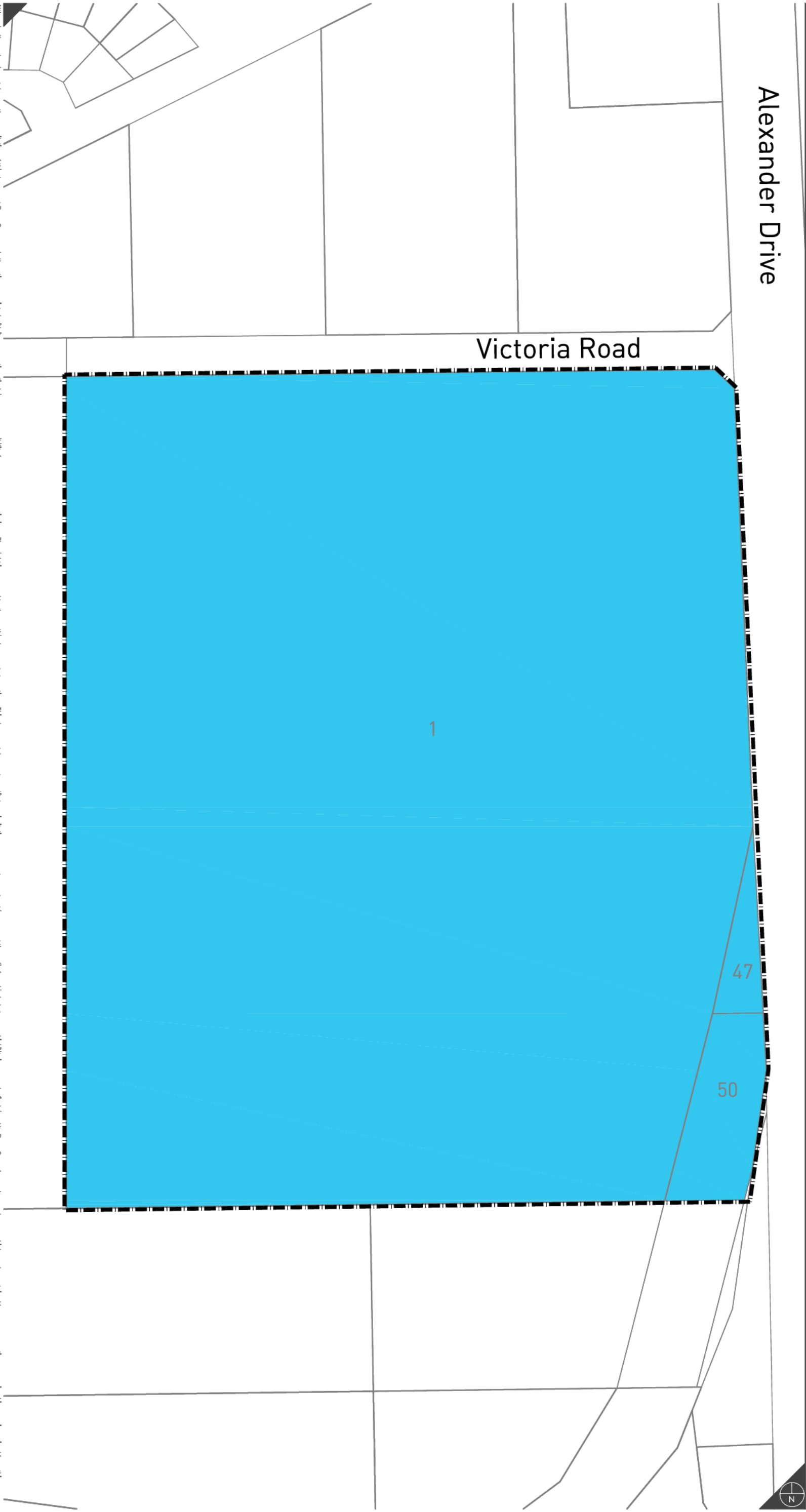
4.0 SUMMARY OF COSTS

The following conclusions and recommendations can be made:

- Existing infrastructure on the Site will likely need to remain until the existing land fill operation have been completed and decommissioned. This would likely result any development of the Site in the immediate future been staged.
- Drainage; the Site geology should result in high permeability of material which would allow for drainage basins and soak wells to be used for the processing of stormwater. Should this be the case then a soakage basin would be required on the site to store between 7,000 – 9,000m³. It is recommended that the basin is designed and size confirmed at detailed design stage.
- Water; Water Corporation is not is a position to provide service capacity until the Structure Plan has been adopted. However, considering the water infrastructure adjacent to the site, it is unlikely that the Water Corporation will require water services to be upgraded to the site as part of the development.
- Sewer; Water Corporation is not in a position to provide service information until the Structure Plan has been adopted. Water Corporation future planning shows that the Harris Street pump station is currently operating above 7.9l/s with future planned capacity of 10.6l/s. Therefore, it is expected that there is capacity available to service the Site but will need to be confirmed with Water Corporation.
- Power; There are existing power infrastructure adjacent to the Site. This infrastructure will need to be extended through the Site to reticulate the proposed development. Western Power should be contacted once the details of the development are known to confirm the capacity of the existing infrastructure.
- Gas; There is existing gas infrastructure located adjacent to the Site. Gas supply is not anticipated to be an issue.
- Telecommunications; are not anticipated to be an issue.

APPENDIX 1 – Local Structure Plan

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Planning Design Delivery



- LEGEND
- 7 Existing Lot Numbers
 - Existing Boundaries
 - MIXED USE
 - Mixed Business
 - OTHER
 - Structure Plan Boundary

0 50 100 Metres

REVISIONS

Rev	Date	Drawn
A	2014.08.27	M. Sullivan



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P:

08 9221 1991

Date Drawn:

2014-08-27

Job Ref:

1878

Scale:

1:2000 @ A3

Client:

Atlas Bricks

Designer:

P. Fitzgerald

Drawn:

M. Sullivan

Projection:

MGAS0 GDA94

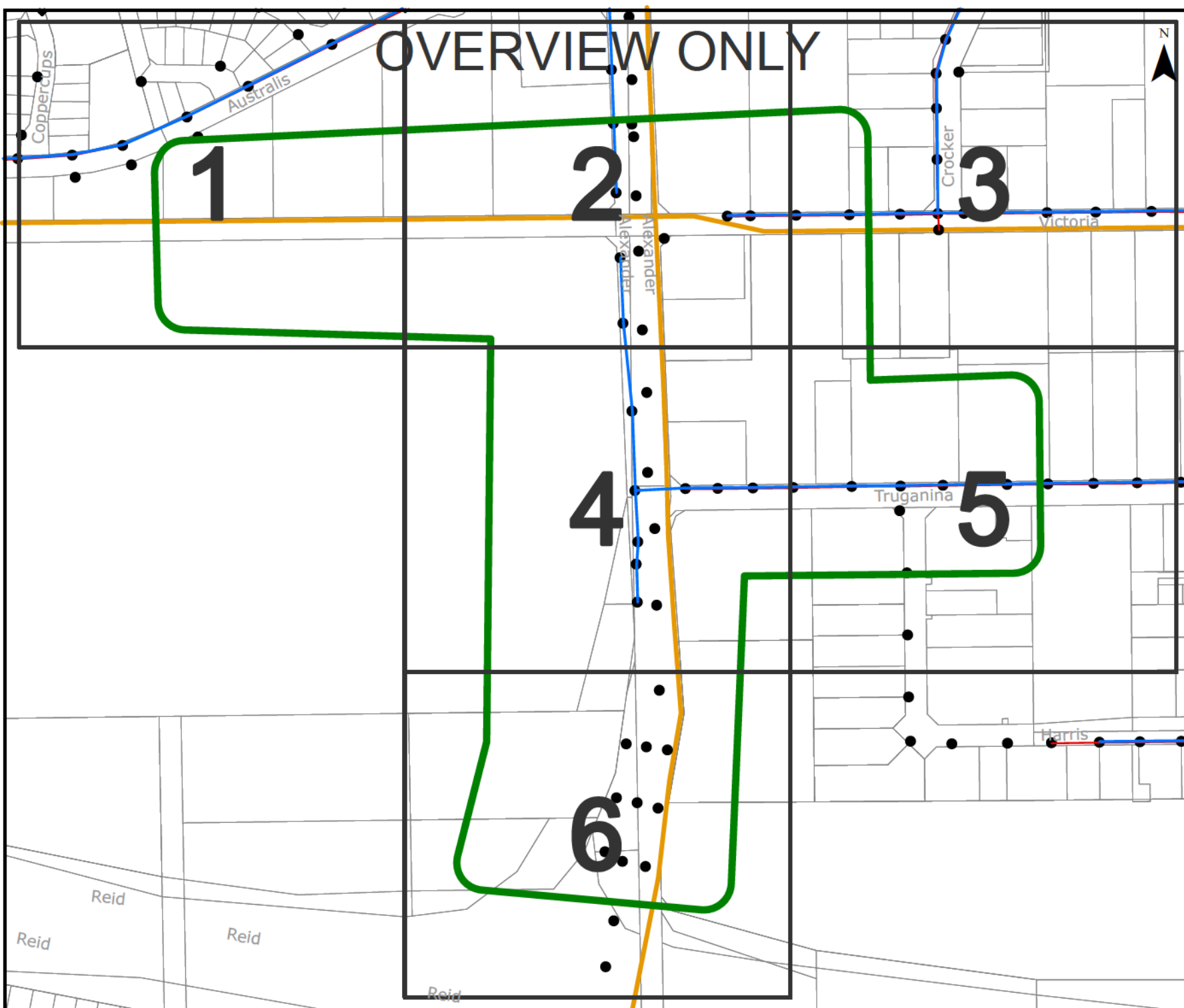
Plan ID:

1878-LSP-01-A

Cadastre supplied by JUROVICH SURVEYING

Local Structure Plan

APPENDIX 2 – DBYD Data



OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

* Please refer to coversheet

Privately owned cables NOT SHOWN
(including house services)

This map is INDICATIVE ONLY.
Check that you have enough
clearance from the DANGER ZONES
near overhead powerlines.

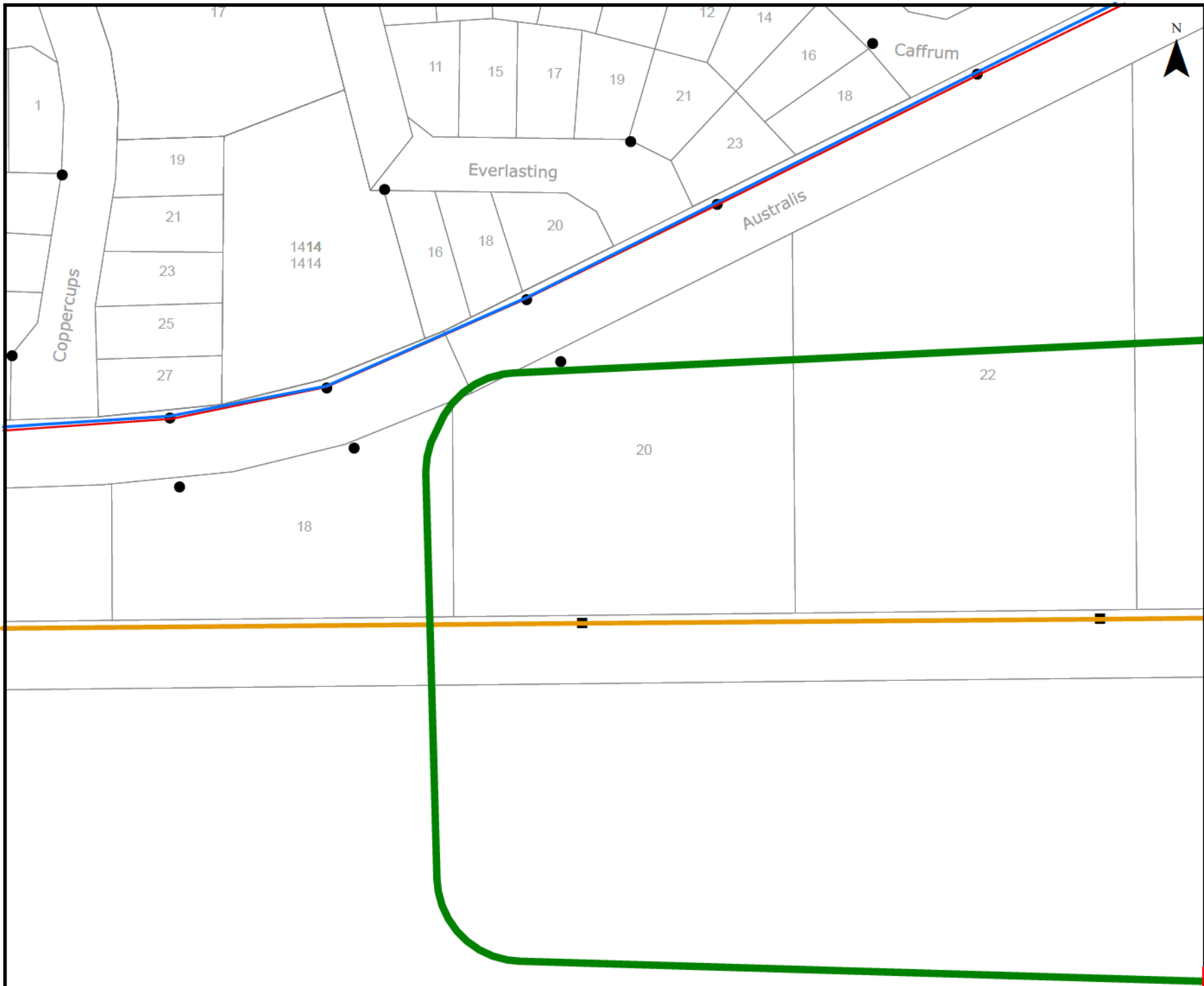
Telephone Support: 1300 769 345
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Information valid for 30 days
from date of issue

A4

Scale : 1:4612

**WARNING! Look out for
overhead power lines**



OVERHEAD LEGEND	
Structures	
● Power Pole	■ Transmission Poles
Transmission Overhead Powerline	
— Transmission (33kV - 330kV)	
Distribution Overhead Powerline	
— High Voltage (1kV - 33kV)	
— Low Voltage (< 1kV)	
Proposed Construction Assets	
■ Design Area *	
— High Voltage Overhead Powerline	
— Low Voltage Overhead Powerline	
● Power Pole	
Communications Assets	
— Overhead Pilot Cable	
Feature	
■ Area of Interest	

*** Please refer to coversheet**

**Privately owned cables NOT SHOWN
(including house services)**

**This map is INDICATIVE ONLY.
Check that you have enough
clearance from the DANGER ZONES
near overhead powerlines.**

**Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30**

Information valid for 30 days
from date of issue

A4	Scale : 1:1500
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**WARNING! Look out for
overhead power lines**



OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

* Please refer to coversheet

Privately owned cables NOT SHOWN
(including house services)

This map is INDICATIVE ONLY.
Check that you have enough
clearance from the DANGER ZONES
near overhead powerlines.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days
from date of issue

A4 Scale : 1:1500

**WARNING! Look out for
overhead power lines**

OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

* Please refer to coversheet

Privately owned cables NOT SHOWN
(including house services)

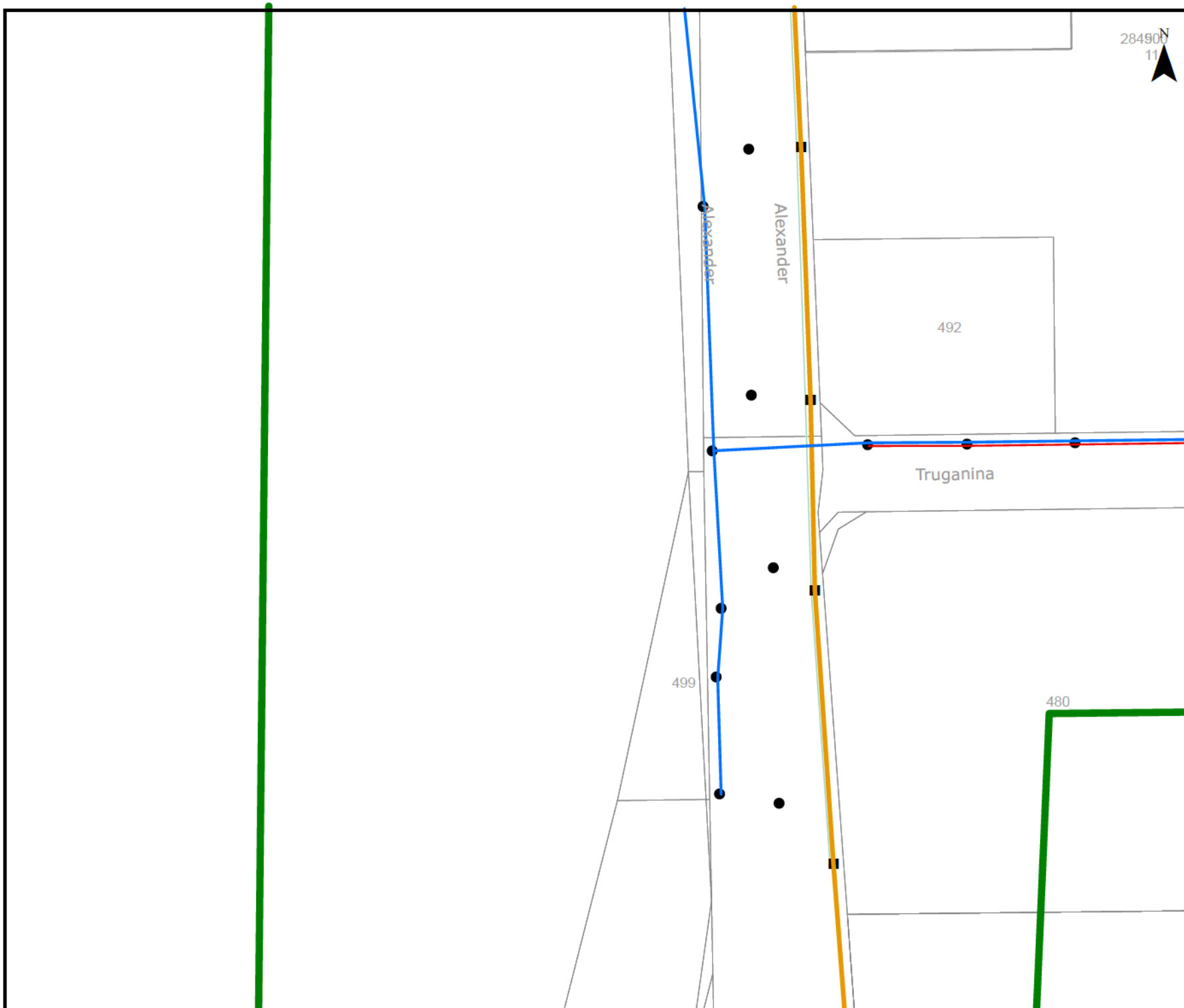
This map is INDICATIVE ONLY.
Check that you have enough
clearance from the DANGER ZONES
near overhead powerlines.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days
from date of issue

A4 | Scale : 1:1500

**WARNING! Look out for
overhead power lines**



OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
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- Design Area *
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Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

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A4

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**WARNING! Look out for
overhead power lines**

OVERHEAD LEGEND

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- Design Area *
- High Voltage Overhead Powerline
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- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

* Please refer to coversheet

Privately owned cables NOT SHOWN
(including house services)

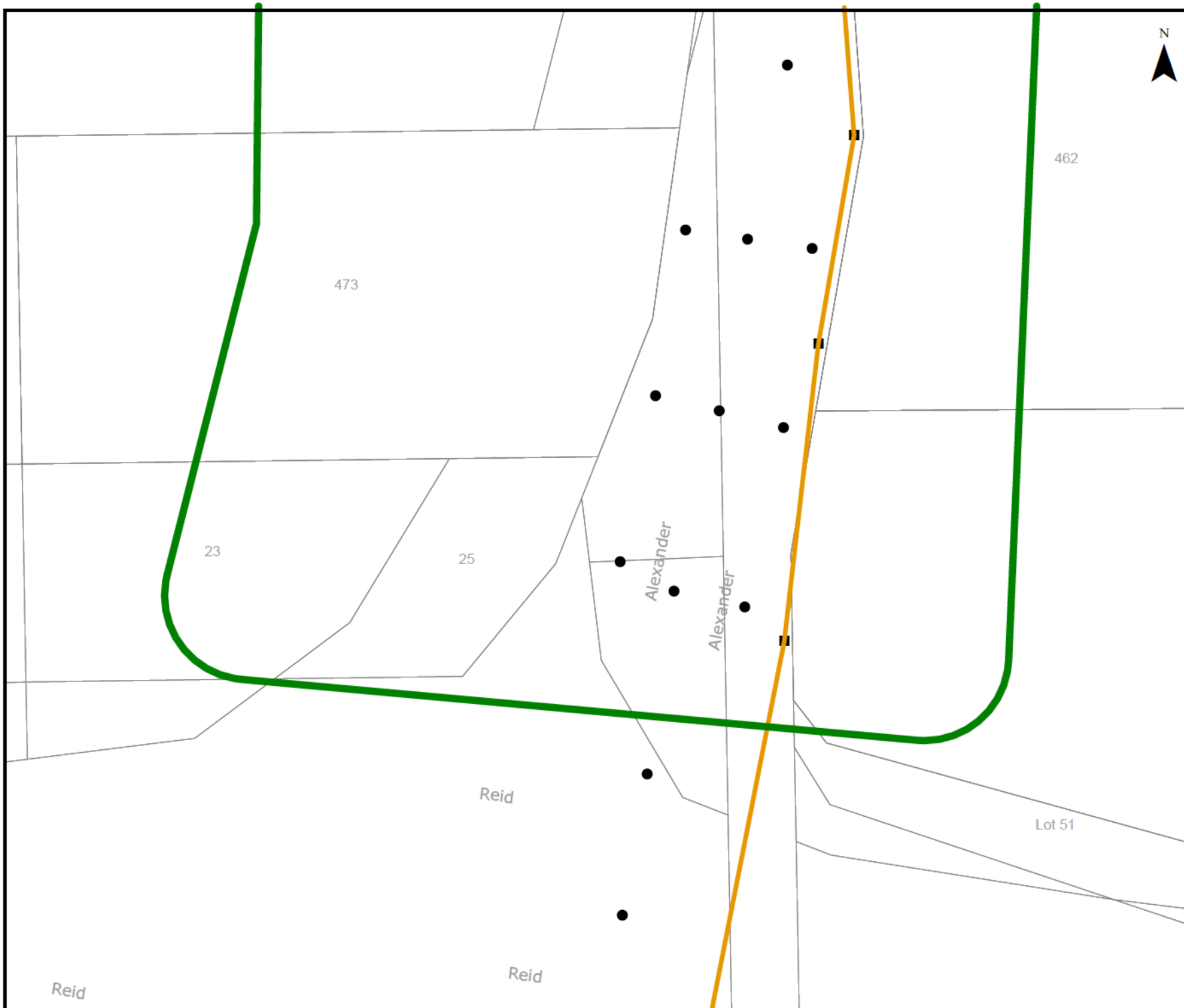
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Mon to Fri - 08:00 to 16:30

Information valid for 30 days
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A4 | Scale : 1:1500

**WARNING! Look out for
overhead power lines**



OVERHEAD LEGEND	
Structures	
● Power Pole	■ Transmission Poles
Transmission Overhead Powerline	
— Transmission (33kV - 330kV)	
Distribution Overhead Powerline	
— High Voltage (1kV - 33kV)	
— Low Voltage (< 1kV)	
Proposed Construction Assets	
■ Design Area *	
— High Voltage Overhead Powerline	
— Low Voltage Overhead Powerline	
● Power Pole	
Communications Assets	
— Overhead Pilot Cable	
Feature	
■ Area of Interest	

*** Please refer to coversheet**

Privately owned cables NOT SHOWN (including house services)

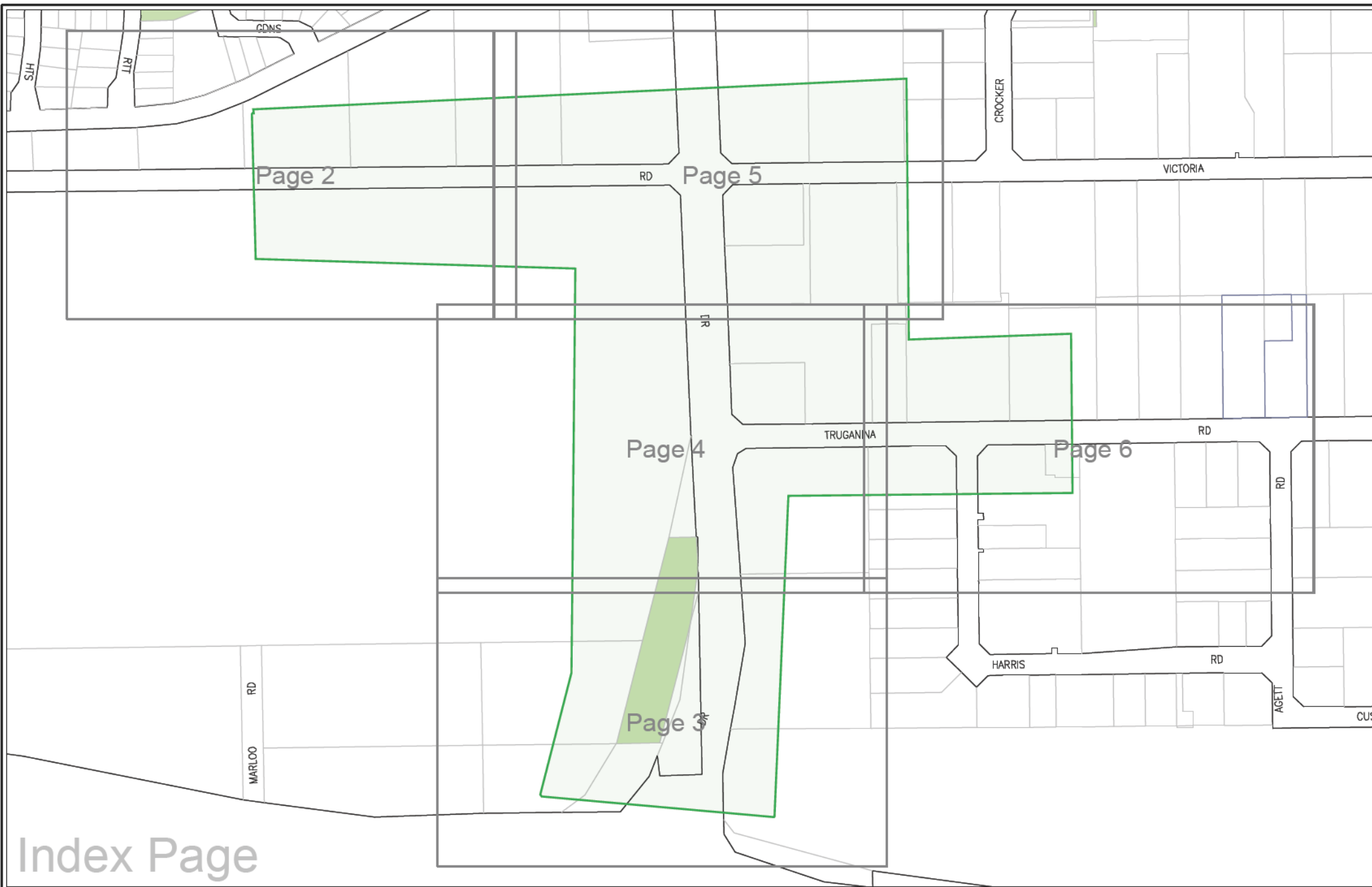
This map is INDICATIVE ONLY.
Check that you have enough clearance from the DANGER ZONES near overhead powerlines.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

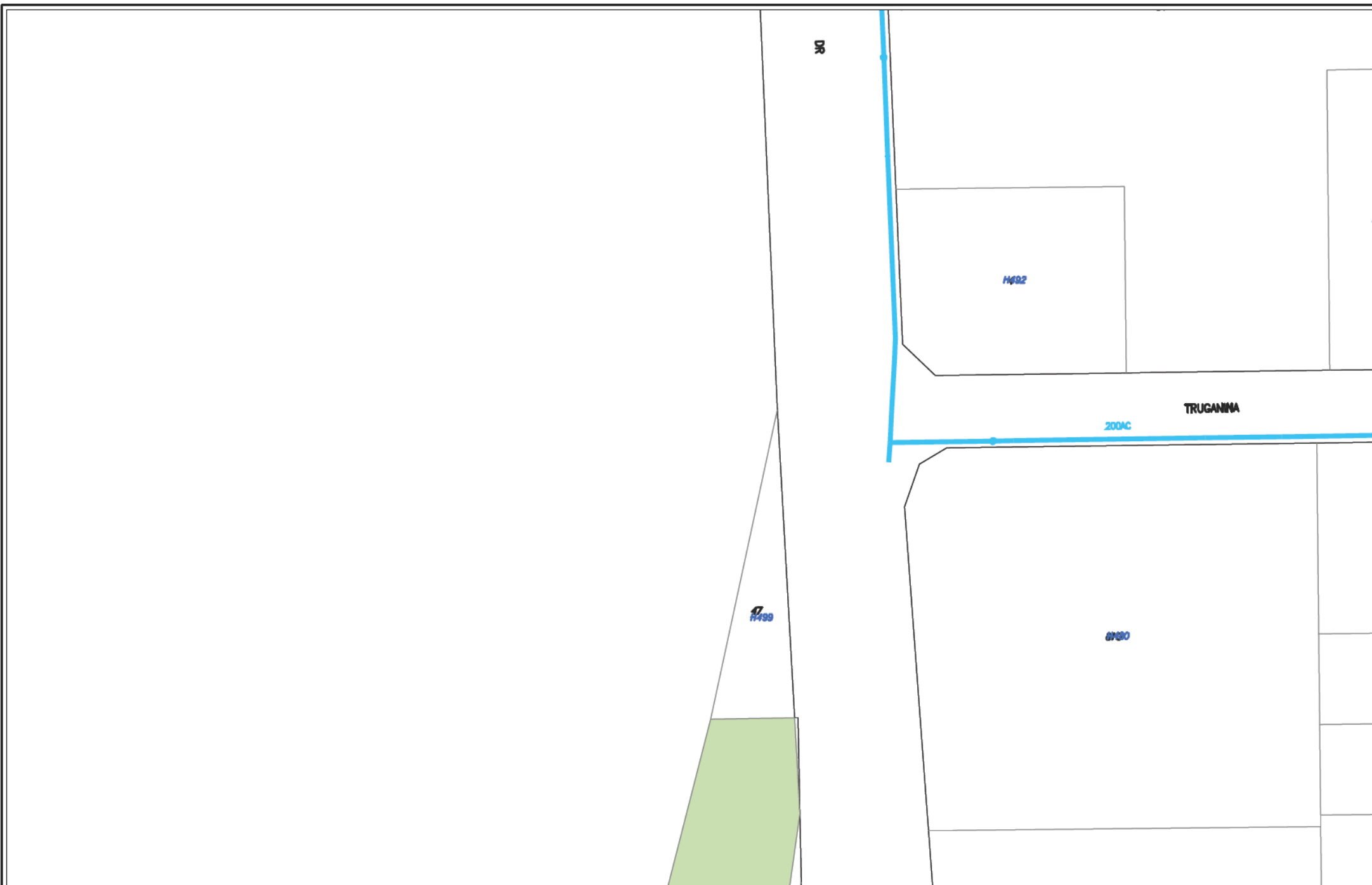
A4 | Scale : 1:1500

WARNING! Look out for overhead power lines











Scale: 1:1500 Centre Point: 115.879°, -31.862°

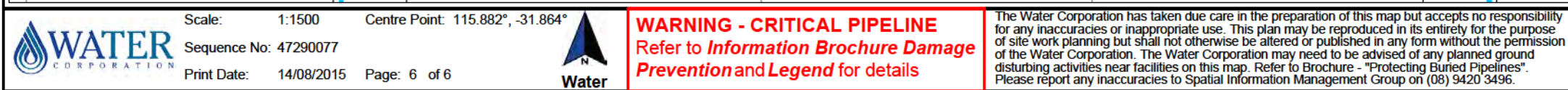
Sequence No: 47290077

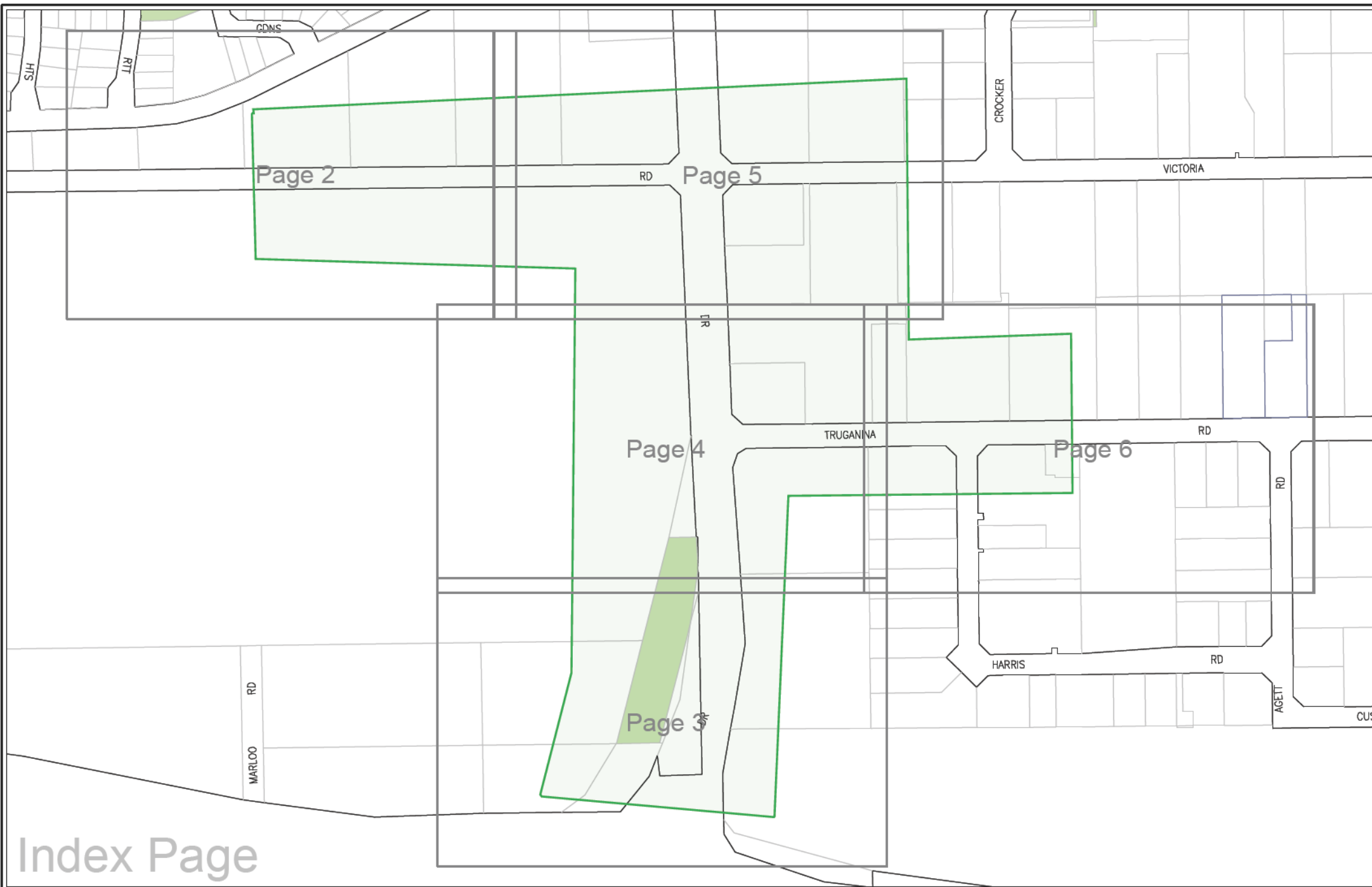
Print Date: 14/08/2015 Page: 5 of 6

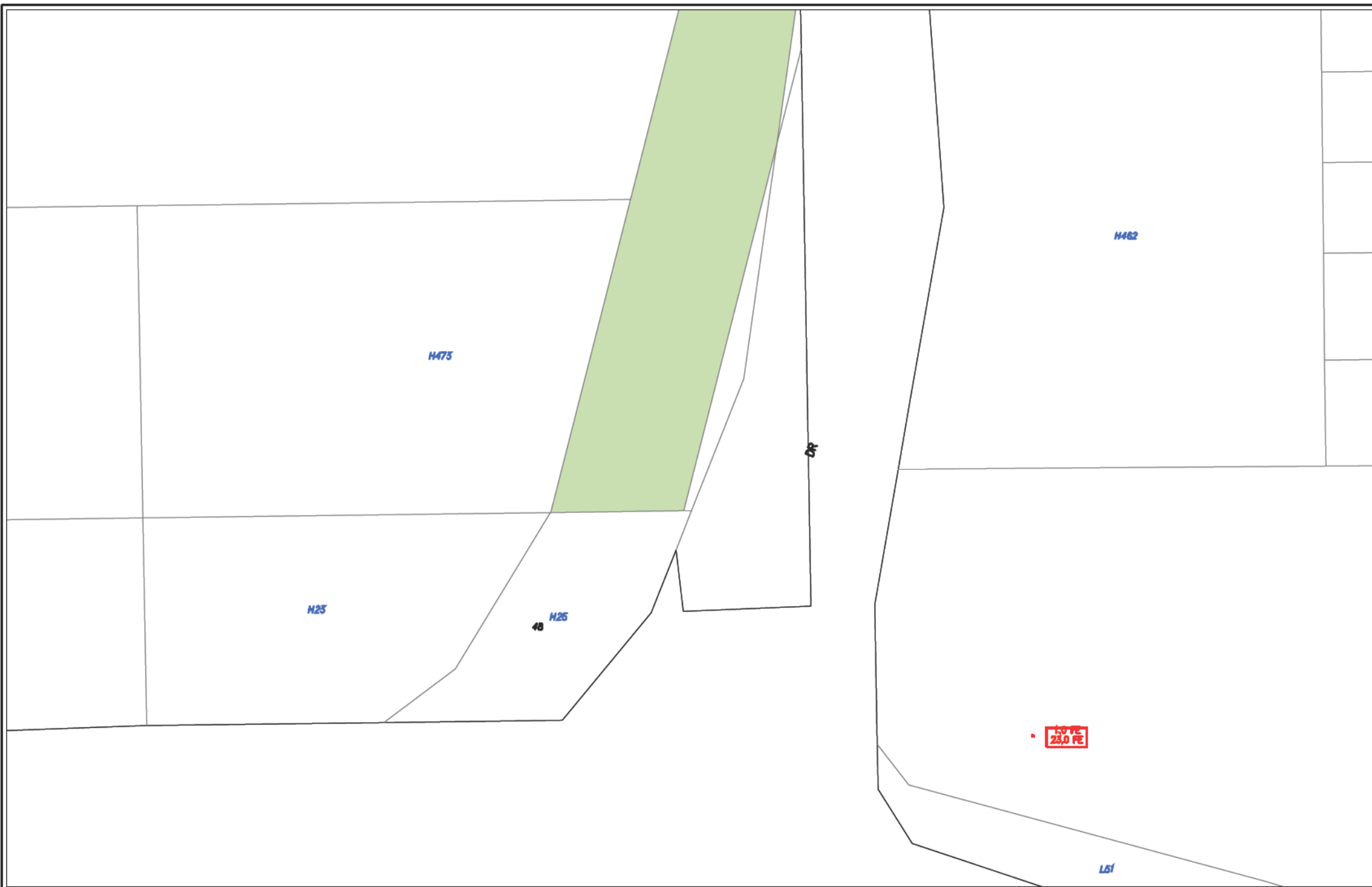


WARNING - CRITICAL PIPELINE
Refer to **Information Brochure Damage Prevention** and **Legend** for details

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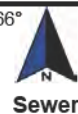




Scale: 1:1500 Centre Point: 115.878°, -31.866°

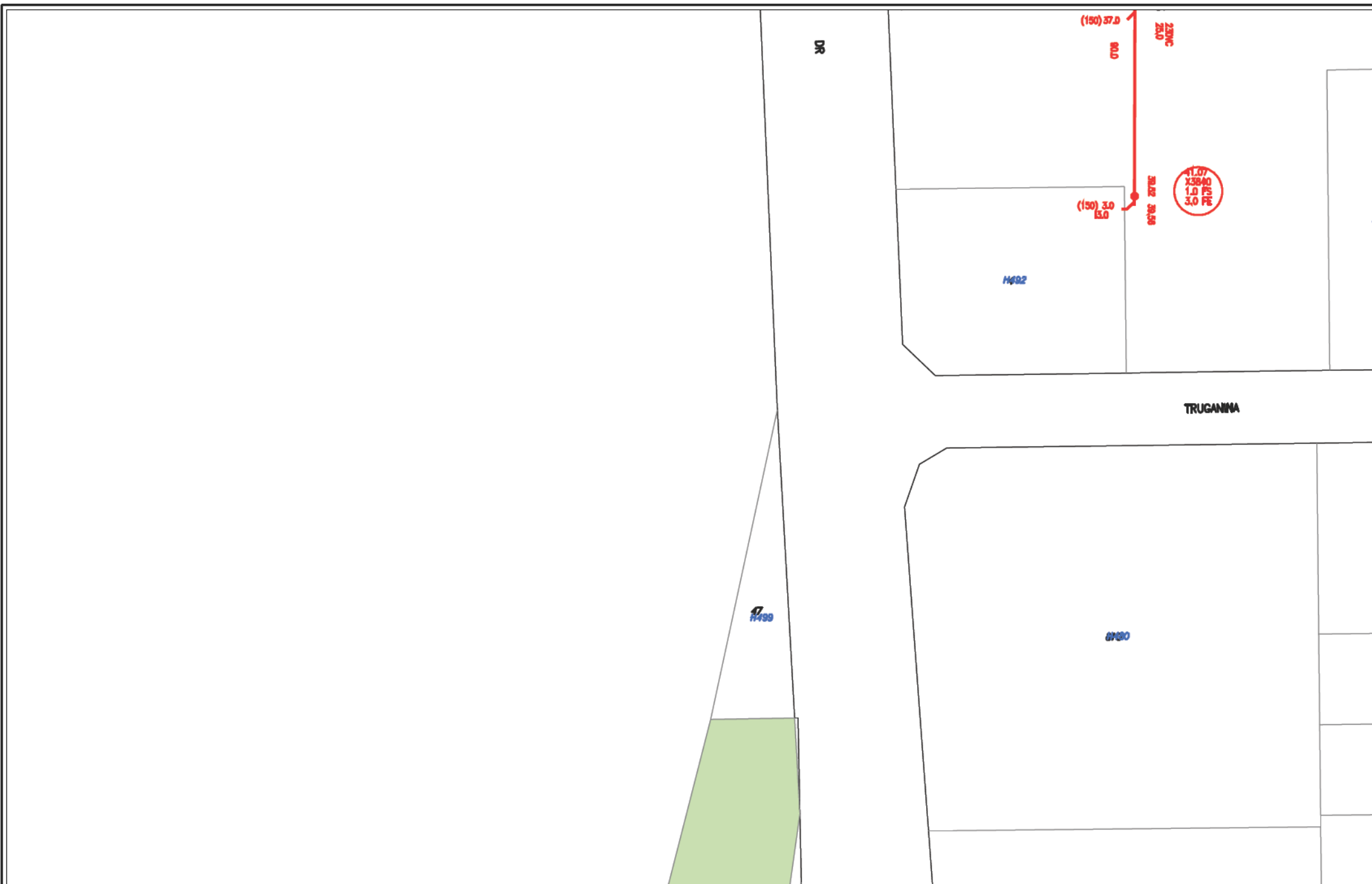
Sequence No: 47290077

Print Date: 14/08/2015 Page: 3 of 6



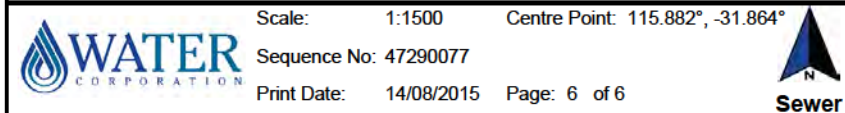
WARNING - CRITICAL PIPELINE
Refer to *Information Brochure Damage Prevention and Legend* for details

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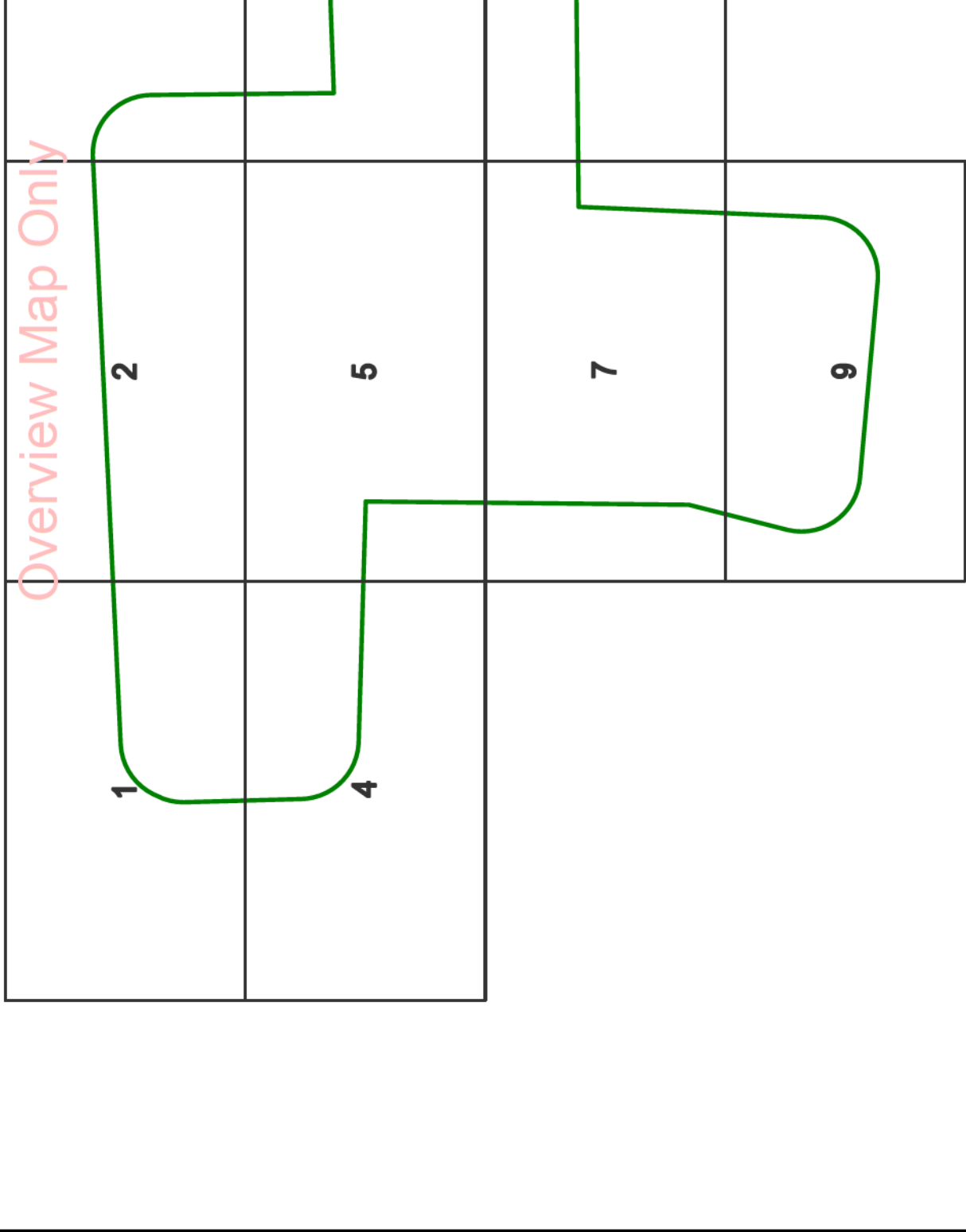


LOT 215 NOT DRAINABLE
FOR SEWERAGE
SEWER HIGHER THAN LAND CONTOURS
REFER TO CUSTOMER DRAWING
PERIOD REGION



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WARNING - HIGH PRESSURE PIPELINE IN THE VICINITY
No works within 15 metres of this asset are permitted without prior approval from ATCO Gas



Sequence No: 47290076 Map Tile: Scale: 1:6150 © 2011 ATCO Gas Australia
Job No: 9542105 Date: 14/08/2015 Location: Alexander Drive, Mirrabooka 6061 ACN 089 531 975

Please read all **warnings**, conditions and information on the attached "Underground Asset Details" information sheet. This plan is issued subject to that information and those conditions and **warnings** (including, but not limited to, the "NO HOT WORKS" warning). Plans are current for only **30 days** from date of request, indicative only and not warranted to be accurate. It is your responsibility to carefully locate underground assets and follow safe work practises and procedures (eg pot-holing). ATCO Gas Australia will seek compensation for damage caused to assets.

© 2011 W
Based on
Western

OVERVIEW ONLY



UNDERGROUND LEGEND

Structures

- Pillar
- Metal Pole
- Transformer Site
- UG Crossing *
- Ring Main Unit
- LV Distribution Frame

Distribution Cables

- High Voltage Cable (1kV - 33kV)
- Low Voltage Cable (< 1kV)
- Street Light Circuit (< 1kV)
- Street Light Pilot (< 1kV)
- Earth Wire

Cable Pole Terminations

- HV Termination
- LV Termination

Proposed Construction Assets

- Design Area *
- High Voltage Underground Cable
- Low Voltage Underground Cable
- Metal Pole
- Pillar
- Transformer site
- HV Termination
- LV Termination

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

* Please refer to coversheet

Privately owned cables NOT SHOWN
(including house services)

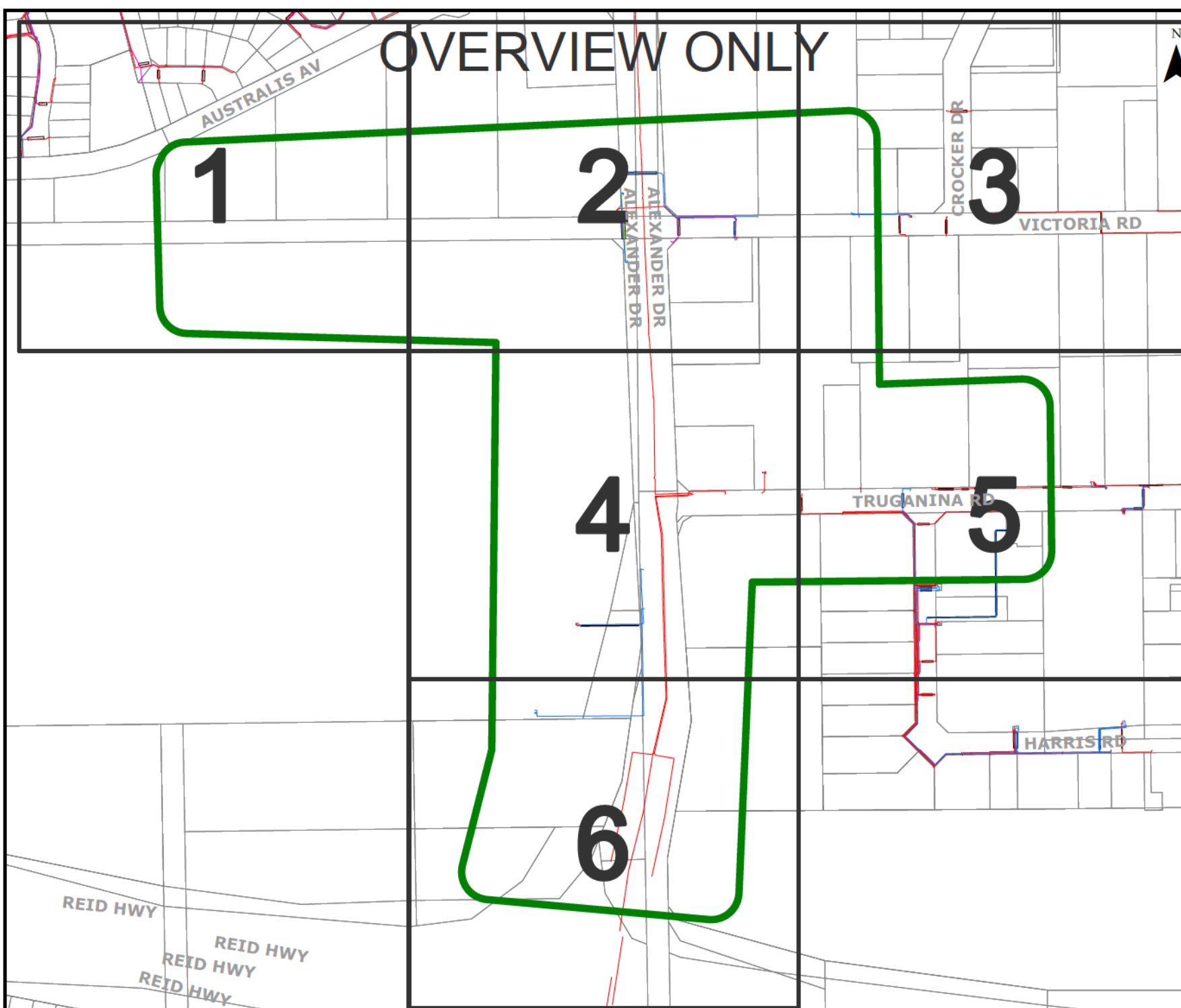
This map is INDICATIVE ONLY.
Hand exposure via pothole
method is MANDATORY.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days
from date of issue

A4 Scale : 1:4612

**WARNING! Look out for
overhead power lines**



UNDERGROUND LEGEND

Structures

-  Pillar
-  Metal Pole
-  Transformer Site
-  UG Crossing *
-  Ring Main Unit
-  LV Distribution Frame

Distribution Cables

-  High Voltage Cable (1kV - 33kV)
-  Low Voltage Cable (< 1kV)
-  Street Light Circuit (< 1kV)
-  Street Light Pilot (< 1kV)
-  Earth Wire

Cable Pole Terminations

-  HV Termination
-  LV Termination

Proposed Construction Assets

-  Design Area *
-  High Voltage Underground Cable
-  Low Voltage Underground Cable
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-  HV Termination
-  LV Termination

State Underground Power Project

-  CURRENT Work Area *
-  COMPLETED Area *

Feature

-  Area of Interest

* Please refer to coversheet

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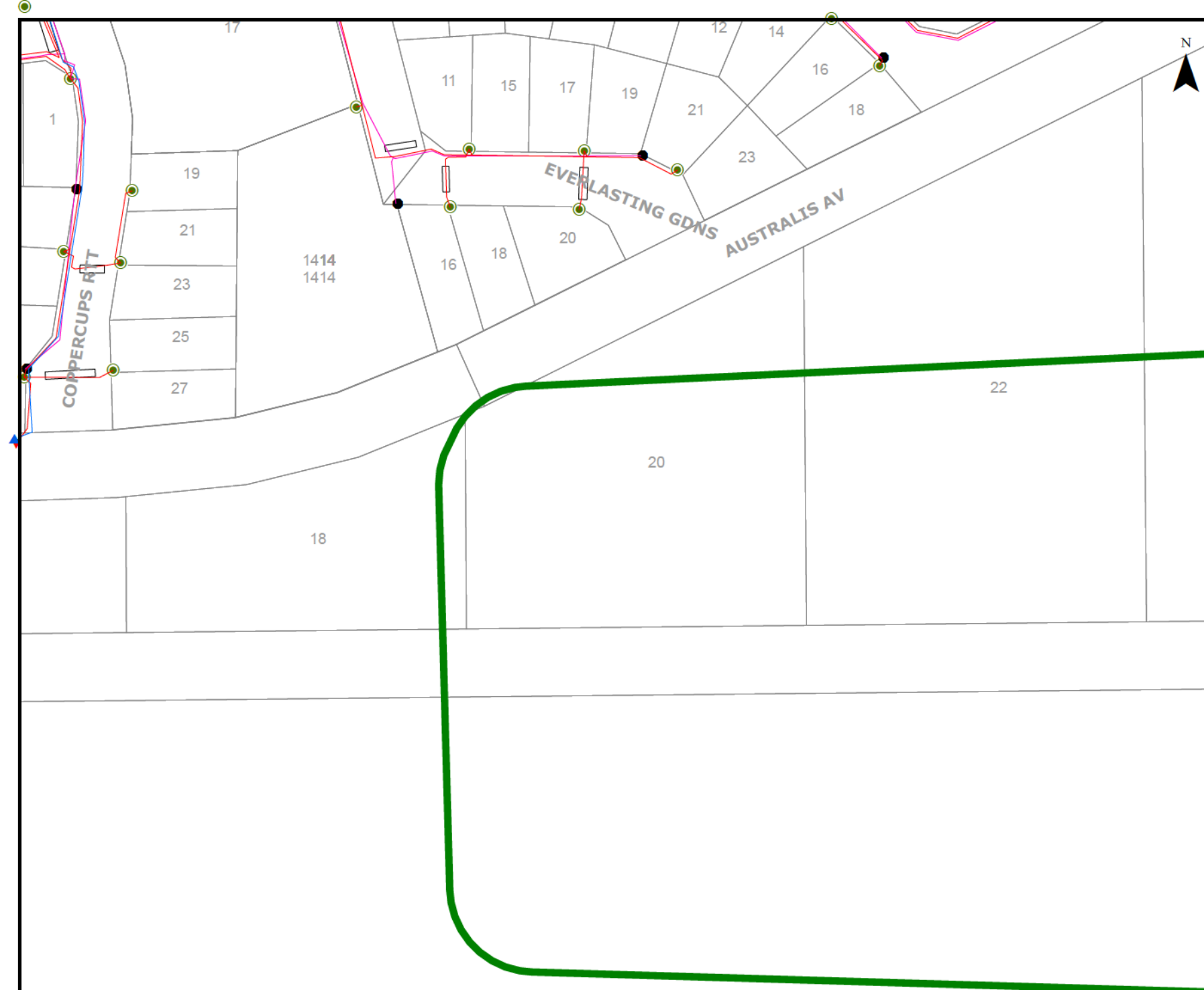
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Mon to Fri - 08:00 to 16:30

Information valid for 30 days
from date of issue

A4 Scale : 1:1500

**WARNING! Look out for
overhead power lines**





UNDERGROUND LEGEND

Structures

- | | |
|--|---|
|  Pillar |  UG Crossing * |
|  Metal Pole |  Ring Main Unit |
|  Transformer Site |  LV Distribution Frame |

Distribution Cables

-  High Voltage Cable (1kV - 33kV)
-  Low Voltage Cable (< 1kV)
-  Street Light Circuit (< 1kV)
-  Street Light Pilot (< 1kV)
-  Earth Wire

Cable Pole Terminations

-  HV Termination
-  LV Termination

Proposed Construction Assets

-  Design Area *
-  High Voltage Underground Cable
-  Low Voltage Underground Cable
-  Metal Pole
-  Pillar
-  Transformer site
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-  LV Termination

State Underground Power Project

-  CURRENT Work Area *
-  COMPLETED Area *

Feature

-  Area of Interest

* Please refer to coversheet

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UNDERGROUND LEGEND

Structures

- | | |
|--|---|
|  Pillar |  UG Crossing * |
|  Metal Pole |  Ring Main Unit |
|  Transformer Site |  LV Distribution Frame |

Distribution Cables

- | |
|---|
|  High Voltage Cable (1kV - 33kV) |
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|  Street Light Circuit (< 1kV) |
|  Street Light Pilot (< 1kV) |
|  Earth Wire |

Cable Pole Terminations

- | | |
|--|--|
|  HV Termination |  LV Termination |
|--|--|

Proposed Construction Assets

- | | |
|--|--|
|  Design Area * | |
|  High Voltage Underground Cable | |
|  Low Voltage Underground Cable | |
|  Metal Pole |  HV Termination |
|  Pillar |  LV Termination |
|  Transformer site | |

State Underground Power Project

- | |
|---|
|  CURRENT Work Area * |
|  COMPLETED Area * |

Feature

- | |
|--|
|  Area of Interest |
|--|

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A4

Scale : 1:1500

**WARNING! Look out for
overhead power lines**



2849 N
50011



UNDERGROUND LEGEND

Structures

- | | |
|------------------|-----------------------|
| Pillar | UG Crossing * |
| Metal Pole | Ring Main Unit |
| Transformer Site | LV Distribution Frame |

Distribution Cables

- High Voltage Cable (1kV - 33kV)
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- Street Light Pilot (< 1kV)
- Earth Wire

Cable Pole Terminations

- HV Termination LV Termination

Proposed Construction Assets

- Design Area *
- High Voltage Underground Cable
- Low Voltage Underground Cable
- Metal Pole HV Termination
- Pillar LV Termination
- Transformer site

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

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from date of issue**

A4 Scale : 1:1500

**WARNING! Look out for
overhead power lines**

ALEXANDER DR

ALEXANDER DR

TRUGANINA RD

492

499

480

UNDERGROUND LEGEND

Structures

- | | |
|--|---|
|  Pillar |  UG Crossing * |
|  Metal Pole |  Ring Main Unit |
|  Transformer Site |  LV Distribution Frame |

Distribution Cables

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Proposed Construction Assets

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-  High Voltage Underground Cable
-  Low Voltage Underground Cable
-  Metal Pole
-  Pillar
-  Transformer site
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-  LV Termination

State Underground Power Project

-  CURRENT Work Area *
-  COMPLETED Area *

Feature

-  Area of Interest

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Telephone Support: 1300 769 345
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Information valid for 30 days
from date of issue

A4 Scale : 1:1500

WARNING! Look out for overhead power lines



UNDERGROUND LEGEND

Structures

Pillar	UG Crossing *
Metal Pole	Ring Main Unit
Transformer Site	LV Distribution Frame

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- LV Termination

State Underground Power Project

- CURRENT Work Area *
- COMPLETED Area *

Feature

- Area of Interest

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Information valid for 30 days from date of issue

A4	Scale : 1:1500
----	----------------

WARNING! Look out for overhead power lines

OVERVIEW ONLY



DATA PILOT LEGEND

Communications Assets

— Data Pilot Cable (Underground)

Feature

— Area of Interest

* Please refer to coversheet

Privately owned cables NOT SHOWN
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Mon to Fri - 08:00 to 16:30

Information valid for 30 days
from date of issue

A4

Scale : 1:4612

**WARNING! Look out for
overhead power lines**

AUSTRALIS AV

1

2

3

VICTORIA RD

4

TRUGANINA RD

5

HARRIS RD

6

ALEXANDER DR

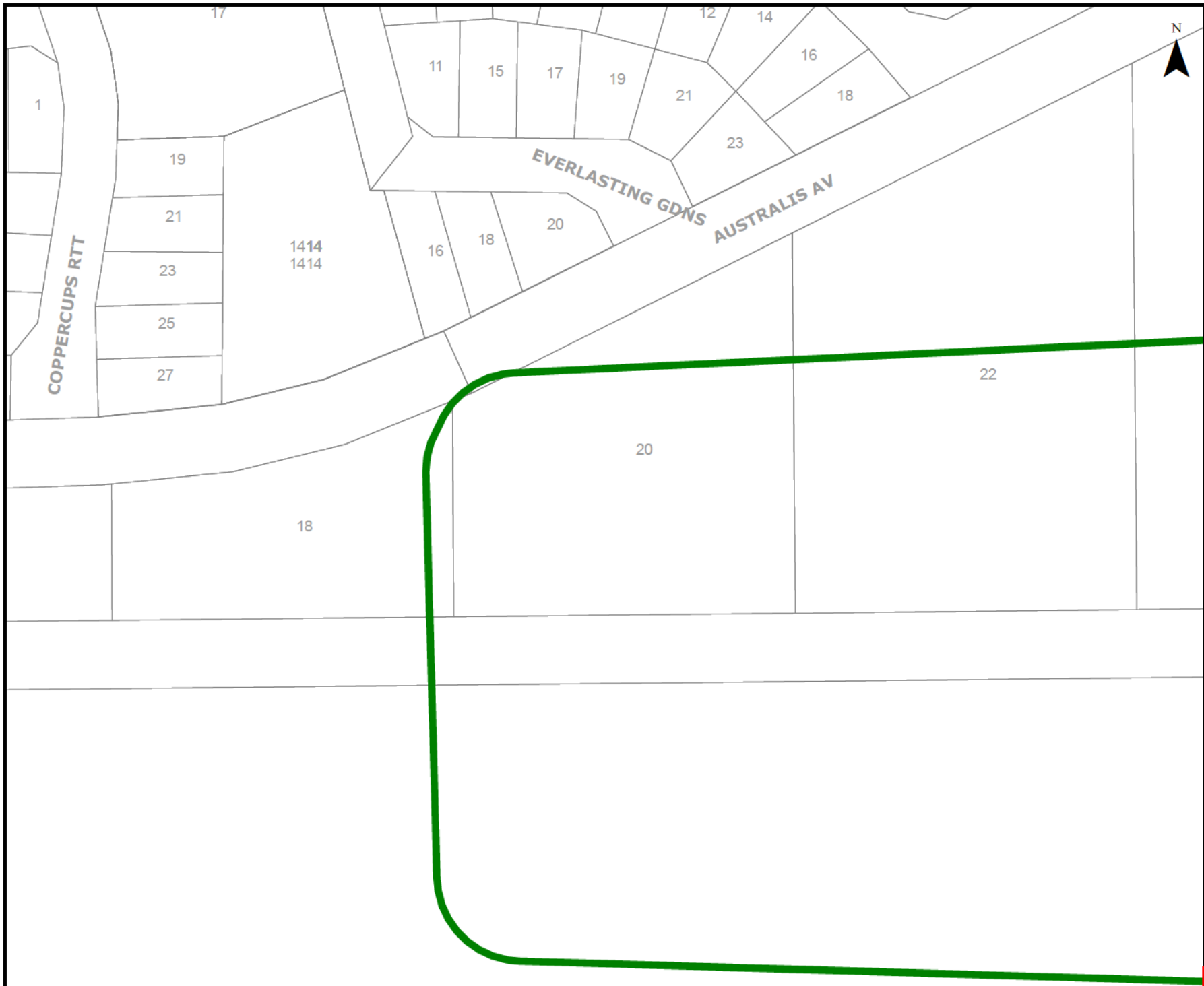
REID HWY

REID HWY

REID HWY

Sequence Number: 47290073

Date of Issue: 14/08/2015



DATA PILOT LEGEND

Communications Assets

 Data Pilot Cable (Underground)

Feature

 Area of Interest

*** Please refer to coversheet**

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**Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30**

**Information valid for 30 days
from date of issue**

A4 | Scale : 1:1500

**WARNING! Look out for
overhead power lines**



DATA PILOT LEGEND

Communications Assets

 Data Pilot Cable (Underground)

Feature

 Area of Interest

*** Please refer to coversheet**

**Privately owned cables NOT SHOWN
(including house services)**

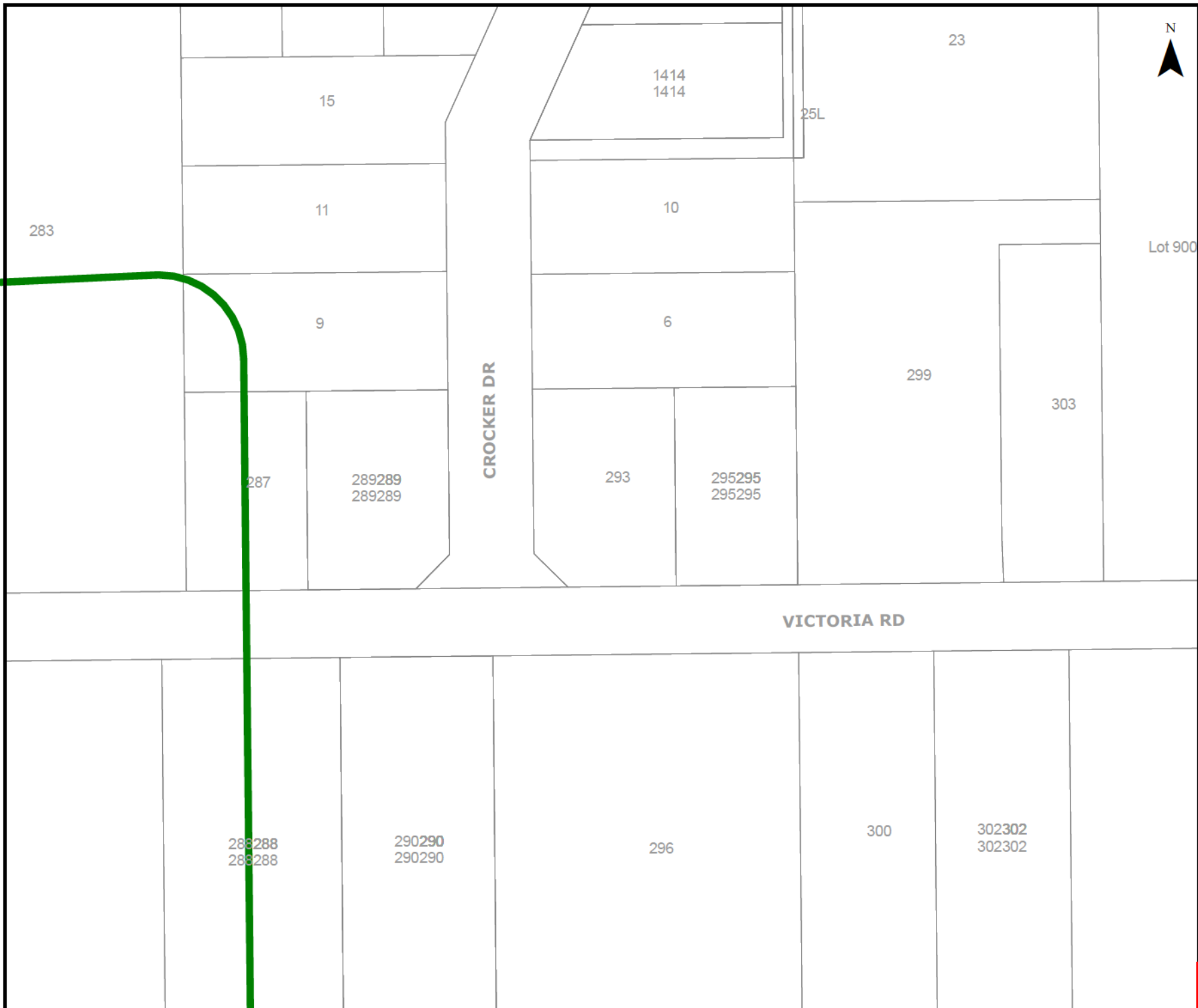
**This map is INDICATIVE ONLY.
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**Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30**

**Information valid for 30 days
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A4 | Scale : 1:1500

**WARNING! Look out for
overhead power lines**



DATA PILOT LEGEND

Communications Assets

 Data Pilot Cable (Underground)

Feature

 Area of Interest

*** Please refer to coversheet**

**Privately owned cables NOT SHOWN
(including house services)**

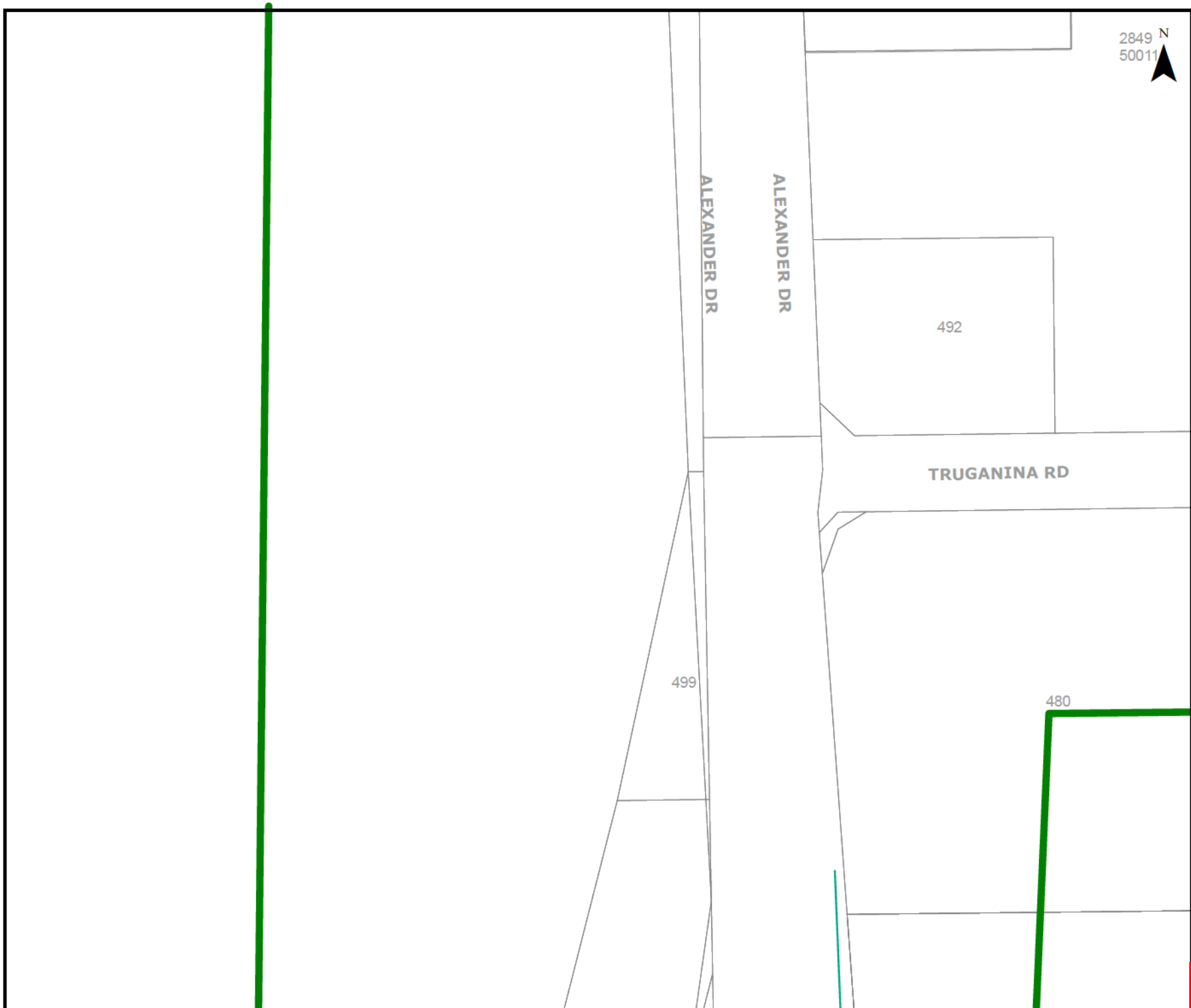
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Mon to Fri - 08:00 to 16:30**

**Information valid for 30 days
from date of issue**

A4 | Scale : 1:1500

**WARNING! Look out for
overhead power lines**



2849 N
50011 E



DATA PILOT LEGEND

Communications Assets

— Data Pilot Cable (Underground)

Feature

▭ Area of Interest

*** Please refer to coversheet**

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A4 | Scale : 1:1500

**WARNING! Look out for
overhead power lines**

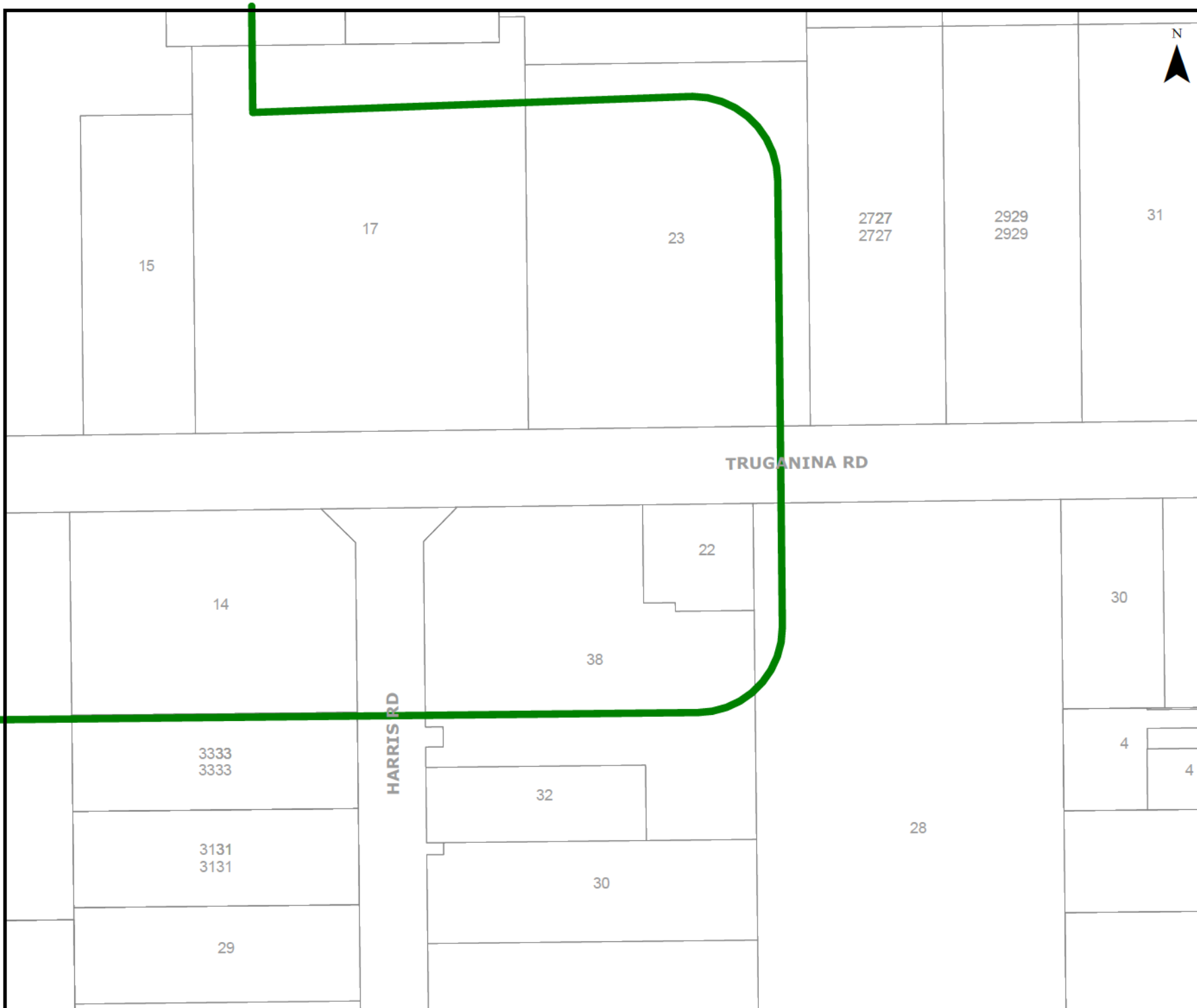
DATA PILOT LEGEND

Communications Assets

— Data Pilot Cable (Underground)

Feature

▭ Area of Interest



* Please refer to coversheet

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Mon to Fri - 08:00 to 16:30

Information valid for 30 days
from date of issue

A4

Scale : 1:1500

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overhead power lines**



DATA PILOT LEGEND

Communications Assets

 Data Pilot Cable (Underground)

Feature

 Area of Interest

*** Please refer to coversheet**

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**Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30**

**Information valid for 30 days
from date of issue**

A4 | Scale : 1:1500

**WARNING! Look out for
overhead power lines**

DIAL BEFORE YOU DIG**LOCATION NOTICE OF TELECOMMUNICATIONS SERVICES**

14/08/2015

Company / Name: Porter Consulting Engineers - Mr David Porter

Phone:	0893159955	Mobile:	Not Supplied
Address:	PO Box 1036	Fax:	0893159959
Suburb:	Canning Bridge	Email:	mel@portereng.com.au
Post Code:	6153		
State:	Wa		

Dear Mr David Porter

Thank you for your request dated 14/08/2015 15:48 , regarding the location of telecommunication services. You requested information for the below area:

Sequence No: 47290078
Job No: 9542105

Address: Alexander Drive
Suburb: Mirrabooka
State: WA

Nearest Cross Road:
Additional Information: Not Supplied

YES - We can confirm that AMCOM has fibre-optic services in the vicinity.

Please find attached a faxed copy of the services plan for the location of the works. Please note that these plans have a life of 30 days, as future works may affect your enquiry.

Yours sincerely,

Stuart Wallace
GIS Coordinator

Please note that the attached plans are to be treated as a guide only, and AMCOM bears no responsibility for the accuracy of the said plans. If machinery is being used in the area, pot-holing to locate services is mandatory.

EMERGENCY CONTACT: 1800 262 663

Legend

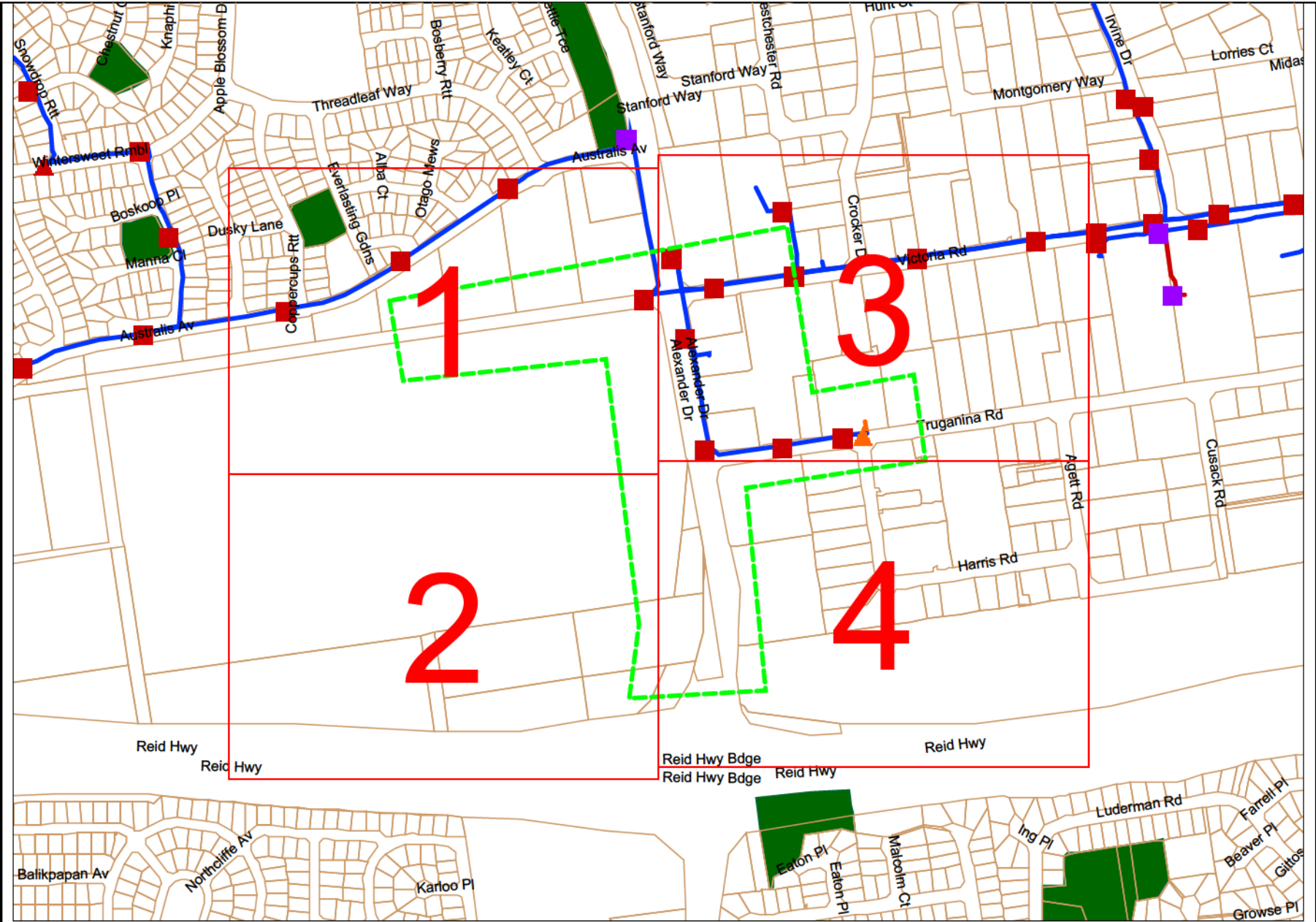
Scale 1:6000

0 0.07km

NOTES

Please note this is an overview of the general area of the enquiry and does not show Amcom Infrastructure.

Please see the following page/s to identify location of Amcom Infrastructure.



SEQUENCE NO: 47290078
JOB NO: 9542105
ADDRESS: Alexander Drive Mirrabooka



amcom

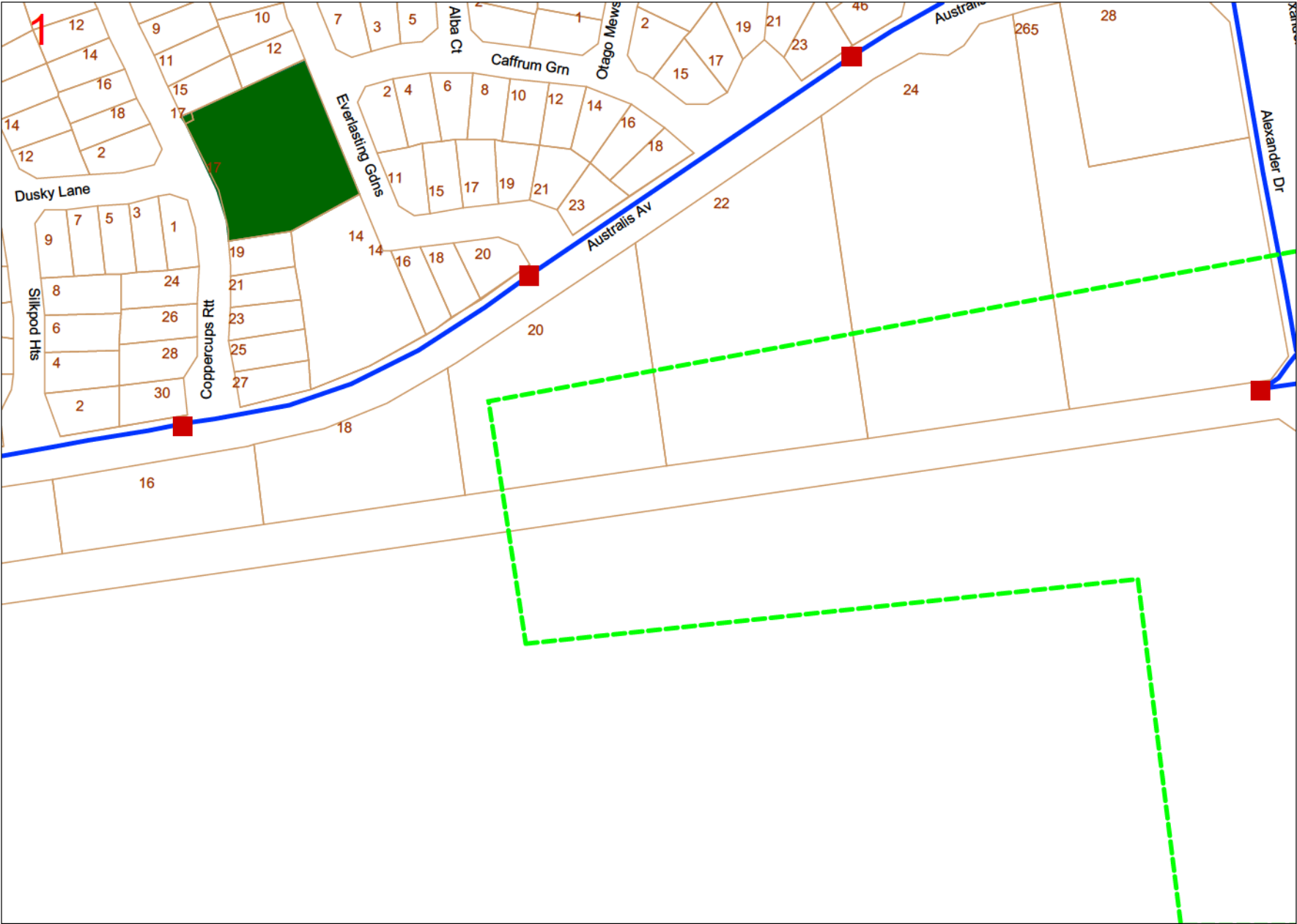
Legend

1	3
2	4

Scale 1:2000

0 0.02km

NOTES



SEQUENCE NO: 47290078
JOB NO: 9542105
ADDRESS: Alexander Drive Mirrabooka



amcom

Legend

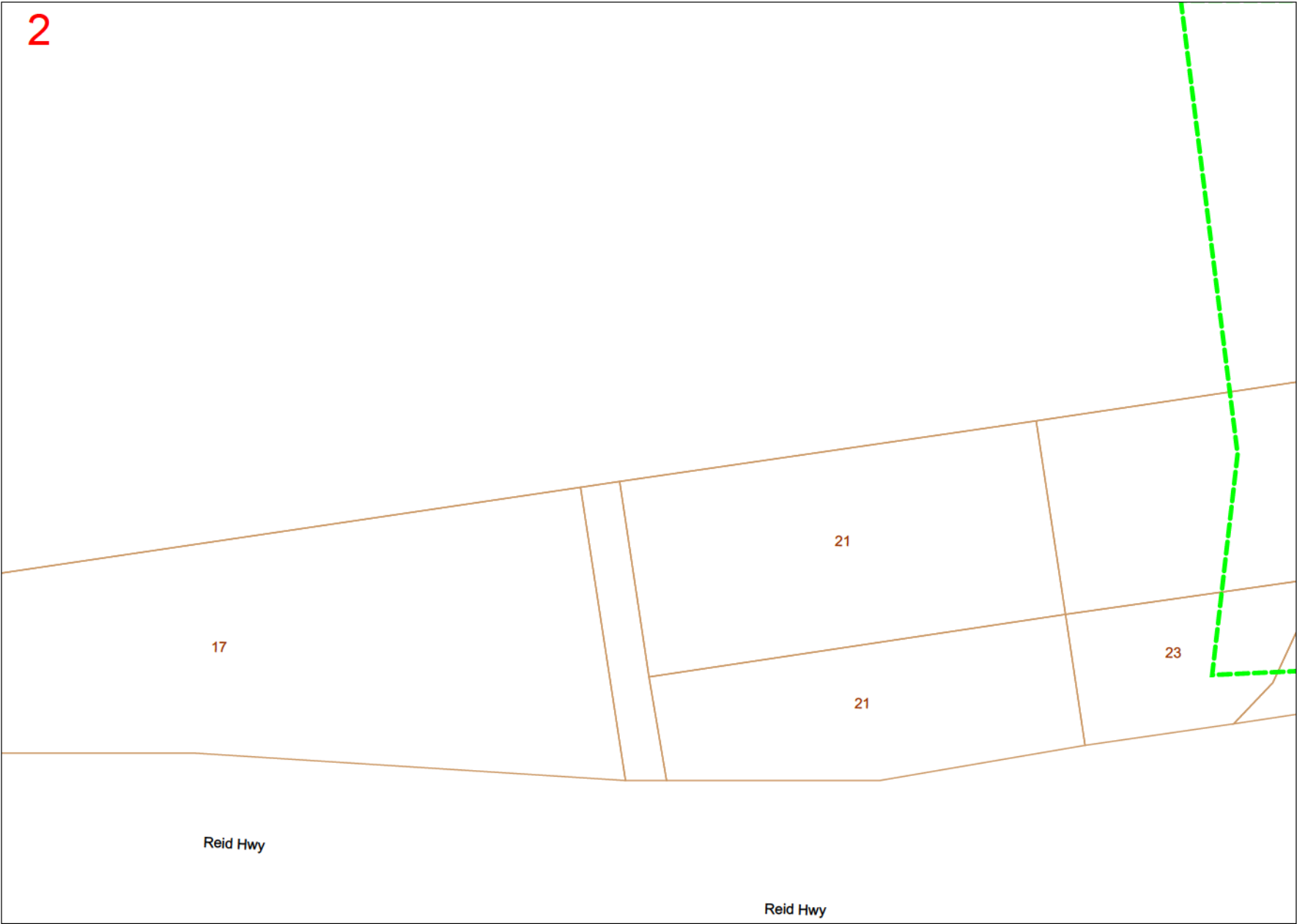
1	3
2	4

Scale 1:2000

0 0.02km

NOTES

2



SEQUENCE NO: 47290078
JOB NO: 9542105
ADDRESS: Alexander Drive Mirrabooka



amcom

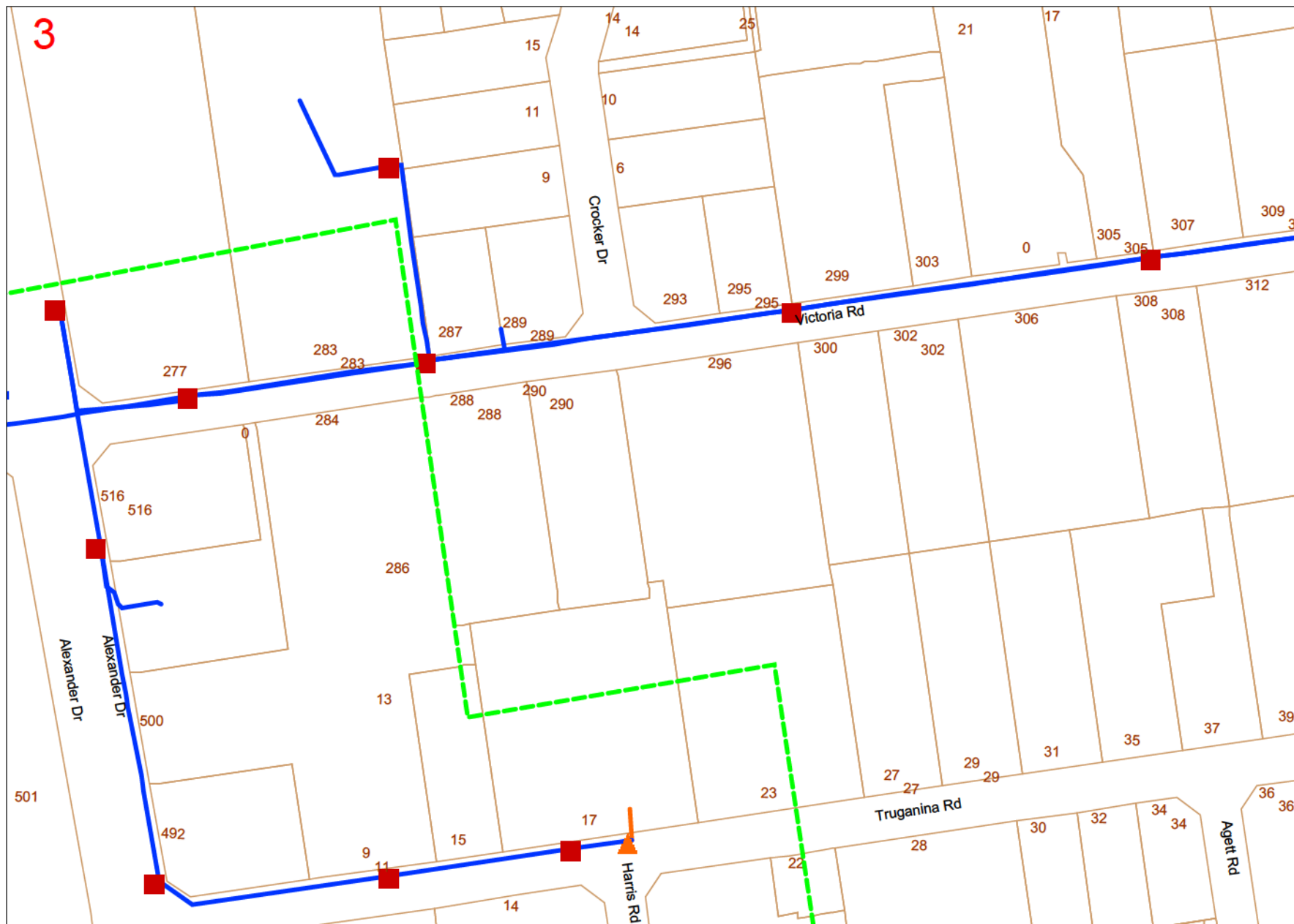
Legend

1	3
2	4

Scale 1:2000

0 0.02km

NOTES



SEQUENCE NO: 47290078
 JOB NO: 9542105
 ADDRESS: Alexander Drive Mirrabooka

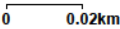


amcom

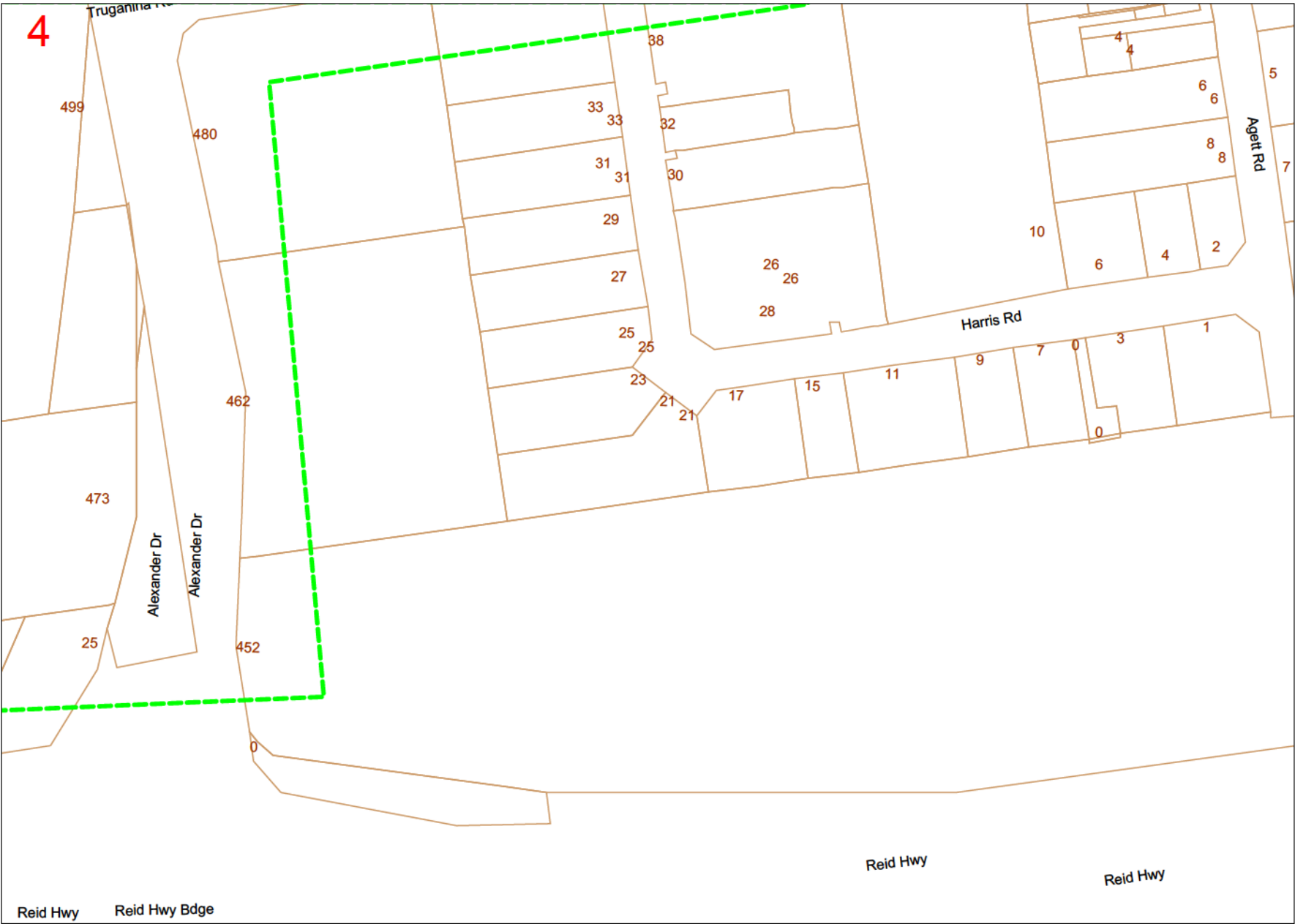
Legend

1	3
2	4

Scale 1:2000



NOTES



SEQUENCE NO: 47290078
JOB NO: 9542105
ADDRESS: Alexander Drive Mirrabooka



amcom

Legend Guide

	Line drawn by the person requesting the information on DigSafe (DBYD Website)
	Point drawn by the person requesting the information on DigSafe (DBYD Website)
	Amcom Pit
	Amcom Conduit
	Amcom Pits
	Amcom Conduit
	Amcom Pit
	Amcom Conduit
	3rd Party Pits which Amcom Fibre Passes Through.
	3rd Party Conduit which Amcom Fibre Passes Through.

The above guide indicates the different layers within the Legend on the map.

CAUTION OPTICAL FIBRE WORKING IN THE VICINITY OF AMCOM PLANT

All Constructors have a **Duty of Care** when working in the vicinity of underground plant.
The processes for complying with this **Duty of Care** while working in the vicinity of Amcom plant are :

❑ **LOCATION OF EXISTING AMCOM PLANT**

It is the Constructors responsibility to;

- Design to minimise impact to, and for protection of Amcom plant.
- Request the location of Amcom plant before construction begins.

Amcom plant locations can be provided through the following options;

1. **Provision of plans**

- All enquiries for plant locations are to be made through the **Dial Before You Dig Service** Dial 1100.
- The Constructor is to provide details of the desired location. Amcom will provide copies of plans of all known Amcom plant in the requested area.
- Amcom will forward this information to the Constructor within two working days. Where the enquiry has **not** been answered **after** two working days please phone Amcom Telecommunications on **(08) 9244 6114**
- This service is provided free of charge via Facsimile, Mail, Email or Collection from the Amcom Telecommunications Office at 43 King Edward Road, Osborne Park, WA 6017 weekdays during normal office hours.
- On receipt of plans the Constructor is responsible for potholing and physical exposure of the Amcom plant to confirm its actual location.

**NOTE – Plans are provided free of charge up to a 1km radius. Larger Plans may incur a cost.
For plan interpretation call (08) 9244 6114**

DO NOT COMMENCE DIGGING UNTIL AMCOM HAS RESPONDED NEVER ASSUME DEPTH OF PLANT

2. **On-site Location**

Location	Onsite Locations Contact	Phone	Mobile	Fax
Perth	Abaxa / WH Location Services	Scheduling 1300 369 642	After Hours or Emergency 0411 746 657 - Boyd	(08) 9256 2922

Amcom accepts no liability for the information provided to the Constructor by the Locators provided above. Further, the Constructor acknowledges that the Locator is the agent of the Constructor and that Amcom takes no responsibility for the Locators acts or omissions.

If any of the above numbers are un-contactable and your call is urgent please phone the Amcom Helpdesk 1800 262 663

- For all work within 2.5 metres of nominal location the Constructor is required to prove the actual location of the plant by potholing and exposing before commencing work.
- Potholing to expose and locate Amcom plant is required before work commences at least every 3 metres where the Constructors works are parallel to the Amcom Plant.
- The Constructor is responsible for all plant damages when works commence without Amcom plans or by failure to follow advice and/or instructions from Amcom.

NOTE – No machinery shall be used within 1 metre of Amcom plant until the actual location has been determined by potholing using hand tools.

NOTE – No heavy earthworking machinery shall be used within 5 metres of Amcom plant until the actual location has been determined by potholing using hand tools.

3. **Remote or on-site advice**

- Amcom may provide either remote (phone) or on-site engineering advice at its discretion to assist the Constructor in deciding where and how they should pothole to expose the Amcom plant.

NOTE – On-site meetings may incur a cost to the Constructor.

CAUTION OPTICAL FIBRE

CLEARANCES FOR NEW WORK IN THE VICINITY OF AMCOM PLANT

These figures represent the minimum clear cover to be maintained over Amcom Plant.
Please note that **actual** cover over existing plant might be greater or less than recommended figures.
Exact alignment and depths cannot be given with certainty as such levels can change over time.

Footpath and Verge Areas	450mm
Roadways	600mm

These figures represent the minimum clearance between construction activity and **actual** location of Amcom plant.

Jackhammers / Pneumatic breakers	Not within 2.5m of actual location.
Vibrating plate or Wacker Packer compactors	Not within 500mm of actual location.
Heavy vehicle traffic	Not to be driven across Amcom plant with less than 600mm cover. The Constructor is to check the depth by potholing using hand tools.
Mechanical excavators	Not within 1m of actual location. The Constructor is to pothole and expose plant using hand tools.

Amcom access pits must remain accessible and at ground level at all times.

NOTE – If these clearances and specifications cannot be maintained, see below.

❑ RESOLUTION OF POINTS OF CONFLICT

- Should plant location and potholing reveal points of conflict between the Constructors planned works and Amcom's existing plant the constructor should contact the Amcom Infrastructure section for advice and to discuss possible solutions. The contact details are;

Stuart Wallace - Business hours
Phone: (08) 9244 6114
Fax: (08) 9244 6001

OR

Urgent enquiries after business hours:
Phone: 1800 262 663

- Where relocation or protection of Amcom Plant is part of an agreed solution the costs of these works will be the responsibility of the Constructor. Amcom will provide an estimated cost for works. Work by Amcom will not commence until a Purchase Order or signed Fee For Service docket is received.

❑ ASSESSMENT OF RISK AND PROTECTIVE ACTIONS

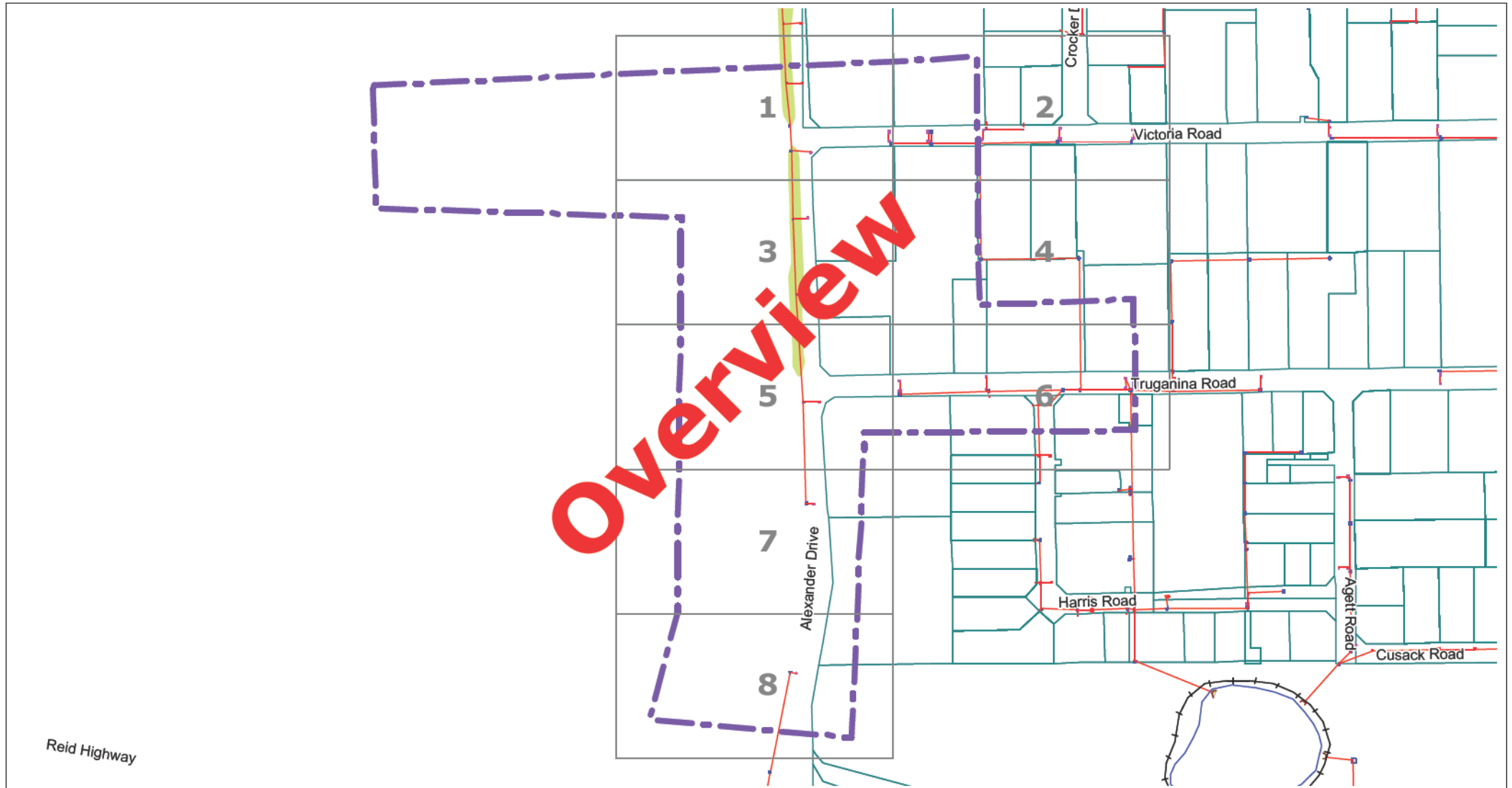
- Where protective works are required around existing Amcom plant the details will be worked out on a case by case basis. Protective works are the responsibility of the Constructor.

All damage to Amcom's network must be reported immediately by dialling

1800 262 663

City of Swan - Drainage

Location: Address: Alexander Drive, Mirrabooka, WA, 6061



Sequence Number: 47290074

Job Number: 9542105

Date Generated: 14/08/2015

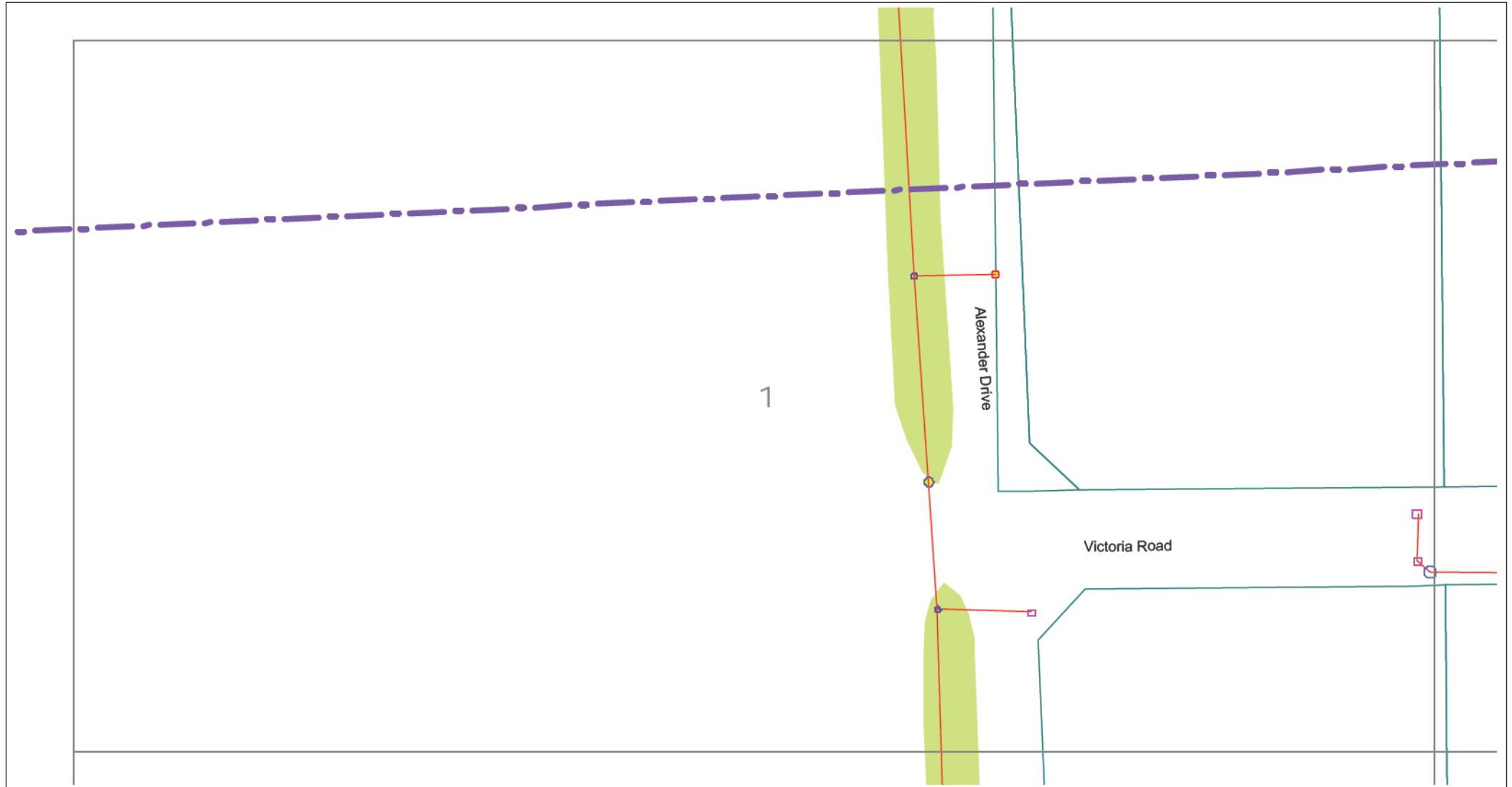
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- City Drainage Lines
- Subsoil Drainage
- Manholes - Gully's - Side Entry Pits
- Fibre Optic Pits
- Fibre Optic Cables
- Water Corp Main Drain
- Reticulation
- Additional Projects

City of Swan - Drainage

Location: Address: Alexander Drive, Mirrabooka, WA, 6061



Sequence Number: 47290074

Job Number: 9542105

Date Generated: 14/08/2015

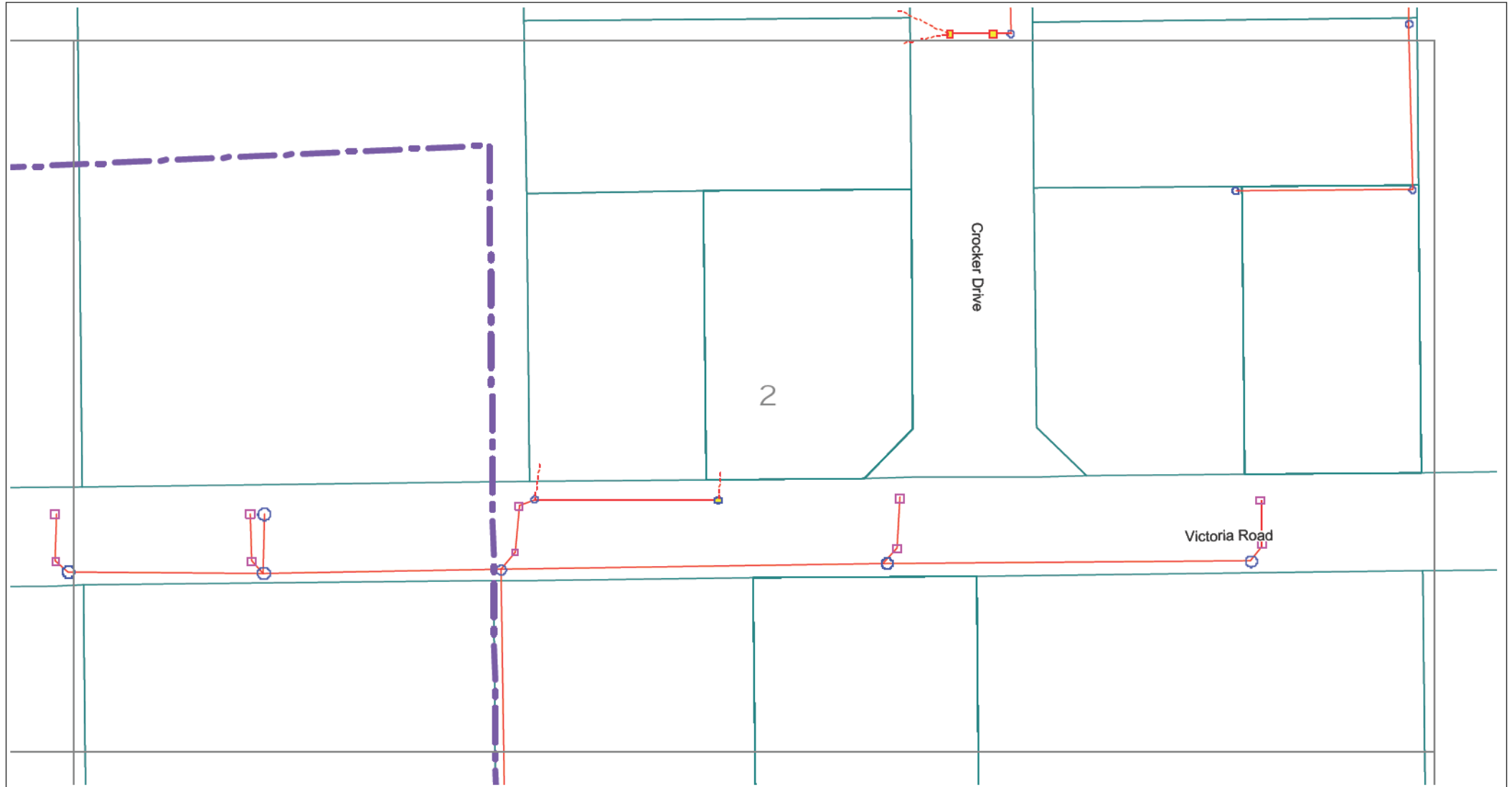
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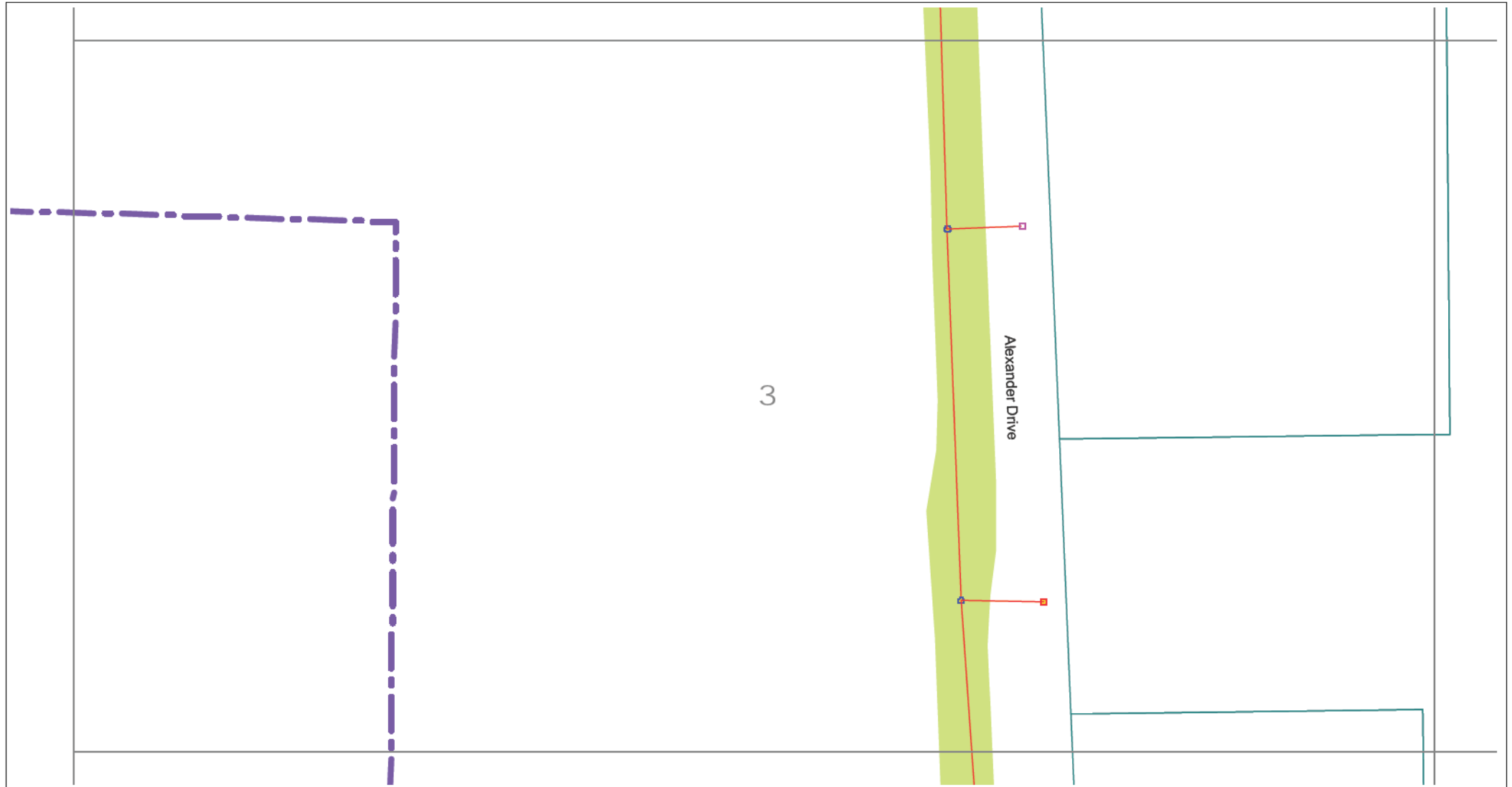


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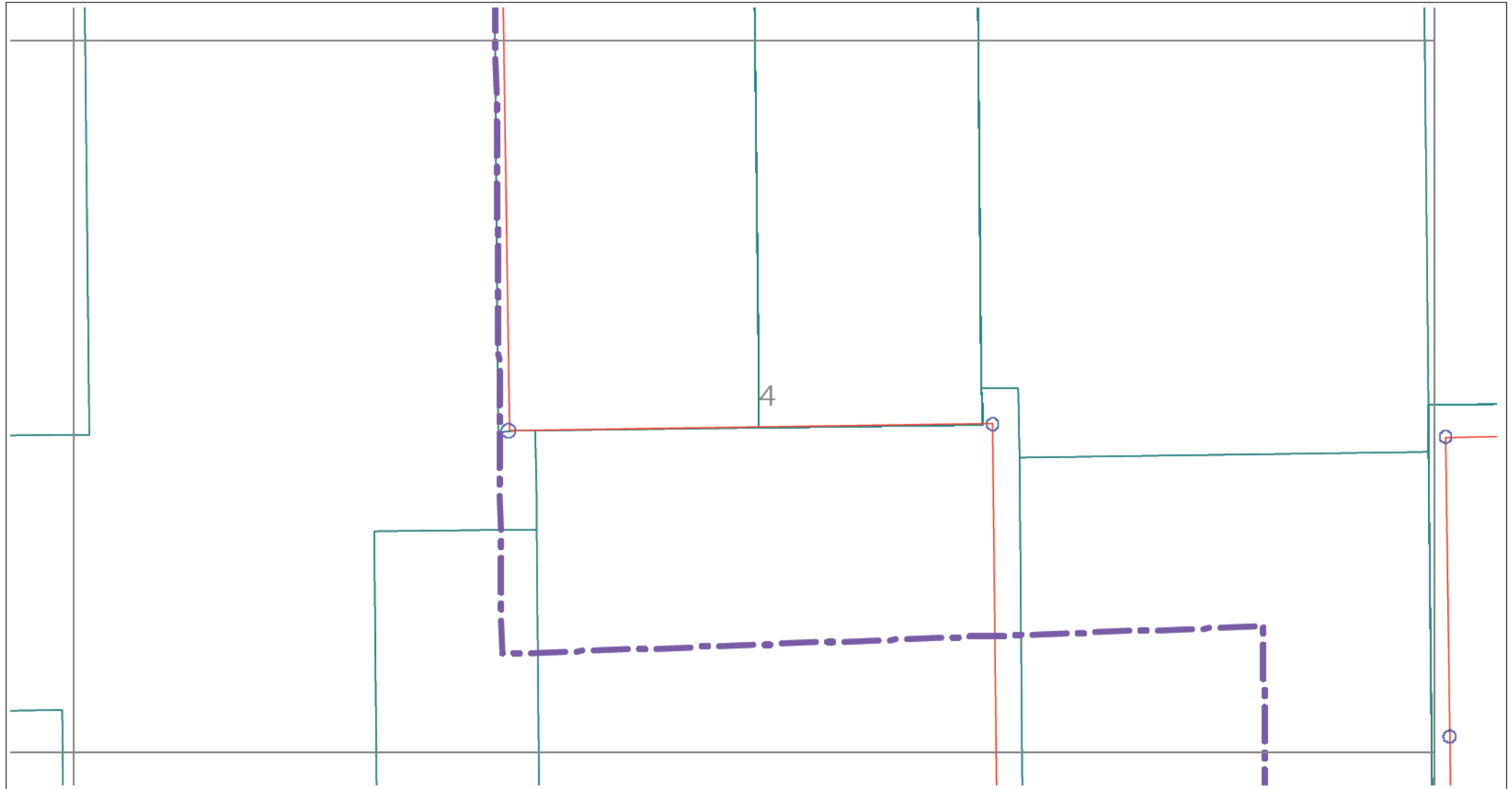
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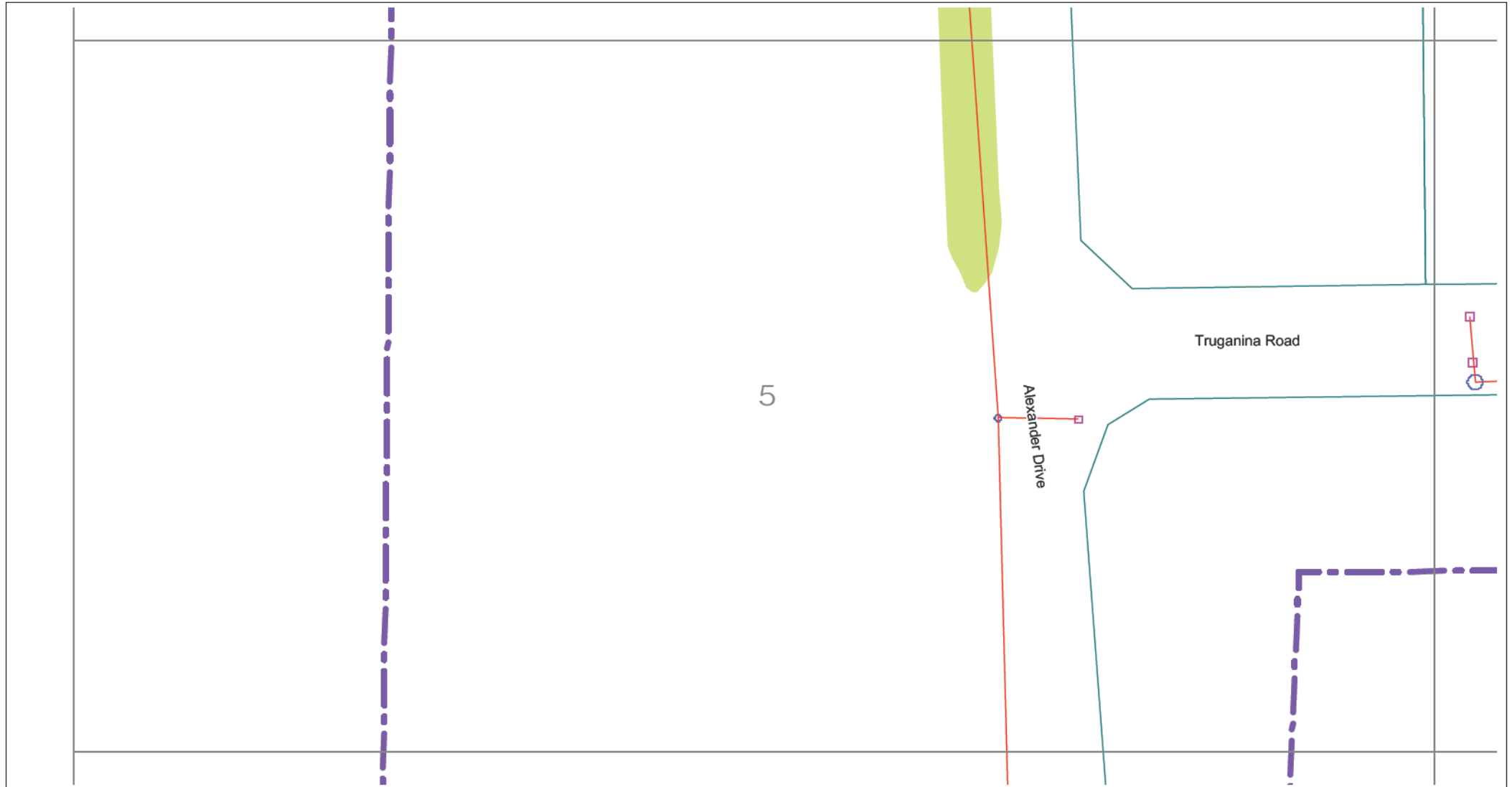


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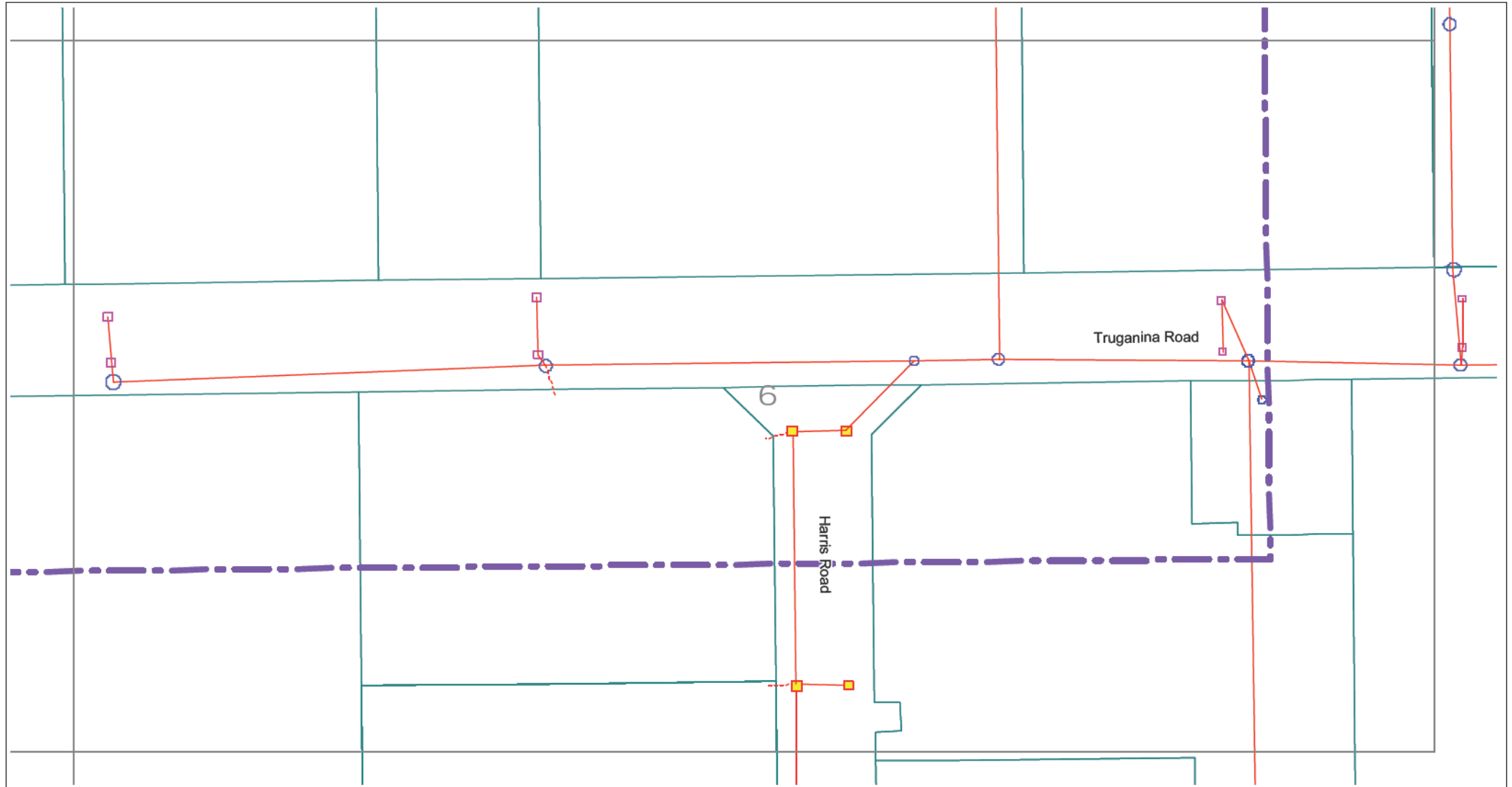
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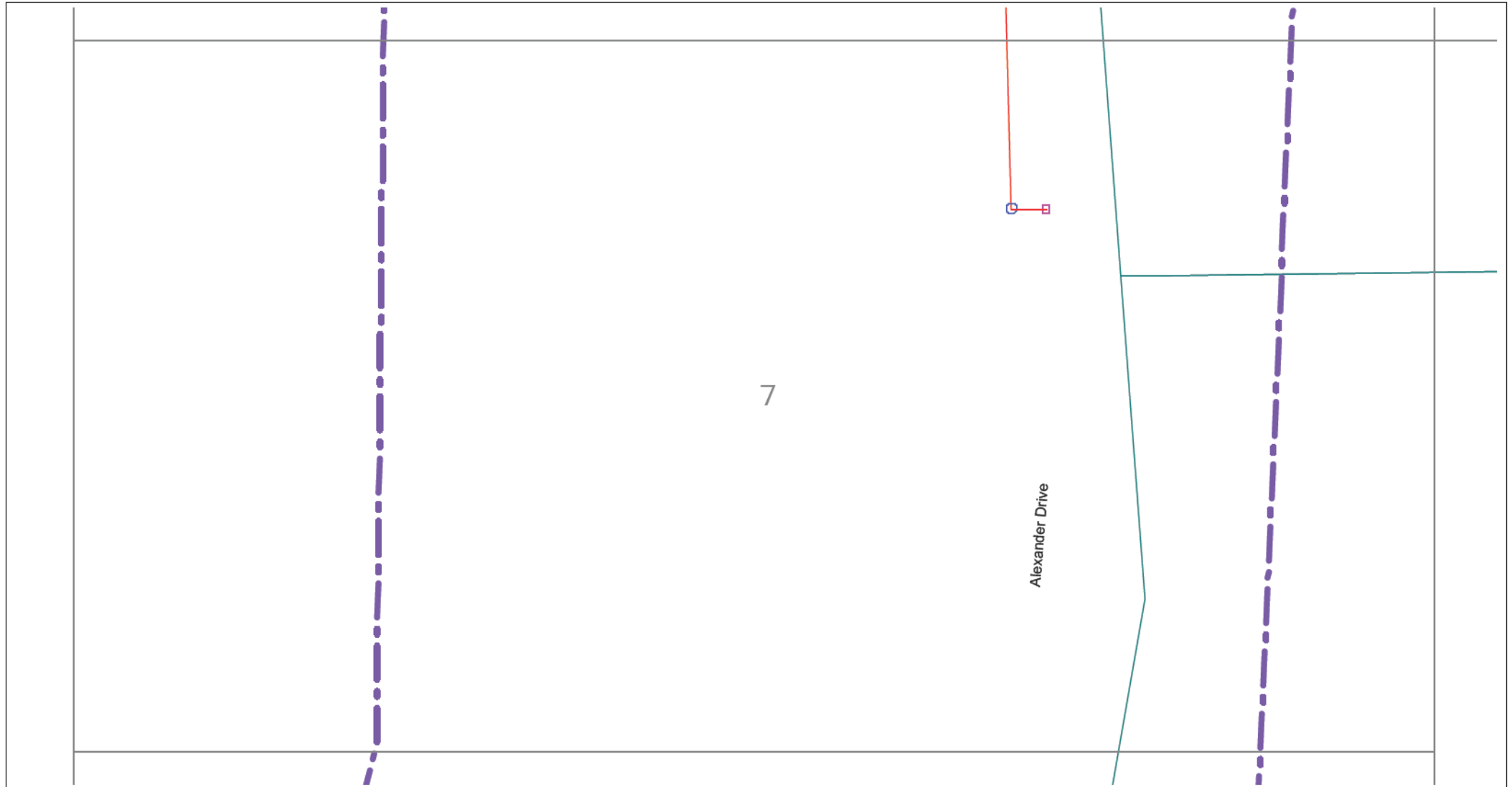


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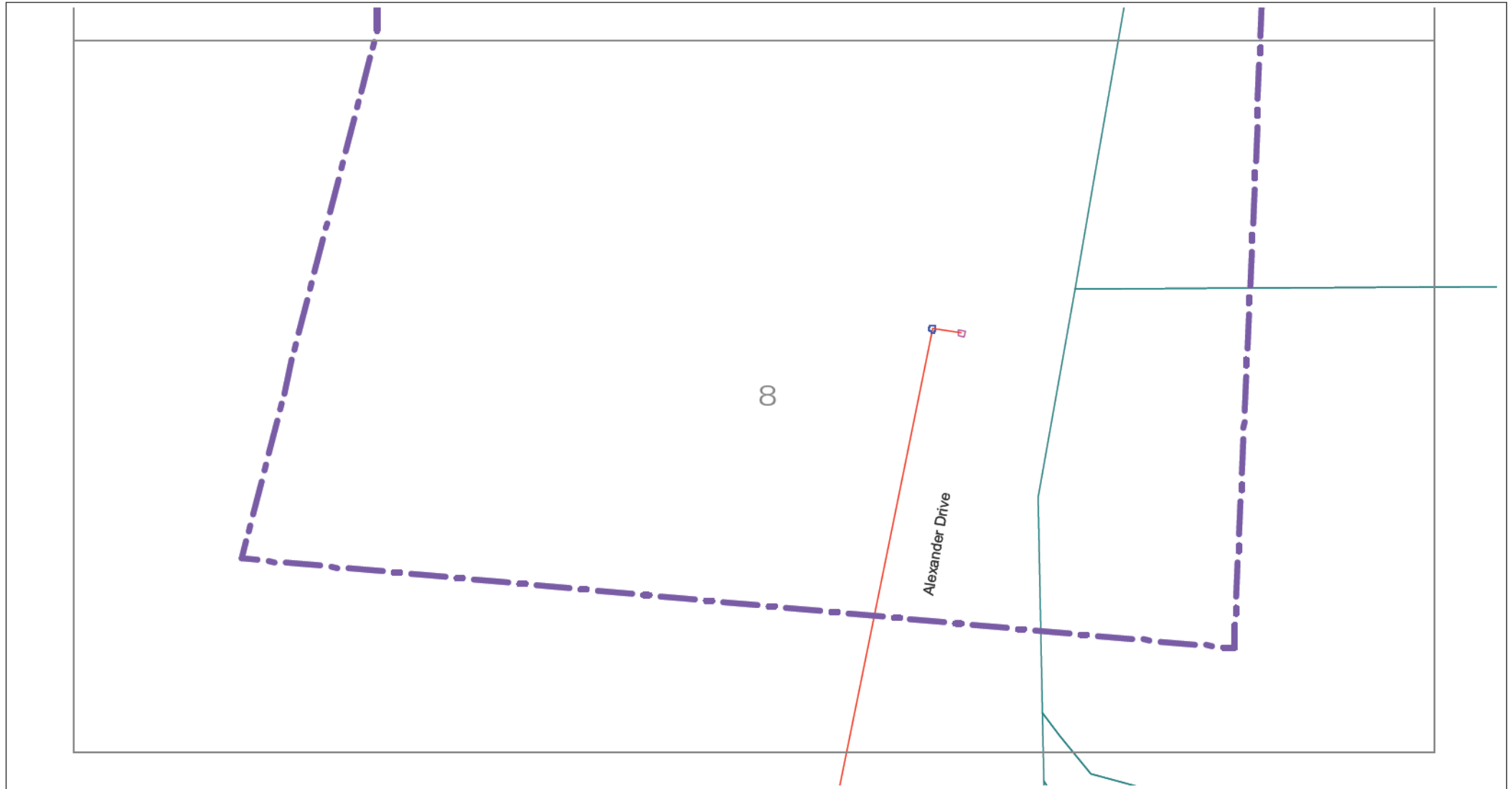
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APPENDIX 3 – Proposed Indicative Development Layout



Level 2 Kishorn Court
58 Kishorn Road
Mount Pleasant 6153
Western Australia

PO Box 1036
Canning Bridge 6153
Western Australia

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Fax: (08) 9315 9959
Email: office@portereng.com.au

www.portereng.com.au